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105th Congress, 2d Session - - - - - House Report 105-847

SUMMARY OF ACTIVITIES  
OF THE  
COMMITTEE ON SCIENCE  
U.S. HOUSE OF REPRESENTATIVES  
FOR THE  
ONE HUNDRED FIFTH CONGRESS



JANUARY 2, 1999

JANUARY 2, 1999.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

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WASHINGTON : 1999

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\*\*Vice Chairman.

## LETTER OF TRANSMITTAL

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HOUSE OF REPRESENTATIVES,  
COMMITTEE ON SCIENCE,  
*Washington, DC, January 2, 1999.*

Hon. JEFF TRANDAHL,  
*The Clerk, House of Representatives,*  
*Washington, DC.*

DEAR MR. TRANDAHL: In compliance with Rule XI, Clause 1(d) of the Rules of the House of Representatives, I hereby submit the Summary of Activities of the Committee on Science for the 105th Congress.

The purpose of this report is to provide the Members of the House of Representatives, as well as the general public, with an overview of the legislative and oversight activities conducted by this committee, as defined by Rule X, Clause 1(n) of the Rules of the House of Representatives.

This document is intended as a general reference tool, and not as a substitute for the hearing records, reports, and other committee files.

Sincerely,

F. JAMES SENSENBRENNER, Jr.,  
*Chairman.*



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## Union Calendar No. 488

105TH CONGRESS }  
2d Session } HOUSE OF REPRESENTATIVES { REPORT  
105-847

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### SUMMARY OF ACTIVITIES—COMMITTEE ON SCIENCE

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JANUARY 2, 1999.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

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Mr. SENSENBRENNER, from the Committee on Science,  
submitted the following

### REPORT

#### HISTORY OF THE COMMITTEE ON SCIENCE

The Committee on Science has its roots in the intense reaction to the Soviet launch of Sputnik on October 4, 1957. Early in 1958 Speaker Sam Rayburn convened the House of Representatives, and the first order of the day was a resolution offered by Majority Leader John McCormack of Massachusetts. It read, “Resolved that there is hereby created a Select Committee on Astronautics and Space Exploration \* \* \*”

The Select Committee performed its tasks with both speed and skill by writing the Space Act creating the National Aeronautics and Space Administration and chartering the permanent House Committee on Science and Astronautics, now known as the Committee on Science, Space, and Technology, with a jurisdiction comprising both science and space.

The Science and Astronautics Committee became the first standing committee to be established in the House of Representatives since 1946. It was also the first time since 1892 that the House and Senate had acted to create standing committees in an entirely new area.

The committee officially came into being on January 3, 1959, and on its 20th Anniversary the Honorable Charles Mosher said, the committee “was born of an extraordinary House-Senate joint leadership initiative, a determination to maintain American pre-eminence in science and technology, \* \* \*”

The formal jurisdiction of the Committee on Science and Astronautics included outer space, both exploration and control, astronomical research and development, scientific research and develop-

ment, science scholarships, and legislation relating to scientific agencies, especially the National Bureau of Standards, the National Aeronautics and Space Administration, the National Aeronautics and Space Council and the National Science Foundation.

The committee retained this jurisdiction from 1959 until the end of the 93rd Congress in 1974. While the committee's original emphasis in 1959 was almost exclusively astronautics, over this 15-year period the emphasis and workload expanded to encompass scientific research and development in general.

In 1974, a Select Committee on Committees, after extensive study, recommended several changes to the organization of the House in H. Res. 988, including expanding the jurisdiction of the Committee on Science and Astronautics, and changing its name to the Committee on Science and Technology.

To the general realm of scientific research and development was added energy, environmental, atmospheric, and civil aviation R&D, and also jurisdiction over the National Weather Service.

In addition to these legislative functions, the Committee on Science and Technology was assigned a "special oversight" function, giving it the exclusive responsibility among all Congressional standing committees to review and study, on a continuing basis, all laws, programs and government activities involving Federal non-military research and development.

In 1977, with the abolition of the Joint Committee on Atomic Energy, the committee was further assigned jurisdiction over civilian nuclear research and development thereby rounding out its jurisdiction for all civilian energy R&D.

A committee's jurisdiction gives it both a mandate and a focus. It is, however, the committee's chairman that gives it a unique character. The Committee on Science and Technology has had the good fortune to have five very talented and distinctly different chairmen, each very creative in his own way in directing the committee's activities.

Congressman Overton Brooks was the Science and Astronautics Committee's first chairman, and was a tireless worker on the committee's behalf for the two and one-half years he served as chairman.

When Brooks convened the first meeting of the new committee in January of 1959, committee Member Ken Hechler recalled, "There was a sense of destiny, a tingle of realization that every member was embarking on a voyage of discovery, to learn about the unknown, to point powerful telescopes toward the cosmos and unlock secrets of the universe, and to take part in a great experiment." With that spirit the committee began its work.

Brooks worked to develop closer ties between the Congress and the scientific community. On February 2, 1959, opening the first official hearing of the new committee Chairman Brooks said, "Although perhaps the principal focus of the hearings for the next several days will be on astronautics, it is important to recognize that this committee is concerned with scientific research across the board." And so, from the beginning, the committee was concerned with the scope of its vision.

Overton Brooks died of a heart attack in September of 1961, and the chairmanship of the committee was assumed by Congressman George Miller of California.

Miller, a civil engineer, was unique among Members of Congress who rarely come to the legislature with a technical or scientific background. He had a deep interest in science, and his influence was clearly apparent in the broadening of the charter of the National Science Foundation and the establishment of the Office of Technology Assessment. He pioneered in building strong relationships with leaders of science in other nations. This work developed the focus for a new subcommittee established during his chairmanship, known as the Subcommittee on Science, Research and Development.

Just a few months before Miller became Chairman, President John F. Kennedy announced to a joint session of Congress the national commitment to land a man on the moon and return him safely to Earth before the end of the decade. Thus, during Miller's 11-year tenure as chairman, the committee directed its main efforts toward the development of the space program.

Chairman Miller was not reelected in the election of 1972, so in January of 1973, Olin E. Teague of Texas took over the helm of the committee. Teague, a man of directness and determination, was a highly decorated hero of the second World War. He was a long-standing Member of Congress and Chairman of the Veterans Committee before taking over the chairmanship of the Science and Technology Committee.

Throughout the 1960's and early 1970's, Teague chaired the Science Committee's Manned Space Flight Subcommittee, and in that capacity firmly directed the efforts to send a man to the moon.

As chairman of the committee, Teague placed heavy emphasis on educating the Congress and the public on the practical value of space. He also prodded NASA to focus on the industrial and human applications of the space program.

One of Teague's first decisions as chairman was to set up a subcommittee on energy. During his six-year leadership of the committee, energy research and development became a major part of the committee's responsibilities.

In 1976, Chairman Teague saw the fruition of three years of intensive committee work to establish a permanent presence for science in the White House. The Office of Science and Technology Policy was established with a Director who would also serve as the President's Science Advisor.

Throughout his leadership, he voiced constant concern that the complicated technical issues the committee considered be expressed in clear and simple terms so that Members of Congress, as well as the general public, would understand the issues.

After six years as Chairman, Teague retired from the committee and the Congress due to serious health problems. He was succeeded by Don Fuqua, a representative from northern Florida.

Fuqua became Chairman on January 24, 1979, at the beginning of the 96th Congress and was the youngest Member to succeed to the committee's chairmanship.

Don Fuqua came to the Congress after two terms in the Florida State Legislature and was, at age 29, the youngest Democrat in Congress when he was elected in 1962.

Fuqua's experience on the committee dated back to the first day of his Congressional service. Since 1963, he had served as a Member of the Committee's Manned Space Flight Subcommittee. When Olin Teague became chairman of the committee in 1973, Fuqua took Teague's place as chairman of the subcommittee.

As the subcommittee chairman he was responsible for major development decisions on the Space Shuttle and the successful Apollo-Soyuz link-up in space between American astronauts and Soviet cosmonauts. Later, the subcommittee's responsibility was expanded to cover all other NASA activities and was renamed the Subcommittee on Space Science and Applications.

As Chairman of the committee, Fuqua's leadership could be seen in the expansion of committee activities to include technological innovation, science and math education, materials policy, robotics, technical manpower, and nuclear waste disposal. He worked to strengthen the committee's ties with the scientific and technical communities to assure that the committee was kept abreast of current developments, and could better plan for the future.

During the 99th Congress, the Science and Technology Committee, under Fuqua's chairmanship, carried out two activities of special note.

The first was the initiation of a study of the nation's science policy encompassing the 40-year period between the end of the second World War and the present. The intent was to identify strengths and weaknesses in our nation's science network. At the end of the 99th Congress, Chairman Fuqua issued a personal compilation of essays and recommendations on American science and science policy issues in the form of a Chairman's Report.

The second activity was a direct outgrowth of the Space Shuttle "Challenger" accident of January 28, 1986. As part of the committee's jurisdictional responsibility over all the NASA programs and policies, a steering group of committee Members, headed by Congressman Robert Roe, the ranking Majority Member, conducted an intensive investigation of the Shuttle accident. The committee's purpose and responsibility were not only the specific concern for the safe and effective functioning of the Space Shuttle program, but the larger objective of insuring that NASA, as the nation's civilian space agency, maintain organizational and programmatic excellence across the board.

Chairman Fuqua announced his retirement from the House of Representatives at the termination of the 99th Congress. He served 24 years on the Committee on Science and Technology and 8 years as its chairman.

Congressman Robert A. Roe of New Jersey, a long-time Member of the Committee, became its new Chairman at the beginning of the 100th Congress. With this fifth Chairman, the Committee was once again presided over by an individual with professional technical expertise. Congressman Roe was trained as an engineer and brought that broad knowledge and understanding to bear on the Committee's issues from the first day of his tenure.

Congressman Roe's first official act as Chairman was to request a change in the Committee's name from the Committee on Science and Technology to the Committee on Science, Space, and Technology. This change was designed not only to reflect the Committee's broad space jurisdiction, but also to convey the importance of space exploration and development to the Nation's future.

In the 100th Congress, under Chairman Roe's stewardship, the Committee kept close scrutiny over NASA's efforts to redesign and reestablish the space shuttle program. The successful launch of the Shuttle Discovery in September, 1988 marked America's return to space after 32 months without launch capability.

The vulnerability of having the nation's launch capability concentrated singularly in the Space Shuttle, and the rapid increase of foreign competition in commercial space activities, precipitated strong Committee action to help ensure the competitive posture of the nation's emerging commercial launch industry.

Chairman Roe's leadership to stabilize and direct the nation's space program led to the Committee's first phase of multi-year authorizations for research and development programs with the advent of three year funding levels for the Space Station.

Within the national movement to improve America's technological competitiveness, Chairman Roe headed the Committee's initiative to expand and redefine the mission of the National Bureau of Standards\* in order for it to aid American industry in meeting global technological challenges.

The Science Committee has a long tradition of alerting the Congress and the nation to new scientific and technological opportunities that have potential to create dramatic economic or societal change. Among these have been recombinant DNA research and supercomputer technology. In the 100th Congress, Members of the Committee included the new breakthroughs in superconductivity research in this category.

Several long-term efforts of the Committee came to fruition during the 101st Congress. As the community of space-faring nations expanded, and as space exploration and development moved toward potential commercialization in some areas, the need arose for legal certainty concerning intellectual property rights in space. Legislation long advocated by the Science Committee defining the ownership of inventions in outer space became public law during this Congress.

Continuing the Committee's interest long range energy research programs for renewable and alternative energy sources, a national hydrogen research and development program was established to lead to economic production of hydrogen from renewable resources its use as an alternative fuel.

At the end of the 101st Congress, the House Democratic Caucus voted Representative Roe Chairman of the Public Works and Transportation Committee to fill the vacancy in that Committee's Chairmanship.

Congressman Roe, who served as Chairman of the Science, Space, and Technology for the 100th and the 101st Congresses,

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\*Now named the National Institute of Standards and Technology (NIST) (P.L. 100-418, Title V, Part B, Subpart A, Sections 5111 through 5163, enacted August 23, 1988).

brought a leadership style of high energy and strong enthusiasm to the Committee. He was known for his tenacious commitment to understanding an issue down to its smallest detail.

The hallmark of Representative Roe's four-year tenure as Chairman was his articulation of science, space, and technology as the well-spring for generating the new wealth for America's future economic growth and long-term security.

At the beginning of the 102nd Congress in January, 1991, Representative George E. Brown, Jr. of southern California became the sixth Chairman of the Science, Space, and Technology Committee. He was the third chairman, among the six, to bring scientific or technical experience to the position. Trained in industrial physics, Brown worked as a civil engineer for many years before entering politics.

Elected to the Congress in 1962, Brown has been a member of the Science, Space, and Technology Committee since 1965. During his more than two decade tenure on the Committee before becoming its Chairman, he chaired subcommittees on the environment, on research and technology, and on transportation and aviation R&D.

Whether from his insightful leadership as a subcommittee chairman or from the solitary summit of a futurist, Brown brought a visionary perspective to the Committee's dialogue by routinely presenting ideas far ahead of the mainstream agenda.

George Brown talked about conservation and renewable energy sources, technology transfer, sustainable development, environmental degradation, and an agency devoted to civilian technology when there were few listeners and fewer converts. He tenaciously stuck to these beliefs and time has proven his wisdom and clairvoyance.

Consistent with his long-held conviction that the nation needed a coherent technology policy, Brown's first action as Chairman was to create a separate subcommittee for technology and competitiveness issues. During his initial year as Chairman, Brown developed an extensive technology initiative which was endorsed by the House of Representatives in the final days of the 102nd Congress. The work articulated Brown's concept of a partnership between the public and private sectors to improve the nation's competitiveness.

The culmination of the 102nd Congress saw Brown's persistent efforts to redirect our national energy agenda come to fruition. The first broad energy policy legislation enacted in over a decade included a strong focus on conservation, renewable energy sources, and the expanded use of non-petroleum fuels, especially in motor vehicles.

In Brown's continuing concern to demonstrate the practical application of advances in science and technology, he instituted the first international video-conferenced meetings in the U.S. Congress. In March of 1992, Members of the Science Committee exchanged ideas on science and technology via satellite with counterparts from the Commonwealth of Independent States. This pilot program in the House of Representatives resulted in a decision to establish permanent in-house capacity for video-conferencing for the House.

As a final activity in the 102nd Congress, Brown issued a Chairman's report on the federally funded research enterprise. The work

will serve as the starting point for a comprehensive review and revision of federal science policy currently in the planning stage.

The 1994 congressional elections turned over control of the Congress to the Republican party. The House Republican Conference acted to change official name of the Committee from Science, Space, and Technology to the Committee on Science. Robert S. Walker of Pennsylvania became the Science Committee's first Republican Chairman, and the seventh Committee chairman. Walker had served on the Science Committee since his election to Congress in 1976, and had been the Ranking Member since 1989.

Chairman Walker acted to streamline the subcommittee structure from five to four subcommittees: Basic Research, Energy and Environment, Space and Aeronautics, and Technology. This action reflected the new Congress' mandate to increase efficiency and cut expenses, and also reflected Walker's personal desire to refocus the Committee's work. Due to the reduction in the number of subcommittees and a sharper focus on the issues, the number of hearings was reduced, while the number of measures passed by the House and signed into law increased.

Chairman Walker chose to use the Full Committee venue to hold hearings exploring the role of science and technology in the future. The first hearing, "Is Today's Science Policy Preparing Us for the Future?" served as the basis for much of the Committee's work during the 104th Congress.

For the first time in recent Science Committee history, every agency under the Committee's jurisdiction was authorized. To preserve and enhance the core federal role of creating new knowledge for the future, the Science Committee sought to prioritize basic research policies. In order to do so, the Committee took strong, unprecedented action by applying six criteria to civilian R&D:

1. Federal R&D efforts should focus on long-term, non-commercial R&D, leaving economic feasibility and commercialization to the marketplace.

2. All R&D programs should be relevant and tightly focused to the agencies' missions.

3. Government-owned laboratories should confine their in-house research to areas in which their technical expertise and facilities have no peer and should contract out other research to industry, private research foundations and universities.

4. The federal government should not fund research in areas that are receiving, or should reasonably be expected to obtain, funding from the private sector.

5. Revolutionary ideas and pioneering capabilities that make possible the impossible should be pursued within controlled, performance-based funding levels.

6. Federal R&D funding should not be carried out beyond demonstration of technical feasibility. Significant additional private investment should be required for economic feasibility, commercial development, production and marketing.

The authorization bills produced by the Science Committee reflected those standards, thereby protecting basic research and emphasizing the importance of science as a national issue. As an indication of the Science Committee's growing influence, the rec-

ommendations and basic science programs were prioritized accordingly.

During the 104th Congress, the Science Committee's oversight efforts were focused on exploring ways to make government more efficient; improve management of taxpayer resources; expose waste, fraud and abuse, and give the United States the technological edge into the 21st century.

The start of the 105th Congress brought a change in leadership to the Committee on Science. Congressman F. James Sensenbrenner, Jr., a Republican representing the 9th District of Wisconsin became the eighth Chairman. Sensenbrenner had been a member of the Committee on Science since 1981 and prior to his appointment as Committee head, served as Chairman of the Subcommittee on Space and Aeronautics.

During the 105th Congress, under Chairman Sensenbrenner's leadership, the Committee on Science worked in a bipartisan fashion to report out a record number of legislative initiatives focused on advancing U.S. interests in research and development. Throughout the 105th Congress, the Science Committee aggressively implemented the Government Performance and Results Act (GPRA/Results Act), legislation making federal agencies accountable for the money they spend.

For Fiscal Year 1998, the Administration's budget proposal was only 1% over the Fiscal Year 1997 level for the research and development programs under the Committee's jurisdiction. In the Views and Estimates submitted to the Committee on the Budget, the Science Committee stated that investment in science is an investment in the future. Therefore, the Committee recommended an increase of 3% for FY98 over the FY97 spending levels. The Committee urged increased funding for basic research, scientific infrastructure, and for selected NASA and environmental programs. (See the appendix section for a copy of Views and Estimates of the Committee on Science for FY 1998.)

In addition, the Committee established the following criteria to guide its deliberative process: (1) Federal Research and Development should focus on essential programs that are long-term, high risk, non-commercial, cutting edge, well-managed, and have great potential for scientific discovery; (2) Federal R&D should be highly relevant to and tightly focused on agency missions, with accountability and procedures for evaluating quality and results; (3) Activities associated with evolutionary advances or incremental improvements to a product or process, or the marketing or commercialization of a product should be left to the private sector; (4) Where possible, international, industry and state science partnerships should be nurtured as a way to leverage the United States taxpayer's R&D investment; and (5) Infrastructure necessary for carrying out essential federal R&D programs needs to be prioritized consistent with program requirements.

Critical analysis by the Committee on Science in the second session of the 105th Congress provided the first look at the Administration's R&D budget proposal and the newly proposed Research Fund for America (RFA) for fiscal year 1999. RFA was one of three new funds (the other two being Environmental Resources and Transportation) proposed that were not trust funds and were es-

entially reclassifications in the President's FY 1999 budget. The RFA was a \$31 billion dollar proposal that combined new and existing programs, with the majority of RFA funds existing in already established federal R&D programs prior to the proposed RFA. Seventy-five percent of the RFA (from FY 1999 to FY 2003) was to be funded within the discretionary cap and the remaining 25% of the funding was to come from the tobacco settlement (15%), unspecified mandatory cuts (4%), new fuel taxes (1%), and cuts to Veterans' Health Care (5%). The major problems with RFA included:

1. funding from uncertain tax increases;
2. funding from uncollected monies from the proposed tobacco settlement;
3. proposed spending increases were outside the discretionary caps established by the historic 1997 Balanced Budget Agreement.

At numerous budget oversight hearings for fiscal year 1999, the Committee requested that the Administration provide impact statements for their respective agencies should the proposed tobacco settlement fail and uncertain revenues not be realized. The Committee recognized the potential harmful impact on United States R&D if these two revenue sources failed to materialize.

The President's original request was for a 7.5% increase for the RFA, and in the end, Congress approved a 9.7% increase for agencies and programs included in the RFA through an emergency supplemental appropriations bill (P.L. 105-277). The result of the second session of the 105th Congress is that R&D now accounts for approximately 14% of discretionary spending.

Of the \$2.794 billion increase Congress approved for programs within the RFA, almost \$2 billion or 70% was for NIH. NSF and DOE research programs received a 7.2% and 8.8% increase respectively. (See the appendix section for a copy of Committee on Science: Analysis and Review, February 26, 1998.)

For Fiscal Year 1999, the Committee's Views and Estimates reflected their goal to substantially increase research and development funding, and urged a 4% increase for programs under the Committee's jurisdiction. The Committee's request for increased funding reflected the continued support for the historic balanced budget agreement, and recommended the funding be within the agreed upon discretionary spending limits. In addition, the Science Committee restated their commitment to the goal of stable and sustainable research and development funding for the long term. (See the appendix section for a copy of Views and Estimates of the Committee on Science for FY 1999.)

While the Science Committee was the last to officially organize in the House, it became the first Committee to complete action on all of its two-year agency authorization bills during the 105th Congress. The Science Committee also became the first to pass legislation banning federal funds for human cloning research, as well as the first to get a computer security bill through the House. Another significant achievement of the Science Committee during the 105th Congress was the passage of legislation encouraging the development of a commercial space industry in the United States. The bipartisan Commercial Space Act of 1998 was a revolutionary piece of legislation opening up space for commercial use.

Other significant legislative accomplishments included:

- Legislation passed by the House to assist small businesses and universities develop advanced technologies. (H.R. 2429)
- Legislation enacted into law which supports research and development programs to protect safety personnel and civilians from fires and earthquakes. (H.R. 1272)
- Exposure of the Administration's management failures in the "Next Generation Internet" (NGI) program, which led to the passage of a bill, revamping the Administration's proposal and allowing for faster communications for schools, businesses and communities.
- Legislation enacted into law authorizing appropriations through the fiscal year 1999 to study the barriers that women face in science, engineering and technology. The bill also directs the National Science Foundation (NSF) to conduct a study of the educational opportunities available to women who want to enter these fields.
- Chairman Sensenbrenner initiated amendments to the Fastener Quality Act, which saved taxpayers millions of dollars by eliminating redundant federal regulations.

At the start of the 105th Congress, the Committee on Science was charged with the task of developing a long-range science and technology policy. Chairman Sensenbrenner appointed the Committee's Vice Chairman, Vernon Ehlers, (R-MI) to lead a study of the current state of the Nation's science and technology policy. The National Science Policy Study, entitled "Unlocking Our Future Toward A New National Science Policy" was unveiled in September of 1998 and was endorsed by the Full House on Oct. 8, 1998, and serves as a policy guide to the Committee, Congress and the scientific community.

Acting in accordance with the Committee on Science's jurisdiction over climate change issues, Chairman Sensenbrenner was chosen by Speaker of the House Newt Gingrich to lead the U.S. delegation at the Kyoto (Dec. 97) and Buenos Aires (Nov. 98) global warming conferences. As any agreement would have to be ratified by the Senate and implementing legislation approved by the House, the Science Committee led delegation provided important oversight of the negotiations and will continue to provide guidance to the leadership and the country on global warming negotiations. Throughout the 105th Congress, the Committee examined the science supporting the Kyoto Protocol and the economic harm it could pose to businesses; as well as the science used to establish the regulatory framework for ozone and air quality strategies.

As a result of the Committee's aggressive oversight agenda, Chairman Sensenbrenner was recognized for his outstanding oversight efforts by Majority Leader Richard Armey with the "Excellence in Programmatic Oversight Award". The award is presented to members who hold federal agencies and programs accountable to American taxpayers.

As the only standing committee chairman to receive the award, Chairman Sensenbrenner was honored for, among other things, exposing the Administration's failures in handling Russian participation in the International Space Station. Through nine hearings on the subject, the Chairman worked tirelessly on a bipartisan basis

to require the Administration and NASA to develop clear-cut plans in dealing with Russian non-performance and delays. In an effort to prevent future cost growth and schedule delays, and direct NASA to solve systemic problems, Chairman Sensenbrenner introduced H.R. 4820, the Save the International Space Station Act of 1998 at the conclusion of the 105th Congress.

The Science Committee examined a number of other issues during the 105th Congress including: monitoring the safety standards on the Russian Mir; national security and economic implications of alleged satellite technology transfers from Loral and Hughes to the Chinese; the Y2K problem; management problems at Brookhaven National Lab resulting in changes that have made the lab safer to the surrounding community; and enforcement of the Results Act with federal agencies.

The leadership of Chairman Sensenbrenner has produced 16 measures signed into law, a proven track record with its aggressive oversight agenda, and a significantly reduced staff level, evidence that more was accomplished with less during the 105th Congress.



## CHAPTER I—LEGISLATIVE ACTIVITIES OF THE COMMITTEE ON SCIENCE

During the 105th Congress, 81 bills were referred to the Committee on Science; 27 bills were reported or discharged by the Committee; 28 measures passed the House; committee interests were conferred in 3 bills; and, 16 measures were enacted.

1.1—P.L. 105–23, TO AMEND SECTION 2118 OF THE ENERGY POLICY ACT OF 1992 TO EXTEND THE ELECTRIC AND MAGNETIC FIELDS RESEARCH AND PUBLIC INFORMATION DISSEMINATION PROGRAM (H.R. 363)

### *Background and summary of legislation*

Because of the prevalence of electricity in the day-to-day operation of society, it is impossible to avoid exposure to the electromagnetic fields (EMF) produced in the generation and transmission of electrical power. Unlike the hazards from shocks and burns by coming into contact with electrical currents, which have been known since the first application of electric current, the hazards of EMF's is a somewhat recent discovery. Concerns first arose during World War II with exposure to high-frequency radar systems and have steadily increased through the late 1970's when public attention became focused on possible adverse health effects to exposure to EMF's. Several studies have drawn correlations between the proximity of power lines and incidences of leukemia and other childhood cancer. While these studies have been proven to contain flaws, popular media focus on them has caused public concern to be peaked.

Section 2118 of the Energy Policy Act of 1992 (EPACT), directed the Secretary of Energy to establish a 5-year cost-shared program—the EMF RAPID Program—starting October 1, 1992 and expiring December 31, 1997. The EMF RAPID Program objectives are to: (1) determine whether or not exposure to EMF produced by the generation, transmission, and use of electric energy affects human health; (2) carry out research, development, and demonstration with respect to technologies to mitigate any adverse human health effects; and (3) provide for the dissemination of scientifically-valid information to the public. The Department of Energy (DOE) and the Department of Health and Human Services' National Institute of Environmental Health Sciences (NIEHS) are jointly responsible for directing the program, with the DOE being responsible for the research, development, and demonstration of new technologies to improve the measurement and characterization of EMF and the NIEHS has sole responsibility for research on possible human health effects of EMF. In addition, the act created two advisory committees to help guide the program. The Electric and Magnetic Fields Interagency Committee (EMFIAC) is composed mostly of

employees of various federal agencies, while the National Electric and Magnetic Fields Advisory Committee (NEMFAC) is made up of members of state agencies as well and private sector employees and members of the public.

Finally, the EPACT established a number of reporting requirements including: (1) the Director of the NIEHS reporting to EMFIAC and to Congress the extent to which exposure to EMF affects human health; (2) the EMFIAC reporting to the Secretary of Energy and Congress on its findings and conclusions on the effects, if any, and any actions that may be necessary to minimize health effects, if any; and (3) the National Academy of Sciences reporting to the EMFIAC and NEMFAC periodically evaluating the research and recommending ways to disseminate information effectively.

H.R. 363, as introduced, amends Section 2118 of EPACT by extending by one year: (1) the EMF RAPID Program, EMFIAC, and the NEMFAC termination dates (from December 31, 1997 to December 31, 1998); (2) the deadline of the Director of the Department of Health and Human Services' National Institute of Environmental Health Sciences report to the EMFIAC and to Congress (from March 31, 1997 to March 31, 1998); and (3) the deadline of the EMFIAC's report to the Secretary of Energy and to Congress (from September 30, 1997 to September 30, 1998).

#### *Legislative history*

H.R. 363 was introduced by Representative Edolphus Towns on January 7, 1997 and was co-sponsored by Congressman Frank Pallone, Jr. The bill was referred to the Committee on Commerce and, in addition, to the Committee on Science. On February 10, 1997 it was subsequently referred to the Subcommittee on Energy and Environment.

The subcommittee held a hearing on March 19, 1997, and received testimony on the bill from the Department of Energy and non-Federal participants. The Subcommittee on Energy and Environment then met to mark up H.R. 363 on April 9, 1997 and ordered the measure reported to the Full Committee by a voice vote.

On April 16, 1997, the Committee adopted the Subcommittee's amendment by voice vote and ordered H.R. 363 reported to the House, as amended. The Committee filed, H. Rept. 105-60, Part 2, on April 21, 1997. The House Committee on Commerce ordered an identical measure reported to the House on April 21, 1997 (H. Rept. 105-60, Part 1).

The House voted to suspend the rules and pass H.R. 363 on April 29, 1997 by: Y-387; N-35; Roll Call No. 94. The bill was received in the Senate on April 30, 1997 and referred to the Senate Committee on Energy and Natural Resources which held a hearing on May 19, 1997. On June 12, 1997 the Senate Committee on Energy and Natural Resources held a markup and ordered the measure reported, without amendment, by a voice vote and filed S. Rept. 105-27.

The Senate passed the measure without amendment by unanimous consent on June 20, 1997, and the President signed H.R. 363, To Amend Section 2118 of the Energy Policy Act of 1992 to Extend the Electric and Magnetic Fields Research and Public Information Dissemination Program, into law on July 3, 1997 (P.L. 105-23).

1.2—P.L. 105—47, TO AUTHORIZE APPROPRIATIONS FOR CARRYING OUT THE EARTHQUAKE HAZARDS REDUCTION ACT OF 1977 FOR FISCAL YEARS 1998 AND 1999, AND FOR OTHER PURPOSES (S. 910/H.R. 2249)

*Background and summary of legislation*

Congress created the National Earthquake Hazards and Reduction Program (NEHRP) in P.L. 95—124, the Earthquake Hazards Reduction Act of 1977, in response to a recognized national threat posed by earthquakes and in an effort to reduce death and property loss from this natural disaster. Since its inception, NEHRP has focused on earthquake research (physical, seismic, structural, and social) as well as earthquake hazards mitigation. NEHRP activities in research and mitigation are executed by four separate federal agencies: The National Science Foundation (NSF); the National Institute of Standards and Technology (NIST); the United States Geological Survey (USGS); and the Federal Emergency Management Agency (FEMA).

As the designated lead agency for NEHRP, FEMA is charged with the responsibility of coordinating the activities of the other principal agencies, conducting planning for and managing of federal responses to earthquakes, and funding state and local preparedness activities.

The USGS conducts and supports earth science investigations to understand the origins of earthquakes, characterize earthquake hazards, and predict the geologic effects of earthquakes. This agency also disseminates earth science information.

The NSF funds earthquake engineering research, basic earth sciences research, and earthquake-related social sciences research. Earthquake engineering research includes assessing the impact of earthquakes on buildings and lifelines.

NIST conducts and supports engineering studies to improve seismic provisions of standards, codes, and practices for buildings and lifelines.

Additional federal agencies contribute to the NEHRP through research activities consistent with their primary missions. For example, the Department of Energy has studied the seismic safety of nuclear reactor designs as part of their nuclear energy research program.

Over the years, NEHRP has provided insightful research and useful information for earthquake hazards mitigation. The program has led to significant advances in knowledge of earth science and engineering aspects of earthquake risk reduction.

NEHRP was last authorized by P.L. 103—374. This Act authorized NEHRP at \$103 million for fiscal year 1995 and \$106 million for fiscal year 1996. In addition, this Act directed the President to conduct an assessment of earthquake engineering research and testing facilities in the United States. The Administration, through NSF and NIST, commissioned the Earthquake Engineering Research Institute (EERI) to conduct the assessment. In a subsequent report released, EERI made a number of recommendations regarding the state of the nation's earthquake engineering testing facilities. The primary recommendation among these, was a specific recommendation that a comprehensive plan for upgrading existing

earthquake engineering research and testing facilities be developed and implemented.

The bill authorizes appropriations to FEMA, USGS, NSF, and NIST for fiscal years 1998 and 1999 for carrying out activities under the National Earthquake Hazards Reduction Act of 1977. The bill also authorizes appropriations for operation of the Global Seismic Network (GSN). In addition, H.R. 2249 authorizes and provides funds for the development by USGS of a new prototype real time seismic hazards warning system. This system is to be a network of seismic sensors connected to receivers located at sites such as electric utilities and gas lines. The system would provide for timely warning to the facilities in the event of a seismic event.

Finally, the bill requires the NSF, in conjunction with the three other NEHRP agencies, to develop a plan to effectively use earthquake engineering testing facilities, upgrade facilities and equipment, and integrate new, innovative testing approaches to earthquake engineering research in a systematic manner.

#### *Legislative history*

H.R. 2249, a bill to authorize appropriations for carrying out the Earthquake Hazards Reduction Act of 1997 and for other purposes. The bill was introduced by Science Committee Chairman Sensenbrenner and Science Committee Ranking Member Brown (CA) on July 24, 1997.

H.R. 2249 authorizes appropriations through the year 1999 to the Federal Emergency Management Agency (FEMA) and the U.S. Geological Survey to carry out the National Earthquake Hazards Reduction Program.

On April 24, 1997, the Basic Research Subcommittee held a hearing on H.R. 2249.

On July 29, 1997 the full Science Committee passed and ordered reported H.R. 2249 (Report 105-238, Part I). The bill provides funding for programs under the National Earthquake Hazards Reduction Program for the Global Seismic Network, the National Science Foundation (NSF) for engineering research and geosciences research, and the National Institute of Standards and Technology (NIST). H.R. 2249 also requires the USGS to report to the Congress on (1) a program to develop a prototype real-time seismic warning system, (2) regional seismic monitoring networks in the United States, (3) improving the seismic hazard assessment of seismic zones, and (4) the need for additional Federal disaster-response training capabilities that are applicable to earthquake response. The bill also authorizes earth science teaching materials and requires NSF, FEMA, USGS, and NIST to develop jointly a comprehensive plan for earthquake engineering research to use effectively existing testing facilities and laboratories, upgrade facilities and equipment as needed, and integrate new, innovative testing approaches to the research infrastructure in a systematic manner.

S. 910, the Senate companion bill to H.R. 1273 was passed by the Senate on July 31, 1997, by the House under Suspension of the Rules on September 16, 1997, and was signed into law on October 1, 1997 as P.L. 105-47.

*Background and summary of legislation*

The Committee requested and received outside conferee status on the FY1998 Defense Authorization Act. In particular, the Committee sought conferee status on provisions in the bill regarding management of the U.S. Global Positioning System (GPS). GPS is a space-based national security system that broadcasts precise timing and location information that enable individuals equipped with appropriate signal receivers to determine their location in three dimensions with a high degree of accuracy. Initiated as a national security system, the Reagan Administration decided that a less precise signal would be made available to civilian users. This has led to a dramatic increase in the civilian and commercial use of the GPS system, which falls under the jurisdiction of the Committee on Science. Commercial space revenues generated around the Global Positioning System, for example, had risen from \$1.3 billion in 1995 and were projected to grow to \$6.4 billion in 1999.

The Senate version of the FY1998 Defense Authorization Act contained several provisions related to the management of GPS, but did not fully spell out a clear management structure or the process for reviewing international agreements related to GPS. In general, the Committee was concerned that the success of the GPS system was leading too many federal department and agencies to assert decision-making authority over the system. That was resulting in inconsistent policy direction within the Executive branch and undermining the continuing development of civilian applications. The Space and Aeronautics Subcommittee had already held one hearing on this problem, while the Chairman had received correspondence from a variety of private sector users expressing their concern about the increasingly contradictory decision-making processes employed in the Executive Branch interagency process. The Committee recommended two changes to the Senate version of the FY1998 Defense Authorization Act to address this problem. First, in recognition of the Defense Department's successful management of GPS as a national security system—while at the same time providing a stable policy environment that enabled the private sector to aggressively develop new applications to benefit non-national security activities—and in order to ensure policy consistency, the Committee recommended legislative language to ensure that the Defense Department not be required to accept GPS rules initiated by other agencies as binding until such time as the Defense Department had determined that such rules were consistent with U.S. national security and the efficient management of the Global Positioning System. The Committee recommended that it might become necessary to change this language if the interagency Global Positioning System Executive Board later proved itself capable of effective interagency management of the system. Second, the Committee recommended language that would require the interagency Global Positioning System Executive Board to review international agreements affecting the GPS before such agreements be accepted by the United States. The Committee was reacting to experience with negotiations during the World Administrative Radio Con-

ference (WARC) making spectrum allocations that fall, during which time the State Department failed to prepare adequately for the implications that WARC negotiations might have on the Global Positioning System and the United States narrowly avoided an international agreement that would have reduced the reliability of the Global Positioning System. Both the Committee's recommendations were accepted and adopted in the bill, which was signed into law as P.L. 105-85.

*H.R. 1119: sections 241, 1074 and 3154*

On July 25, 1997, the Speaker appointed Science Committee Chairman F. James Sensenbrenner, Jr. (WI-9), Subcommittee on Energy and Environment Chairman Ken Calvert (CA-43), and Science Committee Ranking Minority Member George E. Brown, Jr. (CA-42) as additional conferees to H.R. 1119, the National Defense Authorization Act for Fiscal Year 1998, for consideration of Sections 214 and 3148 of the House-passed bill, and Sections 234 and 1064 of the Senate amendment to H.R. 1119, and modifications committed to conference. These conference committee deliberations resulted in the enactment of three sections of the National Defense Authorization Act for Fiscal Year 1998 (Public Law 105-85), which was signed into law by the President on November 18, 1997: (1) Section 241 (Restructuring of National Oceanographic Partnership Program Organization); (2) Section 1074 (Sustainment and operation of the Global Positioning System); and (3) Section 3154 (Plan for External Oversight of National Laboratories). Descriptions of these provisions follow.

*Section 241—Restructuring of National Oceanographic Partnership Program Organization*

In signing the National Defense Authorization Act for Fiscal Year 1997, the President issued a statement that the statute's method for the appointment of certain members of the National Ocean Leadership Council would violate the Appointments Clause of the Constitution. Although the statement provided that the Council should not exercise significant governmental authority, the administration allowed the Council to be convened with the 12 members whose appointment did not raise any constitutional issue, pending the enactment of corrective legislation. The House-passed version of H.R. 1119 contained a provision (Section 214) that would amend Section 7902 of title 10, United States Code, to provide that the President, or his designee, shall appoint members of the National Ocean Research Council who are not already government officers, to represent the views of the ocean industries, state governments, and academia, and such other views as the President considers appropriate.

The Senate amendment to H.R. 1119 contained a provision (Section 234) that would amend Section 7902(b) to revise the membership of the Council by removing those members whose appointment would raise constitutional questions. The National Ocean Leadership Council would remain as currently established by the administration, with members representing the 12 Federal agencies with significant oceanographic interest. The provision also recommended that the membership of the Council's Ocean Research Advisory

Panel be expanded to include representatives from the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine, as well as government, academia, and the oceans industry.

The House receded with an amendment that clarifies the role of the Ocean Research Advisory Panel with regard to membership and responsibilities.

*Section 1074—Sustainment and operation of the Global Positioning System*

The Senate amendment to H.R. 1119 contained a provision (Section 1064) that would endorse and enact into law the presidential policy on the sustainment and operation of the Global Positioning System (GPS) issued in March 1996.

The House-passed bill contained no similar provision.

The House receded with an amendment providing that the Interagency GPS Executive Board, established pursuant to the presidential GPS policy, be the forum for interagency review of any proposed international agreement on the civil use of GPS. The amendment also directs the Secretary of Defense not to accept any restriction on the GPS system proposed by the head of any other department or agency in the exercise of that official's regulatory authority that would adversely affect the military potential of GPS.

*Section 3154—Plan for external oversight of national laboratories*

The House-passed version of H.R. 1119 contained a provision (Section 3148) that would require the Secretary of Energy to develop a plan for the external oversight of the national laboratories. The plan would provide for the establishment of an external oversight committee comprised of representatives of industry and academia for the purpose of making recommendations to the Secretary of Energy and to the congressional defense committees on the productivity of the laboratories and on the excellence, relevance, and appropriateness of the research conducted at the laboratories. The plan also would provide for the establishment of a competitive peer review process for funding basic research at the laboratories.

The Senate amendment to H.R. 1119 contained no similar provision.

The Senate receded with an amendment requiring the Secretary to prepare a report on existing and potential new external oversight practices at the national laboratories. The report is due not later than July 1, 1999, and is to include any recommendations from the Secretary and a plan to implement such recommendations.

*Legislative history*

Congressman Floyd Spence, of South Carolina introduced H.R. 1119 in the House on March 19, 1997. The bill was originally cosponsored by Congressman Ronald V. Dellums of California.

H.R. 1119 was referred to the House Committee on National Security on March 19, 1997. The Committee on National Security held a markup session on June 11, 1997. And on June 16, 1997, reported H.R. 1119 to the House amended (House Report 105-132).

On June 25, 1997, the bill passed the House amended by a recorded vote of 304–120 (Roll No. 236).

H.R. 1119 was received in the Senate on July 7, 1997. On July 11, 1997, the bill was laid before the Senate by unanimous consent, the Senate struck all after the enacting clause and substituted the language of S. 936, as amended, and passed H.R. 1119 with an amendment by unanimous consent. The Senate insisted on its amendments and asked for a conference with the House.

On October 23rd, 1997, the conferees filed the conference report (House Report 105–340) to H.R. 1119 in the House. The House agreed to the conference report by a yeayay vote of 286–123 (Roll No. 534) on October 28, 1997. And the Senate agreed to the conference report by a yeayay vote of 90–10 (Record Vote No. 296) on November 6, 1997. On November 18, 1997, the President signed the bill which became Public Law 105–85.

1.4—P.L. 105–108, UNITED STATES FIRE ADMINISTRATION AUTHORIZATION ACT FOR FISCAL YEARS 1998 AND 1999 (S. 1231/H.R. 1272)

#### *Background and summary of legislation*

In 1974 Congress enacted the Federal Fire Prevention and Control Act in response to a nationwide concern about the increasing number of lives and property lost to fires. The Act established the USFA in an effort to prevent and reduce these losses. The USFA coordinates the nation's fire safety and emergency medical service activities. The USFA works with state and local units of government to educate the public in fire safety and prevention, collect and analyze data related to fire, conduct research and development in fire suppression, promote firefighter health and safety, and conduct fire service training.

The USFA administers the National Fire Academy, which provides education and training to fire and emergency service personnel in fire protection and control.

This legislation will enable the USFA and NFA to continue to pursue these important functions and to continue to minimize fire losses. The bill authorizes \$29.6 million and \$30.5 million in appropriations, respectively, for Fiscal Years 1998 and 1999 in appropriations for the activities of the United States Fire Administration and the National Fire Academy.

#### *Legislative history*

H.R. 1272, a bill to authorize appropriations for fiscal years 1998 and 1999 for the United States Fire Administration, and for other purposes. The bill was introduced by Subcommittee on Basic Research Chairman Schiff, Science Committee Chairman Sensenbrenner, Science Committee Ranking Member Brown (CA) and Subcommittee on Basic Research Ranking Member Barcia on April 10, 1997.

H.R. 1272 authorizes through the year 1999 appropriations to the United States Fire Administration (USFA), which is housed in the Federal Emergency Management Agency, and the National Fire Academy (NFA), which is administered by the USFA, to provide vital assistance to the Nation's fire and emergency services communities.

On March 18, 1997, the Basic Research Subcommittee held a hearing on H.R. 1272.

On April 16, 1997, the Committee passed and ordered reported H.R. 1272, amended (Report # 105-62). The bill, as amended, provides funding for the United States Fire Administration to carry out its four primary missions: fire service training; fire-related data collection and analysis; public education and awareness; and research and technology. In addition, the bill authorizes funding so the agency can perform a new counterterrorism training function.

H.R. 1272 was passed (amended) by the House on April 23, 1997 under Suspension of the Rules. The Senate companion bill, S. 1231, was passed by the Senate on November 4, 1997, by the House under Suspension of the Rules on November 9, 1997, and signed into law on November 20, 1997 as P.L. 105-108.

1.5—P.L. 105-135, SMALL BUSINESS REAUTHORIZATION ACT OF 1997 (S.1139/H.R. 2261/H.R. 2429)—(NOTE H.R. 2429 WAS INCORPORATED AS TITLE VII OF H.R. 2261, HOUSE COMPANION MEASURE TO S. 1139)

#### *Background and summary of legislation*

H.R. 2429, reauthorizes and improves the Small Business Technology Transfer program through FY 2000. Through a Senate amendment, the authorization is extended through FY 2001.

The Small Business Innovation Development Act (P.L. 97-219) created the Small Business Innovative Research (SBIR) program in 1982. In 1992 the program was reauthorized by P.L. 102-564 (15 U.S.C. 638). The reauthorization created a three-year pilot program called the Small Business Technology Transfer (STTR) program.

STTR is intended to facilitate the commercialization of university, non-profit, and contractor operated federal laboratory research and development by small businesses. STTR provides funding for research proposals which are developed and executed cooperatively between small firms and scientists/professors in research institutions. Currently, the Department of Energy (DOE), Department of Defense (DOD), Health and Human Services (HHS), National Aeronautics and Space Administration (NASA), and National Science Foundation (NSF) all contribute to the program. The STTR set-aside was last reauthorized as part of the Omnibus Consolidated Appropriations Act of 1996. That authorization expired on September 30, 1997.

The research is funded by a 0.15% set-aside of an agency's extramural research and development budgets that exceed \$1 billion.

#### *Legislative history*

On September 17, 1997, the Committee on Science convened to mark up H.R. 2429. Chairman Sensenbrenner and Ranking Member Brown offered an amendment in the nature of a substitute which was adopted by voice vote. The amendment: (1) adds the Committee on Science to the list of Committees that are to receive the Small Business Administration's annual report on the STTR and SBIR programs; (2) clarifies that agency program needs are to be met by Phase II STTR awards; (3) reauthorizes the STTR program at 0.15 percent through fiscal year 2000; (4) reaffirms STTR will be included in each agencies' performance plan as described in

31 U.S.C. 1115 (a) and (b), and that STTR and SBIR will be included in each participating agencies' updated strategic plan as described in 5 U.S.C. 306(b); (5) requires agencies to collect data on the STTR program from awardees that will enable them to assess the program's outputs and outcomes; and (6) requires SBA to develop an outreach program to small businesses and universities located in States that have had less than 20 STTR awards in the previous 2 fiscal years. The amendment was adopted by voice vote. The Committee reported H.R. 2429 (H. Rept. 105-259, Part I) on September 23, 1997.

H.R. 2429 passed the House under suspension of the rules as Title VII of H.R. 2261, Small Business Programs Reauthorization and Amendments Act of 1997 on September 29, 1997. Subsequently, the House passed S. 1139, a similar Senate-passed bill, after it was amended to contain the text of H.R. 2261 as passed by the House. S. 1139 passed the Senate, amended, on October 31, 1997. As amended, Title V of the bill authorizes STTR through FY 2001 and changed the eligibility requirement for disadvantaged states from less than 20 STTR awards to less than \$5 million. S. 1139 passed the House under Suspension of the Rules on November 9, 1997. S. 1139 was signed by the President on December 2, 1997 (P.L. 105-135).

1.6—P.L. 105-155, FAA RESEARCH, ENGINEERING, AND DEVELOPMENT AUTHORIZATION ACT OF 1998 (H.R. 1271)

*Background and summary of legislation*

H.R. 1271 authorizes the Federal Aviation Administration (FAA) to conduct research, engineering and development activities for fiscal years (FY) 1998 and 1999. The objective of FAA's RE&D program is to develop and validate the technology and knowledge required for the agency to ensure the safety, efficiency, and security of our national air transportation system. Advances developed through the RE&D program are helping to transform our nation's air traffic control system into a modern air traffic management system capable of meeting the increased aviation demands of the coming century.

Overall, H.R. 1271, as enacted, authorizes \$226.8 million in FY1998 and \$229.7 million in FY1999 for the FAA to carry out the critical RE&D projects and activities. H.R. 1271 increases funding for: the Capacity and Air Traffic Management account, primarily to safeguard sensitive computer and information system data from unauthorized disclosure; the Weather account, to reflect recommendations by the FAA RE&D Advisory Committee and the National Academy of Sciences that the FAA place a higher priority on weather research projects and activities; the Aircraft Safety account, to allow FAA safety inspectors and certification engineers to assess potential aircraft safety risks and to take proactive steps that reduce the rate of aviation-related accidents; the Human Factors account recognizing that "human factors" is a significant contributor in most aircraft and airport accidents; and the Innovative/Cooperative Research account, to establish a new undergraduate research grants program.

H.R. 1271 contains language to require the FAA to provide the House Committee on Science with notice of any major reprogramming or reorganization effort within the RE&D program. Finally, the legislation includes a “Sense of Congress” concerning the need for the FAA to assess immediately the effect of the Year 2000 computer problem on its computer and information systems.

*Legislative history*

The Science Committee marked up and ordered reported H.R. 1271 on April 16, 1997 (H. Rept. 105–61). The House of Representatives passed H.R. 1271, as amended, on April 29, 1997 by a vote of 414–7. The Senate passed H.R. 1271 with an amendment on November 13, 1997. The bill, as passed by the Senate, authorized FAA RE&D activities for two years instead of three. H.R. 1271, as amended by the Senate, was signed into law on February 11, 1998 as P.L. 105–155.

1.7—P.L. 105–160, THE NATIONAL SEA GRANT COLLEGE PROGRAM  
REAUTHORIZATION ACT OF 1998 (S. 927/H.R. 437)

*Background and summary of legislation*

The National Sea Grant College Act (33 U.S.C. 1121–1131), enacted in 1966, established the National Sea Grant College Program (Sea Grant) with the objective of increasing “the understanding, assessment, development, utilization, and conservation of the Nation’s ocean, coastal, and Great Lakes resources by providing assistance to promote a strong education base, responsive research and training activities, and broad and prompt dissemination of knowledge and techniques.” While patterned after the Land Grant College Program and first assigned to the National Science Foundation (NSF), it was, in 1970, assigned to the then newly created National Oceanic and Atmospheric Association (NOAA) of the Department of Commerce.

Currently, there are twenty-nine total Sea Grant College and Institutional programs, encompassing coastal and Great Lakes States and Puerto Rico. In Fiscal Year 1997, Sea Grant’s appropriations totaled \$54.2 million and these programs are the heart of a nationwide network of over 300 participating institutions that utilize the talents and expertise of over 3,000 scientists, engineers, educators, and students.

An applicant must demonstrate a record of superior performance in marine resource programs for a minimum of three years, and once designated, programs receive priority in obtaining federal grants for up to two-thirds of the total project with the remaining one-third coming from non-federal matching funds. Through the Sea Grant “core” programs, designated institutions receive assistance for research, education, and advisory services in fields related to the ocean, coastal, and Great Lakes resources.

Funding devoted to educational programs include the development and strengthening of training programs for marine scientists and technicians as well as education in aquatic sciences for secondary school students and teachers. Year-long fellowships for graduate students in marine-related disciplines to work with Congres-

sional offices, federal agencies, or industry sponsors are also funded by Sea Grant.

S. 927/H.R. 437, the National Sea Grant College Program Reauthorization Act of 1997, as enacted, reauthorizes the National Sea Grant College Program Act and authorizes appropriations of \$56.0 million in FY 1999, \$57.0 million in FY 2000, \$58.0 million in FY 2001, \$59.0 million in FY 2002, and \$60.0 million in FY 2003 to carry out its contract, grant, fellowship, and administrative functions; up to \$2.8 million for competitive grants for university research on the zebra mussel; up to \$3.0 million for competitive grants for university research on oyster diseases and oyster-related human health risks; and up to \$3,000,000 for competitive grants for university research on *pfisteria piscicida* and other harmful algal blooms. The bill also caps the program's administrative expenses at five percent of appropriations; repeals the Sea Grant international program; amends the National Sea Grant College Program Act to add or modify various definitions; amends provisions establishing and administering the National Sea Grant College Program and provisions providing for the designation of Sea Grant colleges and regional consortia; and modifies requirements regarding the Sea Grant Review Panel.

#### *Legislative history*

On January 9, 1997, Representative Jim Saxton, along with numerous co-sponsors, introduced H. R. 437, the National Sea Grant College Program Reauthorization Act of 1997. It was referred to the Committee on Resources which held a markup on March 5, 1997 and ordered the measure reported by voice vote. The Committee on Resources filed H. Rept. 105–22, Part 1, on March 12, 1997.

The measure was then referred to the Committee on Science on March 12, 1997 for a period ending no later than April 28, 1997. It was subsequently referred to and discharged from the Subcommittee on Energy and Environment on March 13, 1997. After a markup held on April 16, 1997, the Committee on Science ordered the measure reported, as amended, by a voice vote and filed H. Rept. 105–22, Part 2 on April 21, 1997.

The Committee on Rules on June 10, 1997 filed H. Rept. 105–127 on H. Res. 164, providing for consideration of H.R. 437 by a voice vote. The House agreed to H. Res. 164 by a voice vote on June 18, 1997, and on the same day H.R. 437 passed the House by: Y–422; N–3, Roll Call No. 208.

The measure was received in the Senate on June 19, 1997 and was referred to the Senate Committee on Commerce, Science, and Transportation. The Senate Committee ordered reported, by a voice vote, a companion measure, S. 927, the Ocean and Coastal Research Revitalization Act of 1997 to the Senate on June 19, 1997, and filed S. Rept. 105–150, on November 9, 1997. The Senate passed the measure, renamed the National Sea Grant College Program Reauthorization Act of 1997, with an amendment by unanimous consent on November 13, 1997. On February 11, 1998, S. 927, renamed the National Sea Grant College Program Reauthorization Act of 1998, passed the House, as amendment, under suspension of the rules by voice vote. On February 12, 1998, the Senate agreed

to the House amendment to S. 927 by unanimous consent, and the President signed S. 927 on March 6, 1998 (P.L. 105–160).

1.8—P.L. 105–178, TRANSPORTATION EQUITY ACT FOR THE 21ST CENTURY (H.R. 2400/H.R. 860)

*Background and summary of legislation*

H.R. 860 authorizes appropriations to the Department of Transportation for surface transportation research and development, and for other purposes. The bill was introduced by Subcommittee on Technology Chairwoman Morella and Science Committee Ranking Member Brown (CA) on February 27, 1997.

H.R. 860 authorizes appropriations to the Department of Transportation to carry-out surface transportation R&D programs, including the Intelligent Transportation System (ITS) program, for Fiscal Years 1998–2000. H.R. 860 establishes that the federal role in surface transportation research and development should be to sponsor and coordinate research and development on new technologies that seek to provide safer, more affordable transportation systems.

Additionally, the legislation consolidates the current University Research Institutes and the University Transportation Centers into a single program; authorizes a new Community and Environmental Research Program to provide State and local transportation officials with the tools and knowledge necessary to better understand the environmental and community impacts of transportation decisions; includes provisions requiring the Department to conduct research on the use of recycled and renewable materials to be used as transportation fuels; and restricts Department of Transportation funds from being used to “lobby” or influence pending legislation.

*Legislative history*

On September 17, 1997 the full Science Committee passed and ordered reported H.R. 860, with an amendment (H. Rept. # 105–503). The bill, as amended, provides funding to three main categories that encompass the Department’s surface transportation R&D portfolio: Surface Transportation Research and Technology Development, including research in the areas of pavements, structures, materials, policy, planning, environment, safety, and motor carriers; Technology Transfer and Applied Research, including the National Highway Institute, Local Technical Assistance Program, Transportation Fellowships, University Research, Technology Partnerships, and the Applied Research and Technology Development Program; and Intelligent Transportation Systems and Infrastructure.

Provisions of H.R. 860 were incorporated into Title VI of H.R. 2400, the Transportation Equity Act for the 21st Century (TEA–21), and signed into law on June 9, 1998 as P.L. 105–178. TEA–21 incorporates research and development programs, projects and activities from H.R. 860 totaling \$372.15 million in FY98; \$378.15 million in FY00; \$411.75 million in FY01; \$422 million in FY02; and \$437 million in FY03.

1.9—P.L. 105–207, NATIONAL SCIENCE FOUNDATION AUTHORIZATION  
ACT OF 1998 (H.R. 1273/S. 1046)

*Background and summary of legislation*

The National Science Foundation Act of 1950 authorizes and directs NSF to initiate and support basic research and programs to strengthen research potential and education at all levels in the sciences and engineering. The Act reinforces that basic research and education have traditionally constituted the heart of the NSF's mission.

The National Science Foundation Act of 1997 authorizes appropriations for the major activities and budget categories of the NSF for FY 1998, FY 1999 and FY 2000. In addition, the bill provides full authorization of the Antarctic rehabilitation program, and authorizes the Polar Cap Observatory and design and development of the Millimeter Array radio telescope in the Major Research Equipment account. Further, the bill requires an annual report on the construction, repair and upgrades to National Research Facilities; a report on indirect cost savings; subjects temporary NSF employees to the same financial disclosure requirements as permanent employees; requires NSF supported universities to develop policies to compensate military reservists who are involuntarily called to active duty; redesignates the Critical Technology Institute as the Science and Technology Policy Institute; contains no new authorization for the Next Generation Internet (NGI) initiative; places limits on lobbying activities; places a funding ban on institutions which receive earmarks; requires reprogramming notification to all the relevant Committees of both the House and Senate; and includes a sense of Congress that NSF should have a plan that its date-related computer programs will operate effectively in the year 2000 and beyond.

*Legislative history*

H.R. 1273, a bill to authorize appropriations for fiscal years 1998, 1999, and 2000 for the National Science Foundation, and for other purposes. The bill was introduced by Subcommittee on Basic Research Chairman Schiff on April 10, 1997.

H.R. 1273 authorizes through the year 2000 appropriations to the National Science Foundation to carry out research and education programs in science and engineering through competitive grants and cooperative agreements. H.R. 1273 supports basic research to help America maintain its lead in science and engineering and prioritizes efforts to improve math and science education.

On March 5, 1997; March 13, 1997; April 9, 1997; and April 22, 1998 the Basic Research Subcommittee held hearings on H.R. 1273.

On April 16, 1997, the Committee passed and ordered reported H.R. 1273, as amended (Report # 105–63). The bill, as amended, provides funding for each of the National Science Foundation's five directorates including the Education and Human Resources, which funds education programs; Research and Related Activities, which provides the resources for a broad portfolio of science and engineering activities including biological sciences, computer and information science and engineering, engineering, geosciences, mathemati-

cal and physical sciences, social, behavioral, and economic sciences, the United States Polar Research Programs, the United States Antarctic Logistical Support Activities, the Critical Technologies Institute, and the Next Generation Internet program; and the Major Research Equipment account.

H.R. 1273 was passed by the House on April 24, 1997 and by the Senate (amended) on May 12, 1998. The House agreed to the Senate Amendment to H.R. 1273 under Suspension of the Rules on July 14, 1998, and this bill was signed into law on July 29, 1998 as P.L. 105–207.

1.10—P.L. 105–234, FASTENER QUALITY ACT AMENDMENTS (H.R. 3824)

*Background and summary of legislation*

The Fastener Quality Act (FQA) (P.L. 101–592) was signed into law in 1990. It requires all threaded, metallic, through-hardened fasteners of one-quarter inch diameter or greater that directly or indirectly reference a consensus standard to be tested or documented by a National Institute of Standards and Technology (NIST) certified laboratory.

Despite its enactment in 1990, no final regulations for the Act have been implemented. NIST's final rule of April 14, 1998 was due to be implemented on July 26, 1998. NIST's current final rule was developed only after legislative changes were adopted to the Act in 1996.

H.R. 3824 amends the FQA by exempting fasteners produced or altered to the standards and specifications of aviation manufacturers from the regulations of the Act. Proprietary fasteners of aviation manufactures are currently subject to the federal quality assurance programs of the FAA. Aviation manufacturers are already required to demonstrate to the FAA that they have a quality control system which ensures that their products, including fasteners, meet design specifications. According to testimony taken by the House Science Committee Technology Subcommittee, both NIST and the FAA agree that requiring such fasteners to fall under FQA regulations would create duplicative and potentially confusing regulations that would not assist the Federal Government in its efforts to ensure the safety of the flying public. Furthermore, neither the FAA nor the National Transportation Safety Board are aware of any fatal aviation accidents caused by substandard proprietary fasteners.

H.R. 3824 addresses this unnecessary duplicative regulatory burden, and, as amended, delays implementation of the FQA's regulations until June 1, 1999 or 120 days after the Secretary of Commerce has issued a report on changes needed to the law, whichever is later. The delay will give Congress and Secretary of Commerce the opportunity to review the law to ensure that other sectors of the U.S. manufacturing economy are not harmed by outdated or unneeded regulation.

*Legislative history*

The Committee on Science marked up and favorably reported, with an amendment, H.R. 3824 by a voice vote on May 13, 1998. H.R. 3824 subsequently passed the full House under Suspension of

the Rules on June 16, 1998 and the full Senate, with an amendment, on July 31, 1998. The full House agreed to the Senate amendment and passed H.R. 3824 on August 6, 1998. The bill was subsequently signed into law by the President on August 14, 1998, and became P.L. 105-234.

1.11—P.L. 105-255, COMMISSION ON THE ADVANCEMENT OF WOMEN IN SCIENCE, ENGINEERING, AND TECHNOLOGY DEVELOPMENT ACT (H.R. 3007)

*Background and summary of legislation*

H.R. 3007 was introduced by Chairwoman Morella on November 9, 1997. The legislation establishes a commission to determine why women are underrepresented in the high-tech workforce; examine what current practices and policies have been successful in recruiting, retaining, and advancing women in science, engineering, and technology development; and provide Congress with a list of recommendations on ways to encourage women to pursue careers in the science and engineering fields. The Commission will consist of eleven individuals, seven of which will be appointed from private sector entities and four drawn from academic institutions. H.R. 3007 requires the Commission to complete its report not later than one year after the initial appointment of the Commissioners.

*Legislative history*

On March 10, 1998 the Subcommittee held a joint hearing with the Subcommittee on Basic Research to discuss H.R. 3007. The Committee on Science marked up and reported H.R. 3007, with an amendment, by a voice vote on May 13, 1998. The Committee on Education and the Workforce marked up H.R. 3007, as amended by the Science Committee, on June 24, 1997. Congressman Payne (D-NJ) offered an amendment, which was adopted, requiring the Commission to also examine the lack of participation of minorities and the disabled in the science and engineering fields.

H.R. 3007, as amended by the Committee on Education and the Workforce, passed the full House under Suspension of the Rules on September 14, 1998 and the full Senate under Unanimous Consent on October 1, 1998. It was signed into law on October 14, 1998 as P.L. 105-255.

1.12—P.L. 105-261, STROM THURMOND NATIONAL DEFENSE AUTHORIZATION ACT FOR FISCAL YEAR 1999 (H.R. 3616)

*Background and summary of legislation*

On July 22, 1998, the Speaker appointed The Honorable F. James Sensenbrenner, Jr., Chairman, Committee on Science, The Honorable Ken Calvert, Chairman, Subcommittee on Energy and Environment, and The Honorable George E. Brown, Jr., Ranking Minority Member, Committee on Science as additional conferees to H.R. 3616, the Strom Thurmond National Defense Authorization Act for Fiscal Year 1999, for consideration of Sections 3135 and 3140 of the Senate amendment to H.R. 3616, and modifications committed to conference. These conference committee deliberations resulted in the enactment of two sections of the Strom Thurmond National Defense Authorization Act for Fiscal Year 1999 (P.L. 105-

261), which was signed into law by the President on October 17, 1998: (1) Section 3136 (Authority for Department of Energy Federally Funded Research and Development Centers to Participate in Merit-Based Technology Research and Development Programs); and (2) Section 3137 (Activities of Department of Energy Facilities). Descriptions of these provisions follow.

*Section 3136—Authority for Department of Energy federally funded research and development centers to participate in merit-based technology research and development programs*

The Senate amendment to H.R. 3616 contained a provision (Section 3135) that would amend the National Defense Authorization Act for Fiscal Year 1995 (P.L. 103–337) to grant Department of Energy (DOE)-sponsored federally funded research and development centers (FFRDCs) the same ability to compete for contracts as Department of Defense (DOD)-sponsored FFRDCs.

The House-passed version of H.R. 3616 bill contained no similar provision.

The House receded with an amendment limiting the authority to those activities conducted under contract with, or on behalf, of the Department of Defense. In addition, the conferees adopted conference report (H. Rept. 105–736) language that states the following:

The conferees do not support the concept of DOE FFRDCs competing directly or indirectly with the private sector. In implementing this authority, the conferees expect DOE FFRDCs to comply fully with all DOD and DOE policy guidance and regulations governing FFRDCs. The conferees expect DOE FFRDCs to focus on their core competencies, expertise, or unique facilities.

*Section 3137—Activities of Department of Energy facilities*

The Senate amendment contained a provision (Section 3140) that would establish a uniform Federal administrative charge of three percent on all contract research activities carried out for non-Department of Energy (DOE) entities at DOE contractor-operated facilities. The provision would eliminate the Secretary of Energy's current authority to waive the Federal administrative charge, except that the Secretary would be authorized to continue existing waivers, if the Secretary so determines, and would be authorized to waive charges for small businesses, institutions of higher education, non-profit entities, and state and local governments. The provision would also authorize the Secretary to enter into a five-year pilot program at selected facilities to develop reduced overhead charges designed to recover all costs generated by external entities who may not utilize the full range of services at a DOE facility for which overhead costs may be charged. And, the provision would encourage the Secretary to establish a new small business technology partnership program to make DOE expertise and capabilities more accessible to small businesses, and would encourage the Secretary to pursue partnerships and interactions with universities and private businesses.

The House bill contained no similar provision.

The House receded with an amendment allowing the Secretary to waive the Federal administrative charge at all DOE facilities. The conferees did not include the small business technology partnership or partnerships and interactions provisions. In addition, the conferees adopted conference report (H. Rept. 105-736) language that states the following:

The conferees encourage the Secretary to continue the establishment of cooperative partnerships and interactions with universities and private industry at contractor-operated facilities where such interaction will help the Department better carry out its national security missions. The conferees further encourage the Secretary to create small business technology partnership programs at contractor-operated facilities where such interaction will help the Department better carry out its national security missions. The Secretary is encouraged to designate small funding pools at DOE sites to carry out such programs. The Secretary should include annually with the President's budget request a report on the effectiveness and applicability of any such programs to the missions of the Department of Energy.

*Legislative history*

H.R. 3616 was referred to the Committee on National Security on April 1, 1998 which subsequently reported the bill, as amended, on May 12, 1998 and filed H. Rept. 105-532. The bill passed the House amended on May 21, 1998 by: Y-357; N-60; Roll Call No. 183.

Upon receiving the bill on May 22, 1998 the Senate subsequently passed H.R. 3616, as amended, on June 25, 1998. The Senate insisted on its amendments and requested a conference. The House disagreed with the Senate amendments and agreed to a conference.

On September 22, 1998, Conference Report 105-736 was filed. The House agreed to the Conference Report on September 24, 1998 by: Y-373; N-50; Roll Call No. 458. The Conference Report was then sent to the Senate which, on October 1, 1998, agreed to it by Y-96; N-2; Roll Call No. 293. The President signed H.R. 3616, The Strom Thurmond National Defense Authorization Act for Fiscal Year 1999, into law on October 17, 1998 (P.L. 105-261).

1.13—P.L. 105-303, COMMERCIAL SPACE ACT OF 1998 (H.R. 1702)

*Background and summary of legislation*

The Department of Commerce estimated that revenue from commercial space activity in the United States totaled approximately \$7.5 billion in 1995. Revenues from commercial space activities exceeded government expenditures for the first time in 1996. For more than a decade, commercial space businesses have grown faster than the economy and proven relatively recession-proof. Congress and the White House have supported and encouraged the growth and development of this industry on a bipartisan basis, regardless of which political party controlled either branch of government.

The Clinton Administration has developed and published a range of policy statements that continue the work of his predecessors, Presidents Reagan and Bush, in establishing a stable business environment from which the commercial sector can create new space businesses and jobs. Those policies deal with space transportation, commercial remote sensing, and the Global Positioning System. The President issued a new National Space Policy on September 19, 1996 which reinforced the government's support of commercial space development, noting that "expanding U.S. commercial space activities will generate economic benefits for the Nation and provide the U.S. government with an increasing range of space goods and services." Taking the position that the government's role is more appropriately limited to creating a stable and predictable environment in which the entrepreneurial spirit of American enterprise can succeed, the policy states, "Commercial space sector activities shall be supervised or regulated only to the extent required by law, national security, international obligations and public safety."

The Commercial Space Act of 1998 incorporates lessons learned in commercial space with the goal of improving the legal and regulatory framework governing commercial space development. Like any young industry, commercial space business is vulnerable to the inconsistencies and sudden changes of government policy. H.R. 1702 provides another building block for clear, precise, and predictable laws that will allow U.S. companies to survive in the fiercely competitive global marketplace of commercial space.

H.R. 1702 contains numerous provisions which will create a better business environment for space transportation, data collection, navigation, and space services. Despite numerous negotiations with the Administration and the Science Committee's willingness to negotiate, a feasible compromise could not be worked out on Title II of the bill. This title, which dealt with remote sensing, had to be stripped from the compromise bill that was passed by the House and Senate in October 1998. The remote sensing provisions amended the Land Remote Sensing Policy Act of 1992 (P.L. 102-555), a law which enabled the private sector to obtain licenses to operate commercial remote sensing satellites.

President Clinton signed Presidential Decision Directive 23 in 1994 which established the President's policy for implementing the Land Remote Sensing Policy Act of 1992. In a statement released by Deputy Secretary of Commerce David Barram announcing the President's new policy on remote sensing, Mr. Barram stated, "This policy is particularly significant because it acknowledges the relationship between this country's national security and its long-term economic security. It recognizes the two as inextricably woven together: our long-term national security is directly tied to our ability to effectively compete in this critical global imaging market."

The remote sensing provisions came from the President's policy and real-world licensing experiences since enactment of the 1992 law. The amendments to the 1992 law were intended to stabilize the regulatory regime, thereby enabling U.S. industry to develop rational business plans, raise capital, market its services, and meet customer demand. Given the time constraints at the end of the 105th Congress, the desire to move the other important provisions

in the Commercial Space Act of 1998, and the inability to reach a workable solution with the State Department, the remote sensing provisions were pulled from the bill.

The final bill requires an independent market study of, and a NASA report on, progress in commercialization of the International Space Station; authorizes the Department of Transportation to license the reentry of space transportation vehicle; makes permanent a launch voucher demonstration program so that scientists can buy their own launch services; encourages the President to ensure that the U.S. Global Positioning System (GPS) becomes the world standard so that foreign systems will not interfere with the GPS satellite signals; encourages NASA to buy commercial data for both space science and earth science researchers; directs NASA to manage its commercial space centers out of NASA Headquarters; creates a better business environment for the U.S. commercial remote sensing industry by clarifying regulations; requires the federal government to purchase space transportation services instead of building and operating its own vehicles; requires NASA to plan for the potential privatization of the Space Shuttle; allows the use of excess ICBMs as low-cost space transportation vehicles; and requires that the Department of Defense study our national launch demand and infrastructure capability through the year 2007.

#### *Legislative history*

Congressman F. James Sensenbrenner, Jr., of Wisconsin introduced H.R. 1702 on May 22, 1997. The bill was originally cosponsored by Congressmen George E. Brown, Jr., of California, Dana Rohrabacher of California, Robert E. (Bud) Cramer, Jr., of Alabama, and Congresswoman Sheila Jackson Lee of Texas.

The Subcommittee on Space and Aeronautics held 3 hearings on this bill in 1997: May 21, May 22, and June 4. On June 11, 1997, the Subcommittee on Space and Aeronautics marked up H.R. 1702 and forwarded it to the full committee. On June 18, 1997, the Science Committee passed and ordered reported H.R. 1702. The report was filed on October 24, 1997 (H. Rept. 105-347). After months of negotiation with the Administration, H.R. 1702 passed the House, with an amendment, under suspension of the rules on November 4, 1997. The Senate filed its report on H.R. 1702 on June 2, 1998 (S. Rept. 105-198) and it passed the Senate on July 30, 1998. The House and Senate negotiated a compromise bill which passed the House on October 5, 1998 and passed the Senate on October 8, 1998. On October 28, 1998, the President signed the bill which became P.L. 105-303.

1.14—P.L. 105-305, NEXT GENERATION INTERNET RESEARCH ACT OF 1998 (H.R. 3332/S. 1609)

#### *Background and summary of legislation*

The Internet is an international, cooperative computer network of networks that links many types of users, such as governments, schools, libraries, corporations, hospitals, individuals and others. The United States has achieved national strategic advantages and prominence as a result of American leadership in information technology.

Furthermore, U.S. dominance in this field grew from critical federal investment, and continued investment is necessary to maintain that dominance and leadership. The explosion of business, government, and academic uses of the Internet has created the need to overhaul the network infrastructure. Additional research must be undertaken in order to develop new applications that will improve educational access, while still contributing to economic growth.

Federal efforts to support computer and telecommunications applications and education have been strongly endorsed by the Clinton Administration since 1993. In October 1996, President Clinton called for a renewed resolve to create the Next Generation Internet (NGI). However, the Administration's proposal was redefined after Congressional concerns were raised. Thus, the NGI Implementation Plan was completed in July 1997. The new proposal identified NGI as a research initiative (rather than a deployment initiative) more clearly than in the previous plan.

The NGI implementation plan combined both policy and program prescriptions in three specific goals.

Goal 1: Experimental Research for Advanced Network Technologies. Develop main areas of network service and corresponding protocols including the following: end-to-end Quality of Service (QoS), security and robustness, network growth engineering, new or modified protocols for routing and switching. Defense Advanced Research Projects Agency (DARPA) serves as the lead federal agency.

Goal 2: Next Generation Network Fabric. Develop a next generation network testbed to connect universities and federal research institutions at rates that are sufficient to demonstrate new technologies and support future research. DOE serves as the lead federal agency.

Goal 3: Revolutionary Applications. Demonstrate new applications that meet important national goals and missions. Potential areas for applications include: health care, education, scientific research, national security, environment, government, and design and manufacture.

In its FY 1998 budget request, the Administration requested \$100 million in funding for the NGI initiative. Although many in Congress expressed support for the basic principles outlined in the NGI plan, several concerns relating to implementation of the plan remained and funding for the initiative was withheld. The level of funding appropriated for FY 1998 was 10–15 percent less than the level of funding included in the President's budget request.

The Next Generation Internet Research Act of 1998 would advance the current state of the Internet, advance university research capabilities, and assist federal agencies in achieving their missions. The bill would provide for a multi-agency program concentrated upon the research and development of a coordinated set of technologies that seeks to create a network infrastructure to support greater speed, robustness, and flexibility beyond what is available in the current Internet.

*Legislative history*

H.R. 3332, a bill to amend the High-Performance Computing Act of 1991 to authorize appropriations for the Next Generation Internet program, to require the Advisory Committee on High-Performance Computing and Communications, Information Technology, and the Next Generation Internet to monitor and give advice concerning the development and implementation of the Next Generation Internet program and report to the President and the Congress on its activities, and for other purposes. The bill, known as the Next Generation Internet Act, was introduced by Science Committee Chairman Sensenbrenner and Science Committee Ranking Member Brown (CA) on March 4, 1998.

H.R. 3332 authorizes appropriations for fiscal years 1999 and 2000 to the National Science Foundation, the Departments of Energy, and Commerce, the National Aeronautics and Space Administration, the National Institutes of Health and the National Institute of Standards and Technology to support the Next Generation Internet Program (Program), with specified objectives for increasing Internet capabilities as well as the development of other networking technologies.

On September 10, 1997, the full Science Committee held a hearing on H.R. 3332.

On May 13, 1998 the full Science Committee passed and ordered reported H.R. 3332. The bill provides for a coordinated effort by several federal agencies to improve the speed, reliability and capability of today's Internet through the development of new cutting-edge networking technologies.

H.R. 3332 was passed by the House under Suspension of the Rules on September 14, 1998, by the Senate on October 8, 1998 and was cleared for the President on October 8, 1998.

1.15—P.L. 105-309, TECHNOLOGY ADMINISTRATION ACT OF 1998 (H.R. 1274/S. 1325)

*Background and summary of legislation*

As introduced, H.R. 1274, authorized appropriations for the National Institute of Standards and Technology for Fiscal Years 1998 and 1999.

The National Institute of Standards and Technology (NIST) is the Nation's oldest federal laboratory. It was established by Congress in 1901 as the National Bureau of Standards (NBS). NBS was renamed NIST by the passage of the Omnibus Trade and Competitiveness Act of 1988. The Act also expanded NIST's scope by establishing both the Advanced Technology Program (ATP) and the Manufacturing Extension Partnership Program (MEP).

NIST is part of the Department of Commerce. Its mission is to promote economic growth by working with industry to develop and apply technology, measurements, and standards. As the nation's arbiter of standards, NIST enables our country's businesses to engage each other in commerce and participate in the global marketplace.

The precise measurements required for establishing standards associated with today's increasingly complex technologies require

NIST laboratories to maintain the most sophisticated equipment and the most talented scientists in the world.

H.R. 1274, as passed the House in 1997, included authorizations for NIST's programs for FY 1998 and FY 1999. The bill also provided express authorization for 1998 and 1999 for the Office of the Undersecretary for Technology and the Office of Technology Policy.

The Senate passed H.R. 1274 with a substitute amendment which struck the authorization of appropriations and included the following provisions: Officially establishes the Office of Space Commercialization (OSC). The OSC is a coordinating office that has been in existence for a decade. H.R. 1274 defines its charter; a program to allow elementary and secondary school math and science teachers access to NIST laboratories and scientists during the summer months to improve the teachers' understanding of science; authorizes the expansion of the Malcolm Baldrige Quality Awards Program into healthcare and education; authorizes for one year the Experimental Program to Stimulate Competitive Technology (EPSCOT); and, lifts the six year sunset requirement for Manufacturing Extension Partnership (MEP) program centers.

The bill as amended by the Senate was signed into law on October 30, 1998 (PL 105-309).

#### *Legislative history*

H.R. 1274 was introduced on April 10, 1997 by Technology Subcommittee Chairwoman Constance Morella. The Committee on Science passed the bill, as amended, on April 16 by voice vote (H. Rept. 105-64). The House passed H.R. 1274, as amended, by voice vote on April 24, 1997. On October 9, 1998, the Senate Commerce Committee discharged H.R. 1274 and the Senate amended and passed the bill. On October 13, 1998, the House passed the bill under suspension of the rules by voice vote. The President signed H.R. 1274 into law on October 30, 1998 (PL 105-309).

1.16—P.L. 105-383, COAST GUARD AUTHORIZATION ACT OF 1998 (H.R. 2204/H.R. 4235—TITLE VI OF H.R. 2204)

#### *Background and summary of legislation*

H.R. 4235, the Harmful Algal Bloom and Hypoxia Research and Control Act of 1998, as introduced, requires the establishment of an Inter-Agency Task Force on Harmful Algal Blooms (HABs) and Hypoxia (Task Force)—chaired by the Department of Commerce, and including representatives of the EPA, the Departments of Agriculture, the Interior, the Navy, and Health and Human Services, EPA, NSF, NASA, and other agencies—through the Committee on Environment and Natural Resources of the National Science and Technology Council. The Task Force is charged with the development of a comprehensive and coordinated national action plan dealing with HABs within one year of the date of enactment, and with submitting to Congress three annual reports describing the progress made on the action plan. In addition, the Task Force is to submit to Congress and the President an integrated assessment of hypoxia in the Northern Gulf of Mexico no later than March 30, 1999; and no later than March 30, 2000, the President must develop and submit to Congress an action plan based on this assess-

ment. The measure authorizes \$25.5 million for each of fiscal years (FYs) 1999, 2000 and 2001, both within NOAA labs and through competitive, peer-reviewed extramural grants for research, monitoring, and assessment activities for HABs and hypoxia; and amends the National Sea Grant College Program Act to allow up to \$3 million to be made available annually through the National Sea Grant College Program for competitive grants for university research, education, training, and advisory services on *Pfiesteria piscicida* and other HABs. Finally, H.R. 4235 amends section 318(a) of the Coastal Zone Management Act of 1972 (CZMA) (16 U.S.C. 1464(a)) to authorize up to \$2 million in total appropriations during fiscal years 1999 and 2000 for technical assistance under section 310 of the CZMA to support State implementation and analysis of the effectiveness of measures to prevent, reduce, mitigate, or control HABs and hypoxia.

*Legislative history*

H.R. 4235, the Harmful Algal Bloom and Hypoxia Research and Control Act of 1998, was introduced by Representative Christopher John on July 16, 1998, and was referred to the Committee on Science, and, in addition, to the Committee on Resources. Within the Science Committee, the bill was referred to the Subcommittee on Energy and Environment on July 23, 1998.

The companion Senate measure, S. 1480, was introduced by Senators Olympia Snowe and John Breaux as the Harmful Algal Bloom and Hypoxia Research and Control Act of 1997 on November 8, 1997, and was referred to the Senate Committee on Commerce, Science, and Transportation. The Committee ordered S. 1480 reported on July 9, 1998 with an amendment in the nature of a substitute, and filed S. Rept. No. 105-357 on September 30, 1998. H.R. 4235 is virtually identical to S. 1480, as reported.

On October 12, 1998, the Senate passed H.R. 2204, the Coast Guard Authorization Act for Fiscal Years 1998, 1999, and 2000 with an amendment by unanimous consent. Title VI of the Senate amendment to H.R. 2204 includes the text of S. 1480 as reported. On October 15, 1998, the House concurred in the Senate amendment to H.R. 2204, with an amendment, under suspension of the rules by a voice vote. The House amendment, which renames H.R. 2204 as the Coast Guard Authorization Act of 1998, changes the authorization levels of Title VI (H.R. 4235/S. 1480) from \$25.5 million for each of Fiscal Years 1999, 2000 and 2001 to \$15.0 million in FY 1999, \$18.25 million in FY 2000, and \$19.0 million for FY 2001. The House amendment also deletes the Title's amendment to the National Sea Grant College Program Act to allow up to \$3 million to be made available annually through the National Sea Grant College Program for competitive grants for university research, education, training, and advisory services on *Pfiesteria piscicida* and other HABs. On October 21, the Senate concurred in the House amendment to H.R. 2204 by unanimous consent, and the President signed H.R. 2204, The Coast Guard Authorization Act of 1998, on November 13, 1998 (P.L. 105-383).

## CHAPTER II—OTHER LEGISLATIVE ACTIVITIES OF THE COMMITTEE ON SCIENCE

### 2.1—HUMAN CLONING RESEARCH PROHIBITION ACT (H.R. 922)

#### *Background and summary of legislation*

H.R. 922 prohibits the expenditure of federal funds to conduct or support research which includes the cloning of humans. In order to address the lack of a permanent statutory ban on the use of federal research funds to produce cloned human embryos, Congressman Vern Ehlers of Michigan introduced H.R. 922 on March 5, 1997. H.R. 922 was referred to the Committee on Commerce and sequentially to the Committee on Science.

In the wake of the announcement that scientists in Scotland had succeeded in cloning an adult sheep, the Science Committee held a series of three hearings, over five months, on human cloning. The Committee examined the legal and ethical issues associated with the use of cloning technology, reviewed the National Bioethics Advisory Commission's report, "Cloning Human Beings," and discussed the parameters for federal funding of human cloning research.

H.R. 922 prohibits the use of federal funds to conduct or support any project of research that includes the use of human somatic cell nuclear transfer technology to produce an embryo. The bill also defines "human somatic cell nuclear transfer" and "somatic cell."

H.R. 922 provides for the Director of the National Science Foundation to enter into an agreement with the National Research Council to conduct a review of the impact of H.R. 922 on research. This report would be completed no later than five years after the date of enactment. The Committee on Commerce took no action on H.R. 922.

#### *Legislative history*

The Committee on Science's Subcommittee on Technology held three hearings on cloning in the 105th Congress. On March 5, 1997, the Subcommittee held a hearing entitled, "Biotechnology and the Ethics of Cloning: How Far Should We Go?". On June 12, 1997, the Subcommittee held a hearing entitled, "A Review of the President's Commission's Recommendations on Cloning." And on July 22, 1997, a hearing entitled, "Prohibition of Federal Government Funding of Human Cloning Research." The Science Committee marked up H.R. 922 on July 29, 1997. The Committee filed the report on H.R. 922 (H. Rept. 105-239, Part I) on August 1, 1997. H.R. 922 was primarily referred to the Committee on Commerce which took no action on the bill.

## 2.2—CIVILIAN SPACE AUTHORIZATION ACT, FISCAL YEARS 1998 AND 1999 (H.R. 1275/S. 1250)

*Background and summary of legislation*

The National Aeronautics and Space Administration was created in 1958 to help win the Cold War. In the last decade of the 20th century, the agency finds itself working with former Cold War adversaries and undertaking activities in new areas. The end of the Cold War, changes in NASA's mission, and changes in the Administration have led to budgetary instability during the 1990s. As late as 1992, projections of NASA's annual budget had it rising to almost \$20 billion by the year 2000. For fiscal year 1997, the White House submitted a request that cut NASA's budget to \$11.6 billion in the year 2000. For fiscal year 1998, the budget runout for fiscal year 2000 is \$13.2 billion. For fiscal year 1999, the runout for fiscal year 2000 is \$13.278 billion.

The budget request for fiscal year 1999 was \$13.465 billion. VA, HUD, and Independent Agencies appropriations for fiscal year 1999 funded NASA at \$13.665 billion, \$200 million over the President's request. H.R. 1275 was intended to address NASA's budget instabilities and provide NASA with a budget that grew, but remained slightly below the level of inflation.

Besides the agency's declining budget requests, NASA is rapidly approaching initial construction on the International Space Station (ISS). The Clinton Administration invited the Russians to join the program in 1993. The Russians have consistently failed to fund and construct their elements of the Space Station. Consequently, construction of the Space Station has been delayed by one year and delivery of the Russian Service Module on time is highly questionable. NASA has sent the Russian Space Agency \$60 million in 1998 and intends to send another \$40 million before the end of the year. These funds are ostensibly for the purchase of Russian crew time and stowage space, but the funds are ultimately intended for further work on the Service Module. Although not yet approved by the Office of Management and Budget, NASA is currently entertaining the notion of paying the Russian Space Agency \$150 million per year for the next four years to help pay for Russia's commitments to the Space Station.

Since the introduction of the Russians into the ISS program in 1993, the Science Committee has advocated an enhancing, rather than enabling, role for the Russians. Unfortunately, the White House negotiated a deal in which the Russians provide components vital to the ISS. So when the Russians' vital components are late, the entire Station is delayed in its schedule, and the Russians have thus become part of the "critical path." The Science Committee has persistently requested the Administration develop a viable plan to deal with the Russian problem. Pressure from the Science Committee and others in Congress led to an independent assessment, known as the Chabrow report, which validated many of the Committee's concerns. This report has led NASA to recommend a change in policy to the White House in an effort to actively pursue removing the Russians from the critical path. One of the main recommendations of the Chabrow report was for the U.S. to develop an independent propulsion capability, commonly referred to as a

propulsion module. This module would provide permanent, independent re-boost and attitude control. The NASA Administrator, in a letter to Chairman Sensenbrenner on October 15, 1998, stated, "Upon completion of a detailed technical requirements review by NASA this fall, NASA will proceed on the long-lead procurements for this propulsion capability." [emphasis added] The Committee remains concerned about the funding source for the propulsion capability and a crew return capability, which is also necessary to remove the Russians from the critical path. NASA too often has been forced to raid funding for the Shuttle program and science programs in order to pay for shortfalls in the ISS program.

Through Title II of H.R. 1275, the Science Committee sought to impose discipline into the decision-making process with the goal of containing future cost growth and preventing additional schedule slips in the program. This title requires an independent market study and a report from NASA on efforts to commercialize the International Space Station; requires the NASA Administrator to report on the costs of Station agreements with foreign entities and report on international hardware agreements; prohibits NASA from transferring money or in-kind payments to Russia for their critical components; requires NASA to develop a contingency plan with decision points for removing each element of Russian hardware in the critical path; directs the NASA Administrator to certify on a monthly basis that the Russians are meeting their obligations; requires the President to make a decision on whether to proceed with permanent replacements for the Russian critical path items with the cost implications; and directs the NASA Administrator to certify that Mir meets or exceeds U.S. safety standards.

The bill authorizes appropriations to the National Aeronautics and Space Administration for the International Space Station; Space Shuttle; Payload and Utilization Operations; Space Science; Life and Microgravity Science; Mission to Planet Earth; Aeronautics and Space Transportation Technology; Mission Communication Services; Academic Programs; Safety, Reliability, and Quality Assurance; Space Communication Services; Research and Program Management; Construction of Facilities; Inspector General; and the United States-Mexico Foundation for Science. The bill also authorizes appropriations to the Department of Transportation for the Office of Commercial Space Transportation and the Department of Commerce for the Office of Space Commerce.

H.R. 1275 contains various administrative provisions on the availability of appropriated amounts; reprogramming for construction of facilities; reporting on unauthorized programs; and using funds for scientific consultations or extraordinary expenses. H.R. 1275 provides limitations regarding earth science data buys, the consolidated space operations contract, and the International Space University. The bill requires the NASA Administrator to prepare a report on the agency's restructuring activities; authorizes the Department of Transportation to license the reentry of space transportation vehicles; requires NASA to conduct independent cost analyses for projects over \$75 million; establishes the Office of Space Commerce and defines its responsibilities; amends the NASA Act of 1958 to allow for delaying the unrestricted public disclosure of technical data; establishes commercial procurement initiatives;

encourages NASA to buy commercial data for both space science and earth science researchers; requires NASA to buy commercially available space goods and services, when feasible; requires a report on threats to the EOSDIS core system; requires NASA to plan for the potential privatization of the Space Shuttle; and deletes outdated references in the launch voucher program.

The bill also encourages the NASA Administrator to use abandoned and underutilized buildings when NASA needs additional facilities; provides direction in calculating cost effectiveness; prohibits NASA from entering into contracts with foreign governments where the foreign government can recover profit if the contract is terminated; grants NASA the authority to suspend contract payments when there is substantial evidence of fraud; ensures that the Science Committee will be able to review and authorize the Next Generation Internet; prohibits authorized funds to be used to "lobby" or influence pending legislation; provides notice requirements; states the sense of the Congress on the year 2000 problem; authorizes NASA to participate in the National Oceanic Partnership program; encourages NASA to provide excess capability on the Tracking Data Relay Satellite System to the National Science Foundation's Antarctic Program; requires compliance with the Buy American Act; and updates the Unitary Wind Tunnel Plan Act of 1949.

#### *Legislative history*

Congressman Dana Rohrabacher of California introduced H.R. 1275 on April 10, 1997. The bill was cosponsored by Congressmen George E. Brown, Jr., of California, Robert E. (Bud) Cramer, Jr., of Alabama, Dave Weldon of Florida, James A. Traficant, Jr., Mark Foley of Florida, Congresswoman Sheila Jackson Lee of Texas, Congressmen Charles W. (Chip) Pickering of Mississippi, Walter H. Capps of California, Nick Lampson of Texas, and Joe Barton of Texas.

The Subcommittee on Space and Aeronautics held 6 authorization hearings in 1997: March 4, March 12, March 13, March 19, April 9, and April 10. The Science Committee passed and ordered reported H.R. 1275 on April 16, 1997. The bill was filed on April 21, 1997 (H. Rept. 105-65) and passed the House, as amended, on April 24, 1997.

Senator Bill Frist of Tennessee introduced S. 1250, a bill to authorize appropriations for the National Aeronautics and Space Administration for fiscal years 1998 and 1999, on October 3, 1997. The bill was cosponsored by Senator John D. Rockefeller of West Virginia, Senator Conrad Burns of Montana, and Senator Ted Stevens of Alaska.

S. 1250 was referred to the Senate Committee on Commerce, Science, and Transportation on October 3, 1997. On March 12, 1998 the Committee on Commerce, Science, and Transportation held a meeting (markup) on S. 1250 and ordered the measure reported, as amended, by a voice vote. On May 22, 1998 the Committee on Commerce, Science and Transportation filed Senate Report 105-195 with an amendment in the nature of a substitute and as an amendment to the title. S. 1250 was placed on Senate Legisla-

tive Calendar under general orders (Calendar No. 387). No further action was taken on this measure.

2.3—ENVIRONMENTAL RESEARCH, DEVELOPMENT, AND  
DEMONSTRATION AUTHORIZATION ACT OF 1997 (H.R. 1276)

*Background and summary of legislation*

EPA research and development (R&D) programs are funded in five separate appropriation accounts in the Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriation Bill: Environmental Programs and Management (Science Advisory Board), Science and Technology, Superfund Research and Development, Leaking Underground Storage Tank Research, and Oil Spills Research.

The Science and Technology appropriation account, created in 1996, represents the largest component of EPA's R&D activities and funds the operating programs of the Office of Research and Development, the Office of Air and Radiation's Office of Mobile Sources, and the Program Office laboratories.

The EPA Office of Research and Development controls twelve research laboratories and four assessment offices, which fall under the management of three national laboratories and two national centers: (1) the National Health and Environmental Effects Research Laboratory in Triangle Park, North Carolina; (2) the National Exposure Research Laboratory in Triangle Park, North Carolina; (3) the National Risk Management Laboratory in Cincinnati, Ohio; (4) the National Center for Environmental Research Quality Assurance in Washington, DC; and (5) the National Center for Environmental Assessment in Washington, DC.

The Science and Technology Appropriations account also funds five non-Office of Research and Development Laboratories: (1) the National Vehicles and Fuels Emission Laboratory, (2) National Radiation Laboratories, (3) Analytical and Environmental Chemistry Laboratories, (4) Drinking Water Program Laboratory, and (5) National Enforcement Investigations Center.

Congress has funded most of EPA R&D programs through direct appropriation without annual legislative authorization. The last comprehensive EPA research and development bill was the Environmental Research, Development and Demonstration Act of 1981 (P.L. 96-569), which expired on September 30, 1981. The sole exception is Drinking Water Research, which is authorized at \$26,593,00 for Fiscal Year 1997 through Fiscal Year 2003 by Title II of the Safe Drinking Water Amendments of 1996 (P.L. 104-182).

The purpose of H.R. 1276, The Environmental Research, Development, and Demonstration Authorization Act of 1997, is to authorize appropriations for Fiscal Years 1998 and 1999 for research, development, and demonstration programs of the Environmental Protection Agency (EPA). H.R. 1276 authorizes \$639,580,500 for Fiscal Year 1998 and \$658,077,600 for Fiscal Year 1999 for these programs.

The measure also eliminates funding authorization for 11 congressionally-earmarked activities funded in FY 1997; assigns the EPA Assistant Administrator for Research and Development the duties of developing and integrating a strategic plan for EPA re-

search activities, and requires the Assistant Administrator to review all EPA research to ensure that it is of high quality and not duplicative; requires the EPA Administrator to ensure that any fellowship award funded under this Act is used only to support EPA scientific research activities; requires the Science Advisory Board (SAB) to submit to Congress and to the EPA Administrator a report on the Board's views on proposed research programs as described in the President's budget for research, development and demonstration activities of the EPA and to evaluate selected planned research development and demonstration activities of the EPA; requires the EPA Administrator to submit to Congress any SAB report required to be submitted to the Administrator; prohibits lobbying activities; excludes from consideration for grant agreements, for a period of 5 years, any person who received funding for a project not subject to a competitive, merit-based award process; sets forth congressional committee notice requirements applicable to fund reprogramming actions and any major reorganization of an EPA program, project, or activity; expresses the sense of the Congress with respect to EPA planning for the Year 2000 computer problem; prohibits an entity from expending funds appropriated pursuant to this Act unless it agrees to comply with the Buy American Act; and expresses the sense of the Congress that in the case of equipment or products authorized to be purchased with financial assistance provided under this Act, recipients should purchase only American-made equipment and products.

*Legislative history*

The Subcommittee on Energy and the Environment held hearings relevant to the EPA's fiscal year 1998 budget request on March 11, March 12, and April 9, 1997. The Honorable Ken Calvert, Chairman, Subcommittee on Energy and Environment, introduced H.R. 1276, Environmental Research, Development, and Demonstration Authorization Act of 1997, on April 10, 1997. The bill was co-sponsored by Representatives George Brown, Shelia Jackson Lee, and Vernon Ehlers.

The Committee on Science held a markup on April 16, 1997, and ordered the measure reported, as amended, by a voice vote. On May 16, 1997, the Committee filed H. Rept. 105-99, Part 1 and the measure was referred to the Committee on Commerce. The Committee on Commerce held a markup on June 25, 1997 and ordered the measure reported, as amended, by a voice vote and filed H. Rept. 105-99, Part 2, on June 26, 1997.

2.4—DEPARTMENT OF ENERGY CIVILIAN RESEARCH AND DEVELOPMENT ACT OF 1997 (H.R. 1277)

*Background and summary of legislation*

Three circumstances dictate the need for H.R. 1277, The Department of Energy Civilian Research and Development Act of 1997: (1) the importance of preserving and strengthening the Nation's scientific leadership; (2) the lack of specific authorizations for the bulk of Department of Energy's civilian research, development, demonstration and commercial application activities under the Commit-

tee on Science's jurisdiction; and (3) the necessity to balance the budget.

Because of its belief that the Nation's future is directly tied to science, the Committee on Science also believes that the Federal Government should take an active role in the promotion and support of scientific endeavors. As we near the millennium, we are faced with numerous problems that can be dealt with by enhancing our scientific and research base.

The Department of Energy (DOE) is superseded only by the National Institutes of Health and the National Science Foundation in size of basic research programs. The DOE supports major energy research and development efforts, including solar and renewable energy, energy efficiency, fossil energy, and nuclear and fusion energy. However, with the exception of Hydrogen Research which is authorized through 2001 by the Hydrogen Futures Act of 1996 (P.L. 104-271), very few of the Department's programs have specific authorizations. Most are covered under the Energy Policy Act of 1992 and will soon expire if they have not already. Therefore, these circumstances make it necessary to enact a comprehensive authorization bill to provide guidelines and support for the programs of the DOE that support and strengthen the Nation's science base and energy future.

It should also be noted that the Committee enthusiastically supports the efforts to balance the budget. This is necessary in order to preserve the future of science and technology funding. To prepare America for an increasingly technologically-advanced competitive world and to prepare our next generation of scientists and engineers, we need to first assure our Federal financial house is in order.

In light of the needs to enhance our scientific base within budget constraints the Committee has closely examined the DOE Fiscal Year 1998 budget request and has established the following five criteria in prioritizing its funding recommendations:

1. Federal Research and Development should focus on essential programs that are long-term, high-risk, non-commercial, cutting edge, well-managed, and have great potential for scientific discovery; funding for programs that do not meet this standard should be eliminated or decreased to reduce budget demands and to enable new initiatives.

2. Federal R&D should be highly relevant to and tightly focused on agency missions, with accountability and procedures for evaluating quality and results.

3. Beyond the demonstration of technical feasibility, activities associated with evolutionary advances or incremental improvements to a product or process, or the marketing or commercialization of a product or process should be left to the private sector.

4. Where possible, international, industry, and state science partnerships should be nurtured as a way to leverage U.S. taxpayer R&D investment.

5. Infrastructure necessary for carrying out essential federal R&D programs needs to be prioritized consistent with program requirements.

H.R. 1277, The Department of Energy Civilian Research and Development Authorization of 1997, meets the Committee's respon-

sibilities to set priorities for good fundamental science and a balanced energy research portfolio that is vital to the Nation's future and a balanced budget. H.R. 1277, as amended and reported by the Science Committee, authorizes appropriations of \$4,605,143,000 for the FY 1998 and \$4,621,732,000 for FY 1999 for the civilian research, development, demonstration and commercial application activities of the Department of Energy. The measure also sets forth funding limitations by specifying programs for which the use of funds under this Act is prohibited (except to fulfill contractual obligations). In addition, the bill directs the Secretary of Energy to arrange with the National Academy of Sciences to report to the Congress on: (1) DOE activities concerning high energy and nuclear physics activities within specified budgetary parameters; (2) DOE basic energy sciences activities based upon certain budget options for the entire Basic Energy Sciences account and all related research and energy asset activities; and (3) construction and operation costs of the National Spallation Neutron Source at alternative sites, including the National Laboratories at Argonne, Brookhaven, Los Alamos, and Oak Ridge; proscribes the use of funds for the Next Generation Internet (except for continuation of FY 1997 activities); and directs the Secretary to exclude from consideration for grant agreements any person who received grant funds from a Federal funding source for a project that was not subjected to a competitive, merit-based award procedure. It also expresses the sense of the Congress with respect to DOE planning for the Year 2000 computer problem; prohibits an entity from expending funds appropriated pursuant to this Act unless it agrees to comply with the Buy American Act; and expresses the sense of the Congress that in the case of equipment or products authorized to be purchased with financial assistance provided under this Act, recipients should purchase only American-made equipment and products.

#### *Legislative history*

H.R. 1277, the Department of Energy Civilian Research and Development Act of 1997, was introduced by The Honorable Ken Calvert, Chairman, Subcommittee on Energy and Environment, on April 10, 1997, and was referred to the Committee on Science. The bill was co-sponsored by Representatives George Brown, Shelia Jackson Lee, and Mark Foley.

The Subcommittee on Energy and Environment held hearings relevant to the Department of Energy's (DOE's) fiscal year (FY) 1998 budget request on March 6, 1997, and 20, and on April 9, 1997, and the full Science Committee met to consider H.R. 1277 on April 16, 1997. The Committee ordered the bill reported, as amended, on April 16, 1997 and filed H. Rept. 105-67, Part 1, on April 22, 1997.

On April 23, 1997, H.R. 1277, as amended, was sequentially referred to the Committee on Commerce for a period ending not later than June 6, 1997 for consideration of such provisions of the bill and amendment as fall within the jurisdiction of that committee. Within the Committee on Commerce, the bill was referred to the Subcommittee on Energy and Power, which forwarded the measure, as amended, to the Committee by a voice vote on May 22, 1997. The Committee on Commerce ordered the bill reported, as

amended, on June 4, 1997 and filed H. Rept. 105–67, Part 2, on June 9, 1997.

2.5—NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
AUTHORIZATION ACT OF 1997 (H.R. 1278)

*Background and summary of legislation*

The National Oceanic and Atmospheric Administration was created by President Nixon in 1970 as part of a plan to consolidate many of the nation's civil programs related to the oceans and atmosphere. NOAA's most recent strategic plan stated that its mission is "to describe and predict changes in the Earth's environment, and conserve and manage wisely the Nation's coastal and marine resources to ensure sustainable economic opportunities."

The NOAA programs for which the Committee on Science has sole jurisdiction include: the National Weather Service (NWS); the National Environmental Satellite, Data and Information Service (NESDIS); the Program Support's Aircraft Services account; and the Oceanic and Atmospheric Research (OAR) Climate and Atmospheric programs. In addition, the Committee has jurisdiction over the line accounts for the programs listed above under the Construction and the new Capital Assets Acquisitions accounts. The Committee on Science also shares jurisdiction (with the Committee on Resources) over OAR's National Undersea Research Program, Sea Grant, Marine Prediction Research, Administration, and Fleet Maintenance and Planning.

Since its creation, NOAA has obtained most of its program funding through direct appropriation without annual legislative authorization. However, during the 102nd Congress, the first comprehensive NOAA authorization bill was approved and signed into law, the National Oceanic and Atmospheric Administration Authorization Act of 1992 (P.L. 102–567). Most of the program funding included in this authorization expired after Fiscal Year 1993 and no comprehensive NOAA authorization bills have been signed into law since the 102nd Congress.

The purpose of H.R. 1278, The National Oceanic and Atmospheric Administration Authorization Act of 1997, is to authorize appropriations for Fiscal Years 1998 and 1999 for programs and missions of the National Oceanic and Atmospheric Administration (NOAA) under the jurisdiction of the Committee on Science. H.R. 1278 authorizes \$1,462,414,000 for Fiscal Year 1998 and \$1,575,232,000 for Fiscal Year 1999.

The measure also terminates 10 programs and accounts and requires the Secretary to submit a report to Congress certifying that all programs and accounts listed to be terminated will be terminated by September 30, 1997; disestablishes the NOAA Corps after Fiscal Year 1997; prohibits unauthorized persons from interfering with any National Data Buoy Center weather data buoys, and authorizes the NOAA Administrator to assess a penalty for each violation and to offer and pay rewards for information regarding violations; delineates the duties of the National Weather Service (NWS) and prohibits the Service from competing with the private sector when a service not specifically designated as a NWS service is provided, or can be provided, by commercial enterprise, unless the Sec-

retary of Commerce finds that the private sector is unwilling or unable to provide the service; gives the Secretary of Commerce the authority to contract out for data and days-at-sea; sets forth congressional committee notice requirements applicable to fund reprogramming actions and any major reorganization of a NOAA program, project, or activity; expresses the sense of the Congress with respect to NOAA planning for the Year 2000 computer problem; prohibits an entity from expending funds appropriated pursuant to this Act unless it agrees to comply with the Buy American Act; and expresses the sense of the Congress that in the case of equipment or products authorized to be purchased with financial assistance provided under this Act, recipients should purchase only American-made equipment and products.

*Legislative history*

The Honorable Ken Calvert, Chairman, Subcommittee on Energy and Environment, introduced H.R. 1278, the National Oceanic and Atmospheric Administration Authorization Act of 1997, on April 10, 1997. The bill was co-sponsored by Representatives George Brown, Sheila Jackson Lee, Mark Foley, and Vernon Ehlers. The measure was referred to the Committee on Science and, in addition, to the Committee on Resources.

Hearings were held on March 13 and April 9, 1997 by the Subcommittee on Energy and Environment relevant to the bill. The Committee on Science held a markup on April 16, 1997, ordered the measure reported, as amended, by a voice vote, and subsequently filed H. Rept. 105-66, Part 1, on April 22, 1997. The measure was then referred to the Committee on Resources on April 23, 1997. The Committee held a markup and ordered the measure reported, as amended, by a voice vote; and, filed H. Rept. 105-66, Part 2 on June 20, 1997.

2.6—COMPUTER SECURITY ENHANCEMENT ACT OF 1997 (H.R. 1903)

*Background and summary of legislation*

H.R. 1903, amends the National Institute of Standards and Technology Act to enhance the ability of the National Institute of Standards and Technology (NIST) to improve computer security, and for other purposes.

The Computer Security Act of 1987 gave authority over computer and communication security standards in federal civilian agencies to NIST. The Computer Security Enhancement Act of 1997 strengthens that authority and directs funds to implement practices and procedures to improve the security of federal civilian information technology systems.

Much has changed in the 10 years since the Computer Security Act of 1987 was enacted. The proliferation of networked systems, the Internet, and web access are just a few of the dramatic advances in information technology that have occurred. The Computer Security Enhancement Act of 1997 addresses these changes and provides for greater security for the federal civilian agencies that base their procurement decisions for computer security hardware and software on NIST standards. H.R. 1903 also promotes the

use of commercially available products and encourages an open exchange of information between NIST and the private sector.

*Legislative history*

The Committee on Science's Subcommittee on Technology held a hearing on H.R. 1903 on June 19, 1997. The Subcommittee on Technology then marked up H.R. 1903 on July 28, 1997. The full Science Committee marked up H.R. 1903 on July 29, 1997 (H. Rept. 105-243). The House of Representatives passed H.R. 1903, as amended, on September 16, 1997 under Suspension of the Rules. The Senate Committee on Commerce passed H.R. 1903 on October 1, 1998. The Senate took no action on H.R. 1903.

2.7—TECHNOLOGY TRANSFER COMMERCIALIZATION ACT OF 1998 (H.R. 2544/H.R. 4859)

Congress has established a system to facilitate the transfer of technology from Federal Government laboratories to the private sector and to state and local governments. The primary law to promote the transfer of technology from our federal laboratories is the Stevenson-Wydler Technology Innovation Act of 1980. The Stevenson-Wydler Act, P.L. 96-480, makes it easier to transfer technology from the laboratories and provides a means for private sector researchers to access laboratory developments.

Subsequently, Congress enacted additional laws to foster technology transfer, including the Federal Technology Transfer Act of 1986 (P.L. 99-502); the Omnibus Trade and Competitiveness Act of 1988 (P.L. 100-418); the National Competitiveness Technology Transfer Act of 1989 (P.L. 101-189); and the American Technology Preeminence Act of 1991 (P.L. 102-245). In addition, Congress enacted the Amendments to the Patent and Trademark Laws, also known as the Bayh-Dole Act of 1980 (P.L. 96-517).

Most recently, in the 104th Congress, the National Technology Transfer and Advancement Act of 1995 (P.L. 104-113) was enacted. Public Law 104-113 amends the Stevenson-Wydler Technology Innovation Act of 1980 and the Federal Technology Transfer Act of 1986 to improve United States competitiveness by speeding commercialization of inventions developed through collaborative agreements between the government and industry. The law also promotes partnership ventures with federal laboratories and the private-sector and creates incentives for laboratory personnel to develop new inventions.

H.R. 2544, the Technology Transfer Commercialization Act of 1998, streamlines the reporting requirements for licensing of technology created in federal laboratories, allowing them to proceed in a more timely manner. It provides parallel authorities for government-owned, government-operated federal laboratories to those currently in place under the Bayh-Dole Act for licensing university or university-operated federal laboratory inventions. The bill also amends the Stevenson-Wydler Act to allow federal laboratories to include already existing patented inventions into a cooperative research and development agreement (CRADA).

Through these changes, agencies would be provided with two important new tools for effectively commercializing on-the-shelf federally-owned technologies—either licensing them as stand-alone in-

ventions, under the bill's revised authorities of Section 209 of the Bayh-Dole Act, or including them as part of a larger package under a CRADA. This will make both mechanisms much more attractive to United States companies that are striving to form partnerships with federal laboratories.

*Legislative history*

The Science Committee's Subcommittee on Technology held two hearings relative to H.R. 2544. On September 25, 1997, the Subcommittee held a hearing entitled, "Promoting Technology Transfer by Facilitating Licenses to Federally-Owned Inventions." And on March 17, 1998, the Subcommittee held a hearing entitled, "Facilitating Licenses to Federally Owned Inventions: A Legislative Hearing on H.R. 2544." The Subcommittee on Technology marked up H.R. 2544 on March 26, 1998 and reported the bill by a voice vote. The Committee filed the report on H.R. 2544 (H. Rept. 105-620) on July 14, 1998. H.R. 2544 was subsequently passed by the full House under Suspension of the Rules on July 14, 1998. On July 15, 1998 H.R. 2544 was received in the Senate and referred to the Senate Committee on Commerce, Science, and Transportation.

CHAPTER III—OTHER MEASURES DISCHARGED BY THE COMMITTEE  
ON SCIENCE

3.1—EXPRESSING THE SENSE OF THE HOUSE OF REPRESENTATIVES ON  
THE COMMITTEE PRINT ENTITLED “UNLOCKING OUR FUTURE: TO-  
WARD A NEW NATIONAL SCIENCE POLICY” (H. RES. 578)

*Background and summary of legislation*

H. Res. 578, a bill to express the sense of the House of Representatives that the print of the Committee on Science entitled “Unlocking Our Future: Toward A New National Science Policy” should serve as a framework for future deliberations on congressional science policy and funding. The bill was introduced by Science Committee Chairman Sensenbrenner on October 7, 1998.

In February of 1997, Speaker Newt Gingrich charged the House Science Committee with the task of developing a long-range science and technology policy for the Nation. Science Committee Chairman F. James Sensenbrenner appointed Congressman Vern Ehlers, the Committee’s Vice-Chairman, to lead a Committee study of the current state of the Nation’s science and technology policies.

On October 23, 1997 and December 12, 1997, the Committee on Science held roundtables on the science policy study. On March 4, 1998; March 11, 1998; March 25, 1998; April 1, 1998; April 22, 1998; May 14, 1998; and June 10, 1998, the Committee on Science held hearings on the science policy study.

On September 24, 1998, the Committee on Science released the report, “Unlocking Our Future: Toward A New National Science Policy,” which updates the science policy model formulated by Vannevar Bush in his 1945 report, “Science: The Endless Frontier.” Moving beyond the frontiers of an earlier generation, the National Science Policy Study broadens the focus of the federal science enterprise to include high technology, education, and the competitive arena of international science.

H. Res. 578 was passed by the House under Suspension of the Rules on October 8, 1998.

3.2—TO PROVIDE FOR THE CONVEYANCE OF CERTAIN PROPERTY FROM  
THE UNITED STATES TO STANISLAUS COUNTY, CALIFORNIA (H.R. 112)

*Background and summary of legislation*

H.R. 112 requires the Administrator of the National Aeronautics and Space Administration (NASA) to convey to Stanislaus County, California, all right, title, and interest of the United States in and to specific property. The property is approximately 1528 acres of land in Stanislaus County, known as the NASA Ames Research Center, Crows Landing Facility. The bill also conveys all improvements to the specific site and any other federal property designated by NASA to be transferred, which is under the jurisdiction of

NASA and located on the specific site. The conveyance shall not relieve any federal agency of responsibility under law for any environmental remediation of soil, groundwater, or surface water. Any remediation of contamination within or related to structures or fixtures on the property shall be subject to negotiation. NASA retains the right to use the specific site for aviation activities. NASA is required to relinquish legislative jurisdiction over the conveyed property to the State of California. NASA shall relinquish this right by filing a notice of relinquishment with the Governor of California or in any other manner prescribed by the laws of California. Further, the NASA Administrator may negotiate additional terms to protect the interests of the United States.

*Legislative history*

Congressman Gary A. Condit introduced H.R. 112 on January 7, 1997. The bill was referred solely to the Committee on Science. On February 10, 1997, the bill was referred to the Subcommittee on Space and Aeronautics. The Subcommittee discharged the bill on September 11, 1997. On November 9, 1997, the House agreed to suspend the rules and pass H.R. 112. On November 13, 1997, the bill was referred to the Senate Committee on Commerce, Science, and Transportation. No further action was taken on this measure.

3.3—OCEANS ACT OF 1998 (H.R. 3445)

*Background and summary of legislation*

H.R. 3445, Oceans Act of 1998, as introduced, directs the President to (1) maintain a coordinated, comprehensive, and long-range national ocean and coastal policy, including a plan to meet infrastructure requirements of federal ocean and coastal programs; and (2) biennially report to the Congress on the relationship between federal programs and the achievement of objectives specified in this Act. It also requires each agency or department involved in ocean and coastal activities to include with its annual appropriations request a report on elements of its proposed budget relating to those activities and how each element contributes to implementation of the national policy. In addition, the bill directs the President to establish a Commission on Ocean Policy; terminates the Commission after its final report; authorizes appropriations of \$1.0 million for FY 1998, \$2.0 million for FY 1999, and \$1.0 million for FY 2000; and removes provisions of Federal law relating to marine resources and engineering development.

The House-passed version of H.R. 3445 includes amendments that prohibit the Commission on Ocean Policy from making any specific recommendations with respect to lands and waters within the boundary of any State located North of 51 degrees North latitude, or with respect to lands and waters within the State of Idaho; and reduced the authorization of appropriations to \$2.0 million for FY 1999, and \$1.0 million for FY 2000.

*Legislative history*

H.R. 3445, the Oceans Act of 1998, was introduced by Representative Jim Saxton on March 12, 1998, and referred to the House

Committee on Resources, and subsequently to the Committee's Subcommittee on Fisheries Conservation, Wildlife and Oceans.

On April 23, 1998, the Subcommittee on Fisheries Conservation, Wildlife and Oceans approved H.R. 3445, as amended, by a voice vote. On July 29, 1998, the Resources Committee ordered H.R. 3445, amended, reported to the House by a voice vote. The Committee reported the measure, as amended, and filed H. Rept. 105-718, Part 1 on September 15, 1998. Also, on September 15, 1998, H.R. 3445, as amended, was referred to the Committee on Science and in addition to the Committee on Transportation and Infrastructure for a period ending not later than September 15, 1998 for consideration of such provisions of the bill and amendment as fall within their jurisdiction. The Committees on Science and Transportation and Infrastructure discharged H.R. 3445 on September 15, 1998. The House passed the measure on September 15, 1998, under suspension of the rules by a voice vote; and the bill was received in the Senate on September 16.

The companion Senate measure, S. 1213, the Oceans Act of 1997, was introduced by Senator Ernest Hollings on September 24, 1997, and referred to the Senate Committee on Commerce, Science, and Transportation. The Committee ordered S. 1213 reported, as amended, on November 8, 1997 and filed S. Rept. 105-151, on November 8, 1997. The Senate passed the measure with an amendment by unanimous consent on November 13, 1997. On January 27, 1998, the Senate-passed version of S. 1213 was referred to the House Committees on Resources, Science, and Transportation and Infrastructure, for consideration of such provisions that fall within the jurisdiction of the committee concerned. The bill was subsequently referred to the Science Committee's Subcommittee on Energy and Environment on January 30, 1998, and to the Committee on Transportation and Infrastructure's Subcommittees on Water Resources and Environment, and Coast Guard and Maritime Transportation on February 9, 1998.

#### 3.4—NATIONAL OILHEAT RESEARCH ALLIANCE ACT OF 1998 (H.R. 3610)

##### *Background and summary of legislation*

H.R. 3610, National Oilheat Research Alliance Act of 1998, as introduced, authorizes the oilheat industry to conduct a referendum through a qualified industry organization among retailers and wholesalers for the creation of a National Oilheat Research Alliance to develop programs concerning oilheat research and development, safety issues, consumer education, and training. The bill defines industry to include those persons involved in the production, transportation, and sale of oilheat, and in the manufacture and distribution of oilheat utilization equipment, in the United States (but not the ultimate consumers of oilheat); permits State participation in such Alliance; and prescribes guidelines for Alliance membership and representation. In addition the measure requires the Alliance to: (1) establish a program coordinating its operation with that of any similar State, local, or regional program; and (2) levy and collect annual assessments on the wholesale sale of No. 1 distillate and No. 2 dyed distillate sufficient to cover Alliance plans and program costs. Finally, H.R. 3610 empowers the Alliance to bring suit

in Federal court to compel compliance with any assessments it levies.

H.R. 3610, as passed by the House, includes three new provisions in addition to those provisions in the original bill described above. The first provision requires that any consumer education activity undertaken with funds provided by the Alliance to include a statement that the activities were supported, in whole or in part, by the Alliance. The second provision prohibits consumer education activities from including references to private brand names, making false or unwarranted claims on behalf of oilheat or related products, or making reference to the attributes of any competing product. And the third provision provides for the Act to sunset four years after the date on which the Alliance is established.

#### *Legislative history*

H.R. 3610, the National Oilheat Research Alliance Act of 1998, was introduced by Representative James C. Greenwood on March 31, 1998, and referred to the Committee on Commerce.

On September 17, 1998, the Commerce Committee's Subcommittee on Energy and Power approved H.R. 3610, as amended, by a voice vote for Committee consideration. On September 24, 1998, the Committee on Commerce ordered H.R. 3610 reported, as amended, by a voice vote. The Committee filed H. Rept. 105-787, Part 1 on October 6, 1998. H.R. 3610, as amended, was referred to the Committee on Science for a period ending not later than October 7, 1998 for consideration of such provisions of the bill and amendments that fall within its jurisdiction. The Committee on Science took no action and was discharged from further consideration of H.R. 3610 on October 7, 1998. The House passed the measure on October 10, 1998, under suspension of the rules by a voice vote; and the bill was received in the Senate on October 12, 1998.

#### 3.5—YEAR 2000 PREPAREDNESS ACT OF 1998 (H.R. 4756)

#### *Background and summary of legislation*

H.R. 4756 seeks to ensure that the United States is prepared to meet the Year 2000 computer problem. The bill urges the President to provide for the acceleration of business continuity plans to ensure uninterrupted delivery of federal services and programs; urges the President to take a high profile national leadership position to aggressively promote Y2K; enhances Congressional oversight by providing that all agency reports be submitted to Congress; codifies certain recommendations made by the General Accounting Office regarding electronic data exchanges, which GAO has identified as critical to Y2K compliance; provides for Y2K assistance for small and medium-sized businesses; and develops a Y2K consumer awareness program.

H.R. 4756 is essentially an amalgamation of three introduced Year 2000 bills and incorporates certain provisions from each bill. The bills are:

- (1) H.R. 4706, the Year 2000 Preparedness Act—Introduced by Congresswoman Morella, Chair of the Technology Subcommittee.

(2) H.R. 4682, the Year 2000 Act—Introduced by Congressman Barcia, the Ranking Member of the Technology Subcommittee.

(3) H.R. 3968, the National Year 2000 Critical Infrastructure Readiness Act—Introduced by Congressman Leach, Chair of the Banking Committee.

*Legislative history*

H.R. 4756 was discharged from the Committee on Science and passed the full House under Suspension of the Rules on October 13, 1998. The Senate took no action on the bill.

3.6—TECHNOLOGY TRANSFER COMMERCIALIZATION ACT OF 1998 (H.R. 4859/SEE H.R. 2544 IN CHAPTER II)

*Background and summary of legislation*

H.R. 4859 is an amended version of H.R. 2544, introduced to reconcile the provisions of H.R. 2544 with changes requested by the Senate. (See H.R. 2544 in Chapter 2 for more details)

*Legislative history*

H.R. 4859 was introduced by Technology Subcommittee Chairwoman Constance Morella on October 20, 1998. The House Science and Judiciary Committees discharged the bill that day, and it passed the House by voice vote. The Senate took no action on the bill.



CHAPTER IV—OVERSIGHT, INVESTIGATIONS AND OTHER ACTIVITIES  
OF THE COMMITTEE ON SCIENCE, INCLUDING SELECTED SUB-  
COMMITTEE LEGISLATIVE ACTIVITIES

A hallmark of Chairman Sensenbrenner's leadership in the Science Committee in the 105th Congress was rigorous oversight of agency programs to stamp out waste, fraud, and abuse and ensure that taxpayer dollars were spent as efficiently as possible. Aggressive oversight by full committee and subcommittees aided in part by the General Accounting Office and Inspector Generals identified:

- major problems with regards to space safety for U.S. astronauts on the Mir space station;
- difficulties with Russian participation in the International Space Station;
- concerns with initial implementation of the Government Performance and Results Act; the need for better management of scientific agencies and programs under the jurisdiction of the House Committee on Science.

As a result of the Committee oversight efforts, Chairman Sensenbrenner was awarded with the "Excellence in Programmatic Oversight Award" by the Majority Leader of the House.

The General Accounting Office provided the Committee on Science with 32 assessments that included both audits and testimony in the 105th Congress. These assessments were instrumental in examining the efficiency and efficacy of numerous federal science programs. (See GAO Documents Data Base in the appendix section.)

The following chapters, sections 4.1 through 4.5, include oversight, investigations and other activities of the Committee on Science, including selected subcommittee legislative activities.

4.1—COMMITTEE ON SCIENCE

*4.1(a)—The Status of Russian Participation in the International  
Space Station Program*

*February 12, 1997*

*Hearing Volume No. 105-2*

*Background*

On February 12, 1997, the Committee on Science held a hearing entitled, "The Status of Russian Participation in the International Space Station Program." Testimony before the Committee focused on the February 6-8, 1997 meetings between Vice President Gore and Russian Prime Minister Chernomyrdin; updated the Committee on the status of Russia as a partner in the ISS and progress on the Russian Service Module; and, reviewed contingency plans

that NASA has developed for the International Space Station (ISS) if Russia continues to fall behind schedule with the Service Module.

Witnesses included: The Honorable John H. Gibbons, Director of the Office of Science and Technology Policy; The Honorable Daniel S. Goldin, Administrator of the National Aeronautics and Space Administration; and Ms. Marcia S. Smith, Specialist in Aerospace and Telecommunications Policy, Library of Congress.

The Space Station was initiated by President Ronald Reagan in 1984 as an international scientific program with Canada, Japan, and the European Space Agency. President Clinton, in 1993, ordered a redesign of the Station (then known as Space Station Freedom). On September 2, 1993, Vice President Gore and Prime Minister Viktor Chernomyrdin announced their intention to include Russia as a partner in the Station program, necessitating another redesign effort.

Some of Russia's contributions to the ISS are "in the critical path" (essential to the operation of the Station). The Russians are currently eight months behind schedule on the Service Module (life support, habitation capability, and guidance). Adequate funding has not been released by the Finance Ministry to the Russian contractors.

#### *Summary of hearing*

The Russian Service Module is eight months behind schedule. During the Gore/Chernomyrdin Commission (February 6–8, 1997), Russian Prime Minister Chernomyrdin promised that the Russian Space Agency (RSA) would receive \$100 million by February 28, 1997, and an additional \$250 million by the end of the year. NASA is currently reviewing whether to 1) proceed with the first two scheduled launches (November and December 1997) for the International Space Station (ISS) and pursue an interim guidance capability to offset delays in the service Module; or 2) delay the first two launches by six months. Under the first option, NASA is studying use of a spacecraft bus (referred to as the Interim Control Module) from the Naval Research Laboratory and an FGB2. The FGB2 would be bought from the Russian contractor, Krunichev.

NASA does not have a sufficient level of insight into the Russian government's finances in order to track disbursements to RSA. NASA intends, instead, to monitor work on the factory floors of the Russian space contractors. Another way to track Russian progress will be the General Design Review (GDR) for the Service Module. The GDR could be held shortly after funding is released. At the GDR, Russian contractors and subcontractors disclose whether they have any money to work on the program and whether they will be able to meet the schedule.

Dr. John H. Gibbons, Director of the Office of Science and Technology Policy, reported that the FGB tug, a component that the U.S. is buying through a Boeing/Krunichev contract, will be on time and ready for launch later this year. Dr. Gibbons said that the Russians are experiencing extraordinary economic, fiscal, and political difficulties as they face the challenges of transitioning to a market economy, and their overall space program is no exception. He explained that as a stopgap measure, the U.S. rephased \$20 million of existing funds from Shuttle-Mir activities and applied it

to the Service Module work. During the Gore/Chernomyrdin Commission (February 6–8, 1997), Dr. Gibbons said that the U.S. reiterated in the strongest terms that Russia needs to meet its commitments on the Service Module. Dr. Gibbons assured the Committee that it was made very clear to the Russians that if they fail to meet those commitments, the U.S. will be forced to take steps that will reduce Russia's role in the ISS program. In closing, Dr. Gibbons said that he was pleased to report that Prime Minister Chernomyrdin responded to the Vice President by stating that the Russian government would begin—by the end of February—to provide necessary funds to proceed with construction, and that adequate funds were budgeted to the Russian Space Agency (RSA) in 1997 to keep the Service Module on track. Dr. Gibbons said that between now and the end of the month, the U.S. will continue to examine two contingency plans (Interim Control Module and FGB2) if Russian delays continue.

Daniel S. Goldin, NASA's Administrator, noted that he has known for 16 months that ISS funds were not being released by the Russian government to the contractors responsible for the Service Module. Mr. Goldin said that right now, RSA is waiting to receive \$100 million by the end of February. If the U.S. cannot validate that the money is flowing and that there is progress in outfitting the Service Module, the U.S. must pursue other alternatives.

Marcia S. Smith, a Specialist in Aerospace and Telecommunications Policy from the Congressional Research Service, testified regarding options available to NASA because of the delay in the Service Module. (1) Maintain launch schedule for the first two segments of the ISS and hope that the Service Module is ready no later than the end of 1998, noting that without the Service Module the first two segments of the ISS would reenter the atmosphere and be destroyed. (2) Pay Russia to build the Service Module. (3) Maintain current launch schedule and build an interim capability to keep the first two segments in orbit in case the Service Module is not ready in time. Ms. Smith mentioned that both options (1 and 2) which NASA is considering would not provide living quarters for a crew. She reiterated the importance of following the flow of funds allocated by the Russian government for the ISS, noting that for the past three years the Ministry of Finance has not transferred the full amount of funding allocated by the Duma (Russian parliament) to RSA. RSA only received between 70 and 83 percent of allocated funding from 1994 to 1996. In closing, Ms. Smith said that considering Russia's economic situation, it simply may not be possible for them to allocate their resources to the ISS program.

*4.1(b)—The United States and Antarctica in the 21st Century*

*March 12, 1997*

*Hearing Volume No. 105–4*

*Background*

On March 12, 1997, the Committee on Science held a hearing entitled, "The United States and Antarctica in the 21st Century." The Hearing was held to review the United States Antarctic Program External Panel's report entitled, "The United States and Antarctica

in the 21st Century.” The discussion focused on the importance of U.S. presence in the Antarctic. The hearing also addressed the long-term funding issues of the U.S. Antarctic Program, including the future of the South Pole Station.

Witnesses included: Mr. Norman Augustine, Chairman of the United States Antarctic Program External Panel for the National Science Foundation.

*Summary of hearing*

Mr. Augustine testified that U.S. presence in Antarctica is essential for continued political stability in the area and the preservation of its ecological system. He further discussed the Panel’s conclusion that it is a necessity to redevelop America’s research facility at the South Pole in order to respond to the challenges of modern-day science in the Antarctic. The Panel recommends a year-round presence in the Antarctic to protect the U.S. position on sovereignty in the region and to allow the U.S. a decisive role in the Antarctic Treaty’s activities-based decision system, both of which are essential to maintaining the political and legal balance that makes the Treaty work. Mr. Augustine identified four factors which make the time between now and the year 2000 a particularly significant period for new means of reducing costs and re-inventing ways of conducting Antarctic activities. In his testimony he listed twelve principle recommendations made by the Panel to continue U.S. leadership in Antarctic issues.

*4.1(c)—Department of Energy Posture*

*May 14, 1997*

*Hearing Volume No. 105–41*

*Background*

On Wednesday, May 14, 1997, the Committee on Science held a hearing entitled, “Department of Energy Posture” to receive testimony from the new Secretary of Energy, the Honorable Federico F. Peña.

Witnesses included: The Honorable Federico F. Peña, Secretary, U.S. Department of Energy.

*Summary of hearing*

Secretary Peña testified to the importance of the Department of Energy (DOE) as a Federal science and technology department; described the scientific research achievements of DOE in the past year; and discussed the CERN Large Hadron Collider project in Geneva, Switzerland, funding for the Next Generation Internet, DOE management at DOE (including the DOE laboratories), and DOE’s implementation of the Government Performance and Results Act of 1993.

*4.1(d)—The State of Science, Math, Engineering, and Technology (SMET) Education In America, Parts I–IV, Including The Results Of The Third International Mathematics and Science Study (TIMSS) (Science, Math, Engineering and Technology Education)*

*July 23, 1997*

*Hearing Volume No. 105–40*

*Background*

On July 23, 1997, the Committee on Science held the first in a series of hearings entitled, “The State of Science, Math, Engineering, and Technology (SMET) Education In America, Parts I–IV, Including The Results Of The Third International Mathematics and Science Study (TIMSS).” The purpose of this initial hearing was to familiarize the Committee with ongoing federal SMET education programs at the Department of Education (DoED) and the National Science Foundation (NSF) and to help identify issues that may need to be examined as the Committee proceeds with this effort.

Witnesses included: Mr. Richard Riley, Secretary of Education; and Dr. Neal Lane, Director, National Science Foundation.

*Summary of hearing*

Secretary Riley stated that the nation’s economic future is dependent on the ability of our workers to be proficient in math, science and technology. He noted that about 190,000 high tech jobs are currently going unfilled due to the lack of qualified applicants. He testified that students are not learning the more advanced mathematics necessary for the new economy.

Director Lane stated that the continued involvement of the Federal Government in SMET education is important to instigate the major changes required for preparing U.S. students for the 21st Century. He testified that through human resource development in partnership with teachers, workers, state and local government, academia, and business, the Federal Government ensures quality and equality of educational opportunity. He also stated that these commitments are central to producing the finest scientists and engineers needed to maintain U.S. leadership across the frontiers of science in the 21st Century.

*4.1(e)—Demanding Results: Implementing the Government Performance and Results Act (GPRA/Results Act)*

*July 30, 1997*

*Hearing Volume No. 105–11*

*Background*

On July 30, 1997, the Committee on Science held a hearing entitled, “Demanding Results: Implementing the Government Performance and Results Act (Results Act).” The hearing was held to review the status of science-agencies implementation of the Results Act. The testimony before the Committee focused on draft strategic plans for science agencies and the need for agencies and the Administration to address crosscutting programs and initiatives.

Witnesses included: Ms. Susan Kladiva, Acting Associate Director, Energy Resources and Science Issues, U.S. General Accounting Office; Mr. Alan Ladwig, Associate Administrator for Policy and Plans, National Aeronautics and Space Administration; Ms. Diana H. Josephson, Deputy Undersecretary for Oceans and Atmosphere, U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Dr. Joe Bordogna, Acting Deputy Director, National Science Foundation; Mr. Marc Chupka, Acting Assistant Secretary for Policy and International Affairs, Department of Energy.

The Results Act directs federal departments and agencies to manage performance for results. Under the Act each federal agency must submit 5-year strategic plans to Congress beginning September 30, 1997. The strategic plans are the framework for implementing all other parts of the Results Act to set up a system of program goal-setting and performance measurements.

#### *Summary of hearing*

Ms. Kladiva, U.S. General Accounting Office, testified that the draft strategic plans showed progress toward meeting the Results Act requirements, but only one of the six agencies reviewed for the Committee had met all six of the Act's elements of the completed elements some were insufficient. Additionally, GAO testified to the importance that under the guidance of the Office of Management and Budget, the agencies final submissions should include cross-cutting activities.

Mr. Alan Ladwig, Associate Administrator for Policy and Plans, National Aeronautics and Space Administration (NASA), assured the Committee of NASA's intention to continue the consultation process to ensure its planning documents become increasingly effective as management tools. Mr. Ladwig also testified that NASA intends to focus on several methods to ensure progress in implementing NASA's goals. Mr. Ladwig promised to write the editor of *Aerospace America* to correct an inaccurate statement that claimed Congress had delayed NASA's release of its strategic plan in February after the Chairman pointed out that he and Ranking Member George Brown's first requested the plan in a March 1997 letter and NASA did not respond until April.

Ms. Diana H. Josephson, Deputy Undersecretary for Oceans and Atmosphere, U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), testified to the importance of the Results Act in improving the performance of agencies and improving the communications of NOAA's strategic goals, responsibilities, resource requirements and achievements. She assured the Committee that NOAA's strategic plan would be integrated with the other Commerce bureaus into a comprehensive Commerce strategic plan.

Dr. Joe Bordogna, Acting Deputy Director, National Science Foundation, testified that the National Science Foundation views the implementation of the Results Act as an opportunity to strengthen its strategic planning process and link its goals to its budget formulations. While acknowledging the challenge NSF faces in measuring performance of research, Dr. Bordogna concluded that the Results Act provides a valuable tool for shaping programs and improving returns on public investment in science and engi-

neering research and education. Dr. Bordogna admitted that NSF has not spent time working at the issue of sharing responsibility in the crosscutting goals under the Results Act.

Mr. Marc Chupka, Acting Assistant Secretary for Policy and International Affairs, U.S. Department of Energy, testified that the Department supported the Results Act legislation. The Chairman pointed out that the Department's draft strategic plan had some serious deficiencies. Mr. Chupka promised the next draft, due on August 1, 1997, would meet those deficiencies.

*4.1(f)—The Next Generation Internet*

*September 10, 1997*

*Hearing Volume No. 105-31*

*Background*

On September 10, 1997, the Committee on Science held a hearing entitled, "Next Generation Internet." The hearing was held to review the status of the Administration's detailed plan for implementation of the Next Generation Internet (NGI), the role of the participating federal agencies and the recommendations of the Presidential Advisory Committee on the NGI program. The Committee also discussed the involvement of academia and the private sector.

Witnesses included: Dr. John H. Gibbons, Assistant to the President for Science and Technology; Mr. David J. Farber, Presidential Advisory Committee for High Performance Computing, Communications, Information Technology and NGI; Dr. Larry H. Landweber, Professor, Department of Computer Science, University of Wisconsin; Dr. Joe F. Thompson, Professor of Aerospace Engineering, National Science Foundation Engineering Research Center; Dr. Stephen S. Wolff, Executive Director, Advanced Internet Initiatives Division, Cisco Systems; Dr. Edward H. Shortliffe, Professor of Computer Science and Medicine, Stanford University School of Medicine.

*Summary of hearing*

Dr. Gibbons opened his testimony with a brief discussion about the importance of information and information systems for our Nation's competitiveness and how important the original investments in the DARPA NET and the NSF NET have been in generating the U.S.'s leadership position in information technology. He stated, however, that today's Internet technologies are simply not designed to meet the kind of increased demands for greater communication speeds and better quality of service demanded by American citizens and businesses. Dr. Gibbons then outlined several reasons for supporting the Next Generation Internet Initiative. First, the private sector will not undertake the kind of highly collaborative, long-term research and development needed to produce the next generation of Internet technologies. Second, the Federal Government has an obligation to ensure that the U.S. remains at the forefront of information technologies. Third, Federal agencies must have access to state-of-the-art communication and information systems, and fourth, the government must ensure that our nation's researchers

have the best possible communications systems. Dr. Gibbons pointed out that the President's Advisory Committee made a thorough review of the NGI Initiative and will continue to provide guidance for agencies involved with NGI activities. Dr. Gibbons closed his testimony by remarking that just as federal investments laid the foundation for today's Internet, the NGI initiative will become the genesis for the information technologies, which will sustain America's leadership in information technology well into the 21st century.

David Farber, a member of the Presidential Advisory Committee on High-Performance Computing and Communications, Information Technology, and the Next Generation Internet, opened his testimony with a discussion of the recent activities of the Presidential Advisory Committee. He stated that the Advisory Committee was given the task of reviewing the Administration's NGI Initiative in February of 1997 and asked to report on the initiative by the end of May 1997. The report, which he submitted with his testimony, enthusiastically supported the Administration's initiative. Professor Farber reiterated the Advisory Committee's recommendation that the goals of the NGI initiative should be restated so as to clarify the real intent of the effort. The goals of the NGI initiative are to create an experimental test-bed, scaled sufficiently to stress the underlying technological building blocks, and to develop and demonstrate new Internet applications that will meet federal agency mission needs and national goals. Professor Farber also clarified the differences between the NGI initiative and "Internet2", a program run by an independent consortium of academic institutions with the goal of connecting its members with new high-tech Internet technologies. As for NGI, Professor Farber closed his testimony by stating that like today's Internet, which has grown into something unforeseen by the original Internet researches, perhaps the most important advances made by the NGI initiative will be those we can yet foresee.

Professor Joe Thompson, the Aerospace Engineering Founding Director of NSF's ERC for Computational Field Simulation at Mississippi State University, focused his testimony on NGI activities at Mississippi State University and other universities. He stated that today's collaborative computer activities, for example DoD's need for computer simulation of submarine maneuvering, need astonishing amounts of computer power. With today's Internet it would take 10 days to transfer the data for such a simulation, whereas the NGI initiative will shorten that time to 17 minutes. Professor Thompson stated that development and installation of high bandwidth connectivity is needed for national security reasons. The NGI initiative will help accomplish this goal. Professor Thompson stated that federal support for NGI is critical.

Lawrence Landweber, Professor of Computer Science at the University of Wisconsin, opened his testimony by comparing the 1970's research that led to the Internet with the research that will be done through the NGI initiative. Unlike the original research, the NGI research will have practical goals such as improving tele-medicine and distance-education. In addition to giving a brief history of the Internet, Professor Landweber discussed why federal involvement is needed even though the Internet is now a billion dollar a

year industry. He stated that the unpredictability of the research is what keeps private business away from conducting such long-term research. In such instances, government has a critical obligation to step in and do the basic research. In closing, Professor Landweber stated that the NGI initiative is critical to the United States' pre-eminence in information technology.

Stephen Wolf, Executive Director of the Advanced Internet Initiatives Division of Cisco System, Inc., discussed Cisco's participation in the Internet2 program and the NGI initiative. Mr. Wolf stated that Cisco will respond to public solicitations that are part of the NGI and will support basic research at universities and elsewhere. Mr. Wolf stated that that Cisco's involvement in NGI will be through the agencies that are participating in the program and, as a result, Cisco's activities will be as diverse as the agencies involved. He said that he was delighted to see that the National Library of Medicine, one of the first federal agencies involved in the ARPANET, will play a critical role in the NGI initiative.

Dr. Edward Shortliffe, Professor of Medicine and Computer Science and the Associate Dean for Information Resources and Technology, Stanford University, discussed the implications that the NGI initiative will have on the medical profession. As a medical student who also studied computer science while a student at Stanford in the early 1970's, Dr. Shortliffe stated that he was fortunate to be able to be introduced to the world of electronic mail and file transfers during those years. However, he stated that it was unfortunate that the medical community was slow to understand and to adopt computing and communication technologies that had great promise for influencing the Nation's health. He stated that only now, 25 years later, are we beginning to see the health care industry understanding and adopting the Internet. Dr. Shortliffe then discussed various medical uses of the Internet such as video-linking of doctors and electronic files that patients and doctors can access over the Internet. He discussed how success of the NGI will help researchers, hospital administrators and the infirm. He noted, however, that with today's technology there is much we can not accomplish and, therefore, the NGI initiative is important and needed. Dr. Shortliffe closed his testimony by stating that only government and academia will do the long-term research necessary to create to next generation of information technologies.

*4.1(g)—International Space Station, Parts I–V (Mir Safety)*

*September 18, 1997*

*Hearing Volume No. 105–79*

*Background*

On September 18, 1997, the Committee on Science held the first in a series of five hearings entitled, "International Space Station, Parts I–V." Testimony before the Committee focused on: procedures that NASA has in place for assessing safety, with particular attention to how that process of determining whether David Wolf would be launched to Mir; problems in developing the relationship between the United States and Russia in space cooperation and how

those problems have been resolved (or not resolved); the merits of continuing the Shuttle-Mir program; the suitability of Mir for long-term habitation by U.S. astronauts; the research productivity aboard Mir; the cost-effectiveness of continuing the U.S. presence on Mir versus placing greater emphasis on completing the International Space Station; the original policy and programmatic goals of the Shuttle-Mir program and the program's success in accomplishing its goals; the programmatic accomplishments of the Shuttle-Mir program to date, which may, or may not, have been anticipated; the policy options regarding the future of the Shuttle-Mir program as they relate to science performed aboard Mir; and the general state of the Russian space program as it relates to the overall health of Mir.

Witnesses included: Ms. Roberta L. Gross, Inspector General, NASA; Mr. Frank Culbertson, Manager, Phase I Program, NASA; Mr. James Oberg, Consultant; and Ms. Marcia S. Smith, Specialist in Aerospace and Telecommunications Policy, Library of Congress.

### *I. Background on Mir*

The former Soviet Union and Russia have more experience in long-term human spaceflight than any other country. The former Soviet Union has launched seven orbiting space stations since 1971. In contrast, the United States launched only one space station, Skylab, in the early 1970s.

Russia's most recent and largest space station is known as Mir. The first element is called the "core module" or "base block" and was launched on February 20, 1986. The crew lives in the core module. Mir's first crew took up residence on March 13, 1986. Since then, Russia has added five major modules to the space station: Kvant-1 (astrophysics, docking, storage) was launched on March 31, 1987; Kvant-2 (biotechnology, Earth observation, airlock) on November 26, 1989; Kristall (biological and materials research) on May 31, 1990; Spektr (atmospheric research and surface studies) on March 20, 1995; and Priroda (remote sensing and Earth observation) on April 23, 1996. A special docking module was added in 1995 to allow the U.S. Space Shuttle to dock with Mir.

Mir was originally designed for a five-year operational lifespan. Mir-2 was to have been launched in the early 1990s as a replacement. However, economic and political difficulties in the former Soviet Union and its successor states reduced funding for the Russian space program and dragged out the assembly of Mir. Russia's space station was only completed in 1996, five years after it was to have ended its designed lifetime. Rather than proceeding with an eighth independent space station, the Russians in 1994 formally accepted the invitation of the Clinton Administration to join the United States, Europe, Canada, and Japan in construction of the International Space Station Alpha. Mir-2 components, some of which exist in various states of completion, have since been redesignated as the Russian contribution to the International Space Station.

### *II. Background on U.S.-Russian cooperation in space*

During 1993, U.S. Vice President Albert Gore and Russian Prime Minister Viktor Chernomyrdin held several meetings to discuss U.S.-Russian technical cooperation. Following these meetings of the

Gore-Chernomyrdin Commission, the White House announced on September 2, 1993, that an agreement had been reached to merge the U.S. and Russian space station programs. At that time, Russia's Mir space station was in orbit while the recently redesigned and downsized International Space Station Alpha was on the drawing board. As part of that cooperation, NASA agreed to purchase a Russian space tug, known as the Functional Cargo Block (FCB) as the newly redesigned International Space Station's first element. NASA paid the Russian government \$25 million directly and then another \$190 million for the FCB through Boeing's single prime contract to build the U.S. segments of the International Space Station. Vice President Gore traveled to Moscow in December of 1993, and on December 16, 1993, a letter contract was signed between NASA and the Russian Space Agency for multiple cooperative projects in human spaceflight. During the June 22-23, 1994 meetings of the Gore-Chernomyrdin Commission in Washington, the principals reached agreement on a definitized contract.

On June 24, 1994, NASA Administrator Daniel Goldin and Russian Space Agency (RSA) Administrator Yuri Koptev signed NASA contract number NAS15-10110. The contract was intended to result in: "enhancement of Mir-1 operational capabilities; joint space flights; and joint activities leading to Russian participation in the design, development, operation, and utilization of an International Space Station." The contract initially called for the United States to pay the Russian government \$400 million, including \$334.6 million for Phase I activities and \$65.4 million for Phase II activities. These funds were paid in annual \$100 million increments from fiscal year 1994 through fiscal year 1997.

The contract between NASA and RSA was modified in 1996, after the Russians indicated to the Clinton Administration that they would be unable to meet their commitments to build the International Space Station on schedule and proposed instead attaching the newer U.S., European, and Japanese modules to the Mir. NASA rejected the Russian proposal, but agreed to pay Russia an additional \$72 million for cooperation in space (split between Phases I and II) and to exercise the option for two additional flights to Mir. The total amended funding breakout for U.S. payments to Russia is summarized below:

NASA-RSA to purchase Russian FCB .....	\$25,000,000
NASA-Boeing to purchase Russian FCB .....	190,000,000
Phase I:	
Management .....	26,531,000
Mir Lifetime Extension .....	27,000,000
Mir Capabilities Expansion .....	152,740,000
Mission Support (to Mir) .....	115,620,000
Extension (flights 8 & 9) .....	41,932,000
Phase I Subtotal .....	363,823,000
Phase II Subtotal .....	108,000,000
Total Phase I and II .....	471,823,000
Total Payments to Russia .....	686,823,000

U.S. astronauts took up residence in Mir for long-term spaceflight beginning in March 1995, with the launch of Norman Thagard aboard a Russian Soyuz capsule for a 115-day stay on

Mir. He was followed by Dr. Shannon Lucid who visited Mir from March to September 1996. Dr. Lucid's mission was extended by about 6 weeks when technical problems with the Shuttle's solid rocket boosters delayed the launch of STS-79 from July 31 to September 16, 1996. John Blaha followed Dr. Lucid and resided on Mir from September 1996 through January 1997. Dr. Jerry Linenger, who experienced the fire aboard Mir in February, lived on Mir from January to May 1997. Dr. Michael Foale, who was aboard Mir during its June 25 collision with a Progress resupply vehicle, began his current mission on Mir in May. Drs. Linenger and Foale both performed external spacewalks on Mir using Russian spacesuits.

Dr. Foale was replaced by David Wolf with the launch of STS-86 on September 25, 1997. Mr. Wolf, who was originally slated to be the seventh astronaut to remain on Mir for an extended period, replaced Wendy Lawrence on the STS-86 manifest when NASA decided that the Russian Orlon spacesuits were too large for Ms. Lawrence to wear safely. Mr. Wolf's mission is scheduled to last through mid-January 1998. He is to be followed by Andy Thomas launched aboard STS-89 on January 15, 1998 and to return aboard STS-91 on June 7, 1998, bringing the Shuttle-Mir program to a close.

U.S. astronauts are aboard Mir to learn how the Russians operate their space station and to conduct scientific experiments as a prelude to doing work on the International Space Station. In addition, the Space Shuttle carries a considerable amount of supplies to Mir, helping it remain aloft. In the judgment of some space policy experts, the Shuttle's role in providing logistics to Mir is significant and the Russians are now dependent on these flights to keep Mir aloft.

### *III. Congressional oversight*

Concerns have been raised about Mir's safety given the frequency of breakdowns in its systems and the fact that its core module has been in space more than twice its design life of five years. Those concerns crystallized in many minds when Mir suffered a major fire in Kvant-1's backup oxygen generating system on February 23, 1997. In 1994, a filter on the same system reportedly ignited and burned when the crew failed to clean it properly prior to use.

These concerns prompted Chairman Sensenbrenner and Ranking Minority Member Brown to offer an amendment to H.R. 1275, the Civilian Space Authorization Act, during markup at the full committee on April 16, 1997. The amendment included a provision which read: "The National Aeronautics and Space Administration shall not place another United States astronaut on board the Mir Space Station, without the Space Shuttle attached to Mir, until the Administrator certifies to Congress that the Mir Space Station meets or exceeds United States safety standards. Such certification shall be based on an independent review of the safety of the Mir Space Station." The Committee agreed to the amendment and the House passed the bill on April 23, 1997.

On June 25, 1997, a Progress spacecraft, which the Russians use to resupply Mir, crashed into the station, puncturing the Spektr science module and damaging its solar arrays. Most of the American science experiments were aboard Spektr. The crew success-

fully sealed the Spektr module from the rest of the station and began working to minimize the impact and recover some capabilities. On July 11, Chairman Sensenbrenner and Mr. Brown sent the NASA Inspector General, Roberta Gross, a letter requesting that she collect and provide to the Committee source documents and working-level materials related to “(1) the suitability of Russia’s Mir space station for habitation by U.S. astronauts and (2) research productivity and cost effectiveness of continued NASA involvement in the Mir space station program.” Chairman Sensenbrenner and Mr. Brown further asked the Inspector General to analyze the aforementioned documents.

On August 29, 1997, the Inspector General sent her first interim response and identified the risk areas on which her inquiry would focus: (1) Soyuz as a Rescue Vehicle; (2) Fire Hazards; (3) Problems with Oxygen Generation and Carbon Dioxide Removal; (4) Fatigue and Stress; (5) Training; (6) U.S./Russian Communications; (7) Ethylene Glycol Exposure; (8) Lack of Knowledge About Mir Systems; and (9) the Russian pay system. The Committee received the letter on September 2, 1997, and on September 10, announced that it would hold a hearing on Mir safety on September 18.

#### *IV. Recent Mir system failures*

On March 4, during an attempt to use a new method of manually docking Progress resupply vehicles with the Space Station, the remote television system used by the crew to dock Mir failed. The commander aborted the docking attempt, and the Progress spacecraft sailed by Mir about 200–250 meters away in what many consider a near-miss. On March 7, the primary elektron oxygen generating system failed. The second system was turned on, but produced too much hydrogen and had to be turned off, forcing the crew to rely on the backup oxygen candles, the same type that had led to the February 23 fire. On March 19, Mir’s gyrodynes, which control the station’s orientation in space, failed, leading to free drift in space while the backup thrusters were used to regain control. During April, the station’s thermal cooling system, which regulates the distribution of heat throughout Mir and its systems, sprung several leaks, which the crew was eventually able to isolate. These leaks led to the presence of ethylene glycol in the crew cabin, which caused some upper respiratory problems for the crew. The thermal control system has a long history of leaks exposing the crew to ethylene glycol, dating back to November of 1995. Temporary shut-downs of the thermal control system led other Mir systems to over-heat, and the Vozdukh system for removing carbon dioxide from the air failed, forcing the crew to rely on its backup system of lithium hydroxide canisters to clean Mir’s air.

On June 25, a Progress resupply vehicle collided with Mir during another test of a new manual docking procedure. Explanations for the cause of the collision vary, although it has been reported that the crew commander lost control of the cargo vehicle’s speed and that the range/rate radar used to assess closure rates between Mir and other vehicles was not functioning. The collision caused Mir to tumble in space, preventing its solar arrays from collecting adequate energy from the sun, which resulted in Mir’s systems being turned off. After the collision, the crew set about gaining control of

the station's orientation and then restarting Mir's major systems. Unfortunately, during July, a data cable for the main computer was accidentally disconnected, again causing Mir's main systems to shut down and the station to suffer from an uncontrolled spin. The crew went back to the beginning and restarted the entire station. On August 5, Mir's elektron oxygen generating system failed. The crew was forced to make repairs and operate the system at a reduced capacity. On August 18, during a docking of another Progress resupply spacecraft, Mir's computer failed, forcing the crew to switch over to manual during the maneuver. The docking was successful, and the failed unit was subsequently replaced. On August 22, while the crew was beginning its internal spacewalk to reconnect cables to the damaged Spektr's solar arrays, a glove on one of the Russian Orlon spacesuits began leaking. The crew successfully fixed the problem and continued the spacewalk. On August 25, one of the elektron systems again failed. On August 26, the backup oxygen generating system failed, but it was successfully replaced. The main computer failed again on September 15, 1997. The crew is expected to build a replacement from parts salvaged from two non-functional computers aboard.

According to press reports, Mir has suffered from more than 1,400 catalogued problems during its lifetime. In the clear majority of these cases, however, the Russians were successful in either repairing, replacing, or working around the affected system. One current concern, however, is that the rate of systems failure has gone up significantly since Mir passed its first decade in orbit, due to its age and/or the fact that the Russian space program has fallen on hard times since the end of the Cold War.

#### *Summary of hearing*

The hearing focused on the issues and questions raised in the August 29, 1997 letter from NASA's Inspector General. In her testimony, Ms. Roberta Gross, Inspector General, NASA, questioned whether NASA has adequate processes and procedures to assess risk versus the benefits of participating in the Russian Mir Space Program. Ms. Gross indicated that NASA has three mechanisms for assessing its participation on Mir: internal safety reviews conducted by the NASA Shuttle/Mir Program Manager; safety reviews conducted by the NASA Associate Administrator for Safety and Mission Assurance; and, safety and operational readiness reviews conducted by an independent team led by Lieutenant General Stafford. While not being able to conduct a systematic evaluation because of time constraints, Ms. Gross reported that some former as well as current NASA employees have questioned the adequacy of these assessment processes. She illustrated the three main areas of concern as indicated by the employees: (1) the inability to discuss and criticize freely within NASA; (2) the perceived lack of independence of the Stafford team; and (3) the reduced level of risk assessment performed because of the overriding goals to continue participation in the United States-Russian partnership. In conclusion, Ms. Gross questioned whether concentration of program responsibility at Johnson Space Center provides sufficient checks and balances to ensure adequate program assessment.

Mr. Frank Culbertson, Phase I Program Manager, NASA, reported that the flight readiness review conducted for STS-86 deemed the mission safe and recommended that it continue as planned. In response to the conditions on Mir, Captain Culbertson noted that often items on the space station are operated until failure. Captain Culbertson also commented that reports of uncontrolled spinning and other station malfunctions are exaggerated. The real risks in the operation, in Captain Culbertson's opinion, occur on the actual ascent of the Shuttle. He concluded by reiterating his total commitment to safety.

Mr. James Oberg, a consultant, testified that the problems aboard Mir are predictable consequences of known, measurable causes, namely the decline of the Russian space industry. Mr. Oberg stated that the safety of Mir is impossible to determine because the normal ground-up safety assessments have never been fully applied. Mr. Oberg also indicated that there are significant questions surrounding the American astronauts ability to operate the Soyuz landing capsule. Mr. Oberg concluded that given the adverse conditions, the Mir space station is not safe for an American at the present time.

Ms. Marcia Smith, a senior analyst for the Congressional Research Service, testified that while there are legitimate concerns about Mir's safety, the portrayal of the events have often been exaggerated and misinterpreted. Ms. Smith detailed NASA's desire to continue Shuttle/Mir cooperation in full because of the benefits of increased operational experience and opportunities for more science research. She indicated that the agency also would like to fulfill its agreement with Russia. Ms. Smith illustrated three possible policy options for NASA: (1) continue with the program as planned; (2) complete the planned dockings, but not leave astronauts on Mir; and (3) terminate the program entirely. In conclusion, Ms. Smith questioned whether the benefits provided sufficient justification for astronauts to remain on Mir.

*4.1(h)—The State of Science, Math, Engineering, and Technology (SMET) Education In America, Parts I-IV, Including The Results Of The Third International Mathematics and Science Study (TIMSS) (Science, Math, Engineering and Technology Education-Curriculum Development)*

*September 24, 1997*

*Hearing Volume No. 105-40*

#### *Background*

On September 24, 1997, the Science Committee held the second in a series of four hearings entitled, "The State of Science, Math, Engineering, and Technology (SMET) Education In America, Parts I-IV, Including The Results Of The Third International Mathematics and Science Study (TIMSS)." The hearing focused on elementary and secondary level curriculum development and pedagogical styles. In America, K-12 curricula are developed at the school-district level using broad guidelines from the states. There is little monitoring of schools by school districts, and of school districts by states, to ensure compliance with standards. Teachers

have been given wide latitude to design course content, and textbooks are written broadly to appeal to a wide audience. Many education experts agree that this less focused, “mile wide and inch deep” approach to teaching a core subject, such as math or science, may not suit students’ needs. These experts along with professional education associations have worked to develop curricular guidelines that they believe will better prepare our youth for a high technology global economy.

Witnesses included: Dr. Bruce Alberts, President of the National Academy of Sciences; Dr. Gerald F. Wheeler, Executive Director, National Science Teachers Association; Mrs. Gail Burrill, President, National Council of Teachers of Mathematics; and Ms. Barbara Sampson, President, Technical Education Research Center.

*Summary of hearing*

Dr. Alberts discussed the development and state of support for national standards in science and mathematics. He stated that modern standards movement represents a response to a series of major reports expressing dissatisfaction with the state of American education coupled with a broad recognition of a heightened need to prepare the nation to cope with an increasingly technological and complex society. He also testified that with these standards, curriculum decisions are left to states and local school districts. He noted that effective use of standards requires strong support from local communities, requiring a level of understanding that takes years to build.

Dr. Gerald F. Wheeler testified that there are three barriers which hinder the use of standards: (1) lack of time on the teachers part; (2) teacher isolation; and (3) a lack of quality resources and professional development opportunities.

Mrs. Gail Burrill stated that most states determine the qualification needed for becoming a teacher and that in many schools students taught by teachers with little or no preparation in math and science. She testified that the key to improving the teaching and learning of mathematics is to have a standards-based curriculum and teachers who can implement that curriculum.

Ms. Barbara Sampson noted three goals for high-performance education: (1) all students excel; (2) students understand what they are learning; and (3) students develop an enthusiasm for learning that lasts a lifetime.

*4.1(i)—The State of Science, Math, Engineering, and Technology (SMET) Education In America, Parts I–IV, Including The Results Of The Third International Mathematics and Science Study (TIMSS) (Science, Math, Engineering and Technology Education—Third International Math and Science Study)*

October 8, 1997

Hearing Volume No. 105–40

*Background*

On October 8, 1997, the Science Committee held the third in a series of four hearings entitled, “The State of Science, Math, Engineering, and Technology (SMET) Education In America, Parts I–IV,

Including The Results Of The Third International Mathematics and Science Study (TIMSS).” The purpose of this hearing was to assess where the United States stands in comparison to our industrial competitors overseas in K–12 math and science education and to discuss how policy makers and educators can improve the way we teach these core subjects.

TIMSS is the largest comparative study of educational achievement ever performed. The study involved over one million students from 15,000 schools in 50 nations during the 1995 school year. TIMSS produced data on how, and how well, students in participating nations learn math and science.

Witnesses included: Dr. William Schmidt, Chairman of U.S. TIMSS National Research Coordinator at Michigan State University in East Lansing, MI; Dr. James Hiebert, Professor, TIMSS Videotape Study Department of Educational Development at the University of Delaware in Newark, DE; and Mr. Roger Bybee from the National Academy of Science in Washington, DC.

*Summary of hearing*

Dr. Schmidt testified that instead of using the results of TIMSS to mimic what other countries are doing, the science community should determine where American students are excelling and find out what educators are doing right in these areas. Once we know what we are doing well, we can adapt these operating principles into the areas where we have fallen behind. This suggests that it is easier to adopt things from our own culture instead of learning and applying to the U.S. what works in other cultures. Dr. Schmidt noted that what is interesting about the results is what happens between fourth and eighth grades. Our fourth graders are equal to and ahead of the rest of the world. However, by the eighth grade, our students have fallen significantly behind. The difference is that in these years, our students are no longer challenged with new concepts, and only repeat material they have already learned. He went on to say that tracking regulated up to 80 percent of our students to basic elementary arithmetic, which was unique to our education system. He added that our curriculum is more of a “to do” list instead of a coherent directives. Dr. Schmidt concluded that we need to concentrate our efforts and focus on material that will allow our students to exceed our own expectations and those of our international competitors.

Dr. Hiebert testified about the differences in classroom lessons. While foreign students experience a smooth transition from one topic to the next, American students are subjected to choppy, mundane lessons that do little to capture the attention and creativity of the students. He agreed that instead of copying what other cultures are doing, we should explore our own successes and implement those principles throughout our curriculum. He suggested we develop a teaching system to train educators in improved ways to reach students and then institute these teaching methods in the classrooms. Dr. Hiebert concluded that we should implement changes that will ensure better classrooms and a better education system.

Mr. Bybee echoed the sentiment of the first two witnesses saying that our curriculum is incoherent, unfocused and fragmented. He

suggested that we implement standards at some level, whether it be federal, state, or local, so that the school systems would have a mission to focus on and a structure to accomplish their missions. Mr. Bybee cautioned, however, against swinging the pendulum too far to a point where we focus too much on one set of subjects, saying there is a point in the middle that we need to find. He suggested that our initial focus should be on teaching methods to find the best way for teaching our students as other, older cultures have already done.

4.1(j)—*The State of Science, Math, Engineering, and Technology (SMET) Education In America, Parts I–IV, Including The Results Of The Third International Mathematics and Science Study (TIMSS) (Science, Math, Engineering and Technology Education (SMET) in America—Collaboration and Coordination of Federal Agency Efforts in SMET K–12 Education)*

October 29, 1997

Hearing Volume No. 105–40

#### *Background*

On October 29, 1997, the Science Committee held the last in a series of four hearings entitled, “The State of Science, Math, Engineering, and Technology (SMET) Education In America, Parts I–IV, Including The Results Of The Third International Mathematics and Science Study (TIMSS).” This hearing focused on the roles that various federal agencies play in K–12 Science and Math Education Programs. The major issues addressed at this hearing were the collaboration and coordination of federal science and math programs, and the priorities and allocation of federal resources.

Many federal agencies support science and math education programs. For example, in 1996 the Eisenhower National Clearinghouse for Mathematics and Science Education (ENC) published The Guidebook of Federal Resources for K–12 Mathematics and Science. ENC’s comprehensive listing runs more than 1500 pages. This hearing focused on federal SMET education programs, specifically at agencies other than the Department of Education (DOEd) and the National Science Foundation, and how those programs are related to and coordinated with DOEd and NSF activities.

Witnesses included: Dr. Clifford Gabriel, Acting Associate Director, Science Division, Office of Science and Technology Policy; Dr. David E. Shaw, Chairman, Panel on Educational Technology, President’s Committee of Advisors on Science and Technology; Gordon Ambach, Executive Director, Council of Chief State School Officers; and Dr. James Rutherford, Chief Education Officer, American Association for the Advancement of Science.

#### *Summary of hearing*

Dr. Gabriel testified that there is a solid need for a federal presence in the primary and secondary curriculum, even as local and state governments take on an increasingly larger role in funding education. Dr. Gabriel said that the President’s Committee of Advisors on Science and Technology (PCAST), and the National Science and Technology Council (NSTC) had examined the results of

TIMSS and had discussed reforms based on the results. Their suggestions included developing a strategy to improve teaching, increasing the availability of high-quality materials, and illustrating the effective use of technology in the classroom. He also said that these groups are reviewing the priorities of federal sponsorship in new educational programs and the methods used for determining these priorities. He concluded that agencies must coordinate scarce resources, make use of lessons learned, and share experiences openly to promote educational excellence.

Dr. Shaw testified that there is not enough research into finding significant improvements in our current education system. He felt that the problem had less to do with underfunding more to do with inadequate research into teaching methods. He suggested exploring alternative educational approaches, testing them as target research projects, then gathering the results of these projects with the object of forming a better, more comprehensive educational system. He said this would require a central coordination system, either by a single entity or by a multi-agency consortium. Deciding the best approach would involve a background study on the agency or agencies given this charge.

Mr. Ambach testified that the federal government plays an essential role for its ability to gather enormous amounts of funding for research and development in teaching methods and materials. He voiced his concerns as to whether all the sources for research and development were being used, and he cited programs within the Defense Department and Department of Energy (DOE) lab system that receive federal funding but are not looked upon as alternatives by the National Science Foundation and Department of Education. He went further saying that within these agencies there are existing programs that are specially designated and that do not share research and methodology within a larger review of educational ideas. He concluded that there must be better coordination between agencies in providing research and support for education and that there must be a meeting point where the resources come together to coordinate these resources.

Dr. Rutherford testified that the results of TIMSS have given us a purpose to develop Science and Math Education policy. He stated that federal programs seeking funding should provide a roadmap of what they are trying to accomplish, how they intend to get there, and how the mission would help all students in understanding math and science topics. He also testified that politicians and agencies should spend more time focusing policy on the suggestions of scientists and educators on how to approach educational restructuring. He also said that more effort should be made to simplify the system so that ideas and funds will flow to the areas when and where they are needed. When outside agencies are seeking science and math education funding, they should be required to show how their programs will link with the existing structure. Finally, a better system of coordination of research and development projects is needed so that all our resources can be used to generate reforms to our education system.

*4.1(k)—Road from Kyoto, Part I: Where Are We, Where Are We Going, and How Do We Get There? (Road from Kyoto, Parts I–IV)*

*February 4, 1998*

*Hearing Volume No. 105–73*

*Background*

On February 4, 1998, the Committee on Science held the first in a series of four separately published hearings entitled, “Road from Kyoto, Part I: Where Are We, Where Are We Going, and How Do We Get There?,” to examine the outcome and implications of the climate change negotiations concluded at the Third Session of the Conference of Parties to the UN Framework Convention on Climate Change (COP–3) held in Kyoto, Japan from December 1–11, 1997. On December 11, COP–3 adopted the Kyoto Protocol, which requires that the U.S. reduce its net greenhouse gas (GHG) emissions by 7 percent below 1990 levels.

Witnesses included: Ms. Kathleen A. McGinty, Chair, Council on Environmental Quality; Dr. Jay E. Hakes, Administrator, Energy Information Administration (EIA), U.S. Department of Energy; Mr. David Smith, Director of Public Policy Program, AFL–CIO; Mr. Joseph Goffman, Senior Attorney, Environmental Defense Fund; Mrs. Connie Holmes, Chairman, Global Climate Coalition; and Mr. Michael Marvin, Executive Director, Business Council for Sustainable Energy.

*Summary of hearing*

Ms. McGinty testified that the choice between jobs and the environment is a false one, that mechanisms in the Kyoto Protocol will show that the environment and the economy can work together, and that the Protocol was a “work-in-progress.” Dr. Hakes testified on EIA’s projections of energy trends—which forecast that U.S. carbon emissions from energy will increase to levels 34 percent above 1990 levels by 2010—and described many factors that could change the projections by either restraining or encouraging the growth of carbon emissions. Mr. Smith argued that climate change is a global problem requiring global participation, and that the President should not sign the Kyoto treaty—which has enormous consequences in terms of costs and the way people live. Mr. Goffman stated that the Kyoto Protocol’s greenhouse gas emissions reduction objectives could be met through the use of international emissions trading, and asked the Congress and the Administration to focus on the potential of the Protocol’s new market-based mechanisms. Mrs. Holmes testified that the Kyoto Protocol was fatally flawed and should not be ratified in its current form. And Mr. Marvin testified that there is sufficient information about the science of global climate change to merit a response by policymakers and that the agreement reached in Kyoto could be a first step, although it fails to address a number of topics with clarity.

*4.1(l)—Road from Kyoto, Part II: Kyoto and the Administration's Fiscal Year 1999 Budget Request. (Road from Kyoto, Parts I–IV)*

*February 12, 1998*

*Hearing Volume No. 105–74*

*Background*

On February 12, 1998, the Committee on Science held the second in a series of four separately published hearings entitled, “Road from Kyoto, Part II: Kyoto and the Administration’s Fiscal Year 1999 Budget Request,” to examine the Administration’s Fiscal Year (FY) 1999 budget proposals related to the Kyoto Protocol and the Protocol’s requirement that the U.S. reduce its net greenhouse gas (GHG) emissions by 7 percent below 1990 levels. In particular, the hearing considered the Climate Change Technology Initiative (CCTI)—a five-year (FY 1999–FY 2003), \$2.710 billion research and technology initiative and a \$3.635 billion package of tax credits—to reduce U.S. GHG emissions. In addition, testimony was presented on the FY 1999 budget request for the U.S. Global Change Research Program (USGCRP).

Witnesses included: Dr. John H. Gibbons, Assistant to the President for Science and Technology, and Director, Office of Science and Technology Policy; Dr. Ernest J. Moniz, Under Secretary of Energy, U.S. Department of Energy (DOE); Mr. David M. Gardiner, Assistant Administrator for Policy, Planning and Evaluation, U.S. Environmental Protection Agency (EPA); and, Mr. Gary R. Bachula, Acting Under Secretary for Technology, U.S. Department of Commerce.

*Summary of hearing*

Dr. Gibbons testified on behalf of the U.S. Global Change Research Program (USGCRP), a program designed to provide scientific information necessary to understand climate change for making policy decisions. Dr. Moniz described DOE’s R&D portfolio and discussed the Administration’s draft framework of a comprehensive energy strategy. Mr. Gardiner testified on the President’s proposed Climate Change Technology Initiative (CCTI). And Mr. Bachula described the National Institute of Standards and Technology’s contribution to the CCTI.

*4.1(m)—National Science Policy Study, Parts I–VII (Math and Science Education, Part I: Maintaining the Interest of Young Kids in Science)*

*March 4, 1998*

*Hearing Volume No. 105–60*

*Background*

On March 4, 1998, the National Science Policy Study Task Force conducted the first in a series of seven hearings entitled, “National Science Policy Study, Parts I–VII” to examine the common components educators have found that are critical to engaging children

in science, and thereby successfully imparting scientific understanding to them.

This was the first of seven hearings held by the Committee on Science as part of the National Science Policy Study led by Congressman Vernon Ehlers, Vice Chairman of the Committee.

Witnesses included: Mr. Bill Nye of the television program "Bill Nye the Science Guy"; Dr. Joel Schneider, Vice President for Education and Research, Children's Television Workshop; Ms. Sandra Parker, fifth grade teacher at Flint Hill School, Oakton, Virginia and recipient of the 1997 Presidential Award for Teaching Excellence in Mathematics and Science; Dr. Thomas Krakauer, Director, North Carolina Museum of Science and Technology; and Dr. Susan Carey, Department of Psychology, New York University.

#### *Summary of hearing*

Mr. Nye testified that science is intrinsically interesting. He acknowledged that his educational television show is entertainment and that if the show stopped being entertaining, its ratings would drop, and the show would be taken off the air. He stated that science teachers should try to make their own classrooms as interesting as possible. He noted that science has an inherent advantage over other disciplines in that only science has the "gizmos and demonstrations" that are the basics of scientific experimentation. He said that teachers should use all the gizmos that they can in order to make the classroom interesting. He stated that grammar school and high school science textbooks should be written in plain English and not bogged down with unnecessary scientific verbiage. Mr. Nye said that the government should support more funding for schools, support programs to help encourage women and under-represented minorities to enter scientific professions, and also suggested that the U.S. should convert to the metric system.

Dr. Scheider stated that his 30 years of experience in education and educational television has convinced him that informal science and math education is extremely important. He stated that perhaps the most valuable contribution of informal science and math education is that it fosters a culture of learning amongst our children. As examples of informal science and math education, Dr. Scheider showed four short video clips from recent children's television shows. The four video clips showed that women can be mathematicians, doing science takes desire and perseverance, and that science helps to solve everyday problems. The clips demonstrate how science education can be interesting and relevant. Dr. Scheider stated that these themes are repeated over and over throughout effective children's educational television shows.

Ms. Sandra Parker opened her testimony by stating that much has changed since she was a science student. She stated that in terms of science teaching, there are three things that need to be improved. First, there needs to be more coordination between science textbooks and science classroom experiment kits. Second, teacher training needs to be improved, and third, science classes must be fun so that students complain when the class is over. She stated that science should be integrated into reading, writing and all other areas of instruction. She stated that students need to be taught about the basic practices of science; namely, classifying,

data collection, keeping records, inferring, hypothesizing, and becoming critical thinkers. In support of using hands-on science activities, Ms. Parker quoted the following proverb: I hear, I forget; I see, I remember; I do, I understand. Ms. Parker stated that the National Science Foundation's Activities to Integrate Math and Science (AIMS) program and the Thinkquest program are two excellent science education programs.

Dr. Krakauer opened his testimony with an short description of the Life and Science Museum. He said the museum is hands-on and allows a single exhibit to speak directly to a broad spectrum of visitors who differ in age, educational background and personal experience. The museum celebrates scientific success rather than testing for failure. Mr. Krakauer also discussed the Museum's program for underserved teenagers which hires teenagers to work in the museum. He stated that the museum's hands-on structure is perfect for young students. He said that is important because experts have found that many students decide by fourth or fifth grade if science is going to be part of their lives. According to Mr. Krakauer, science education need not be confined to a classroom. Formal and informal science education can be made interesting and can help promote a love of science among America's next generation.

Professor Carey testified that the last concerted national initiative to improve math and science education was in the 1960's and unfortunately math and science instruction in this country is now in a crisis. The major reason for this situation is that in the 1960's educators and psychologists misanalyzed the problem. Since the 1960's, educators have focused on what individual students lack. The educators should have focused on what the student has, rather than lacks. What young students have is curiosity and science classes should build on that curiosity. Unfortunately, young students often have different theories or understandings of the world around them. For example, many young students do not understand the idea of weight density differentiation. Teachers first must understand how the student thinks, and then work from there. Professor Carey compared this kind of thinking to the actual history of the scientific progress. The way medieval scientists viewed the world was very different to how today's scientist views the world. Teachers must understand the student's concepts about science. If the teacher understands this, the teacher can use a student's misunderstanding of a scientific concept as an opportunity to advance a student's conceptual thinking, rather than a humiliation for the student.

*4.1(n)—Road from Kyoto, Part III: State Department Overview  
(Road from Kyoto, Parts I-IV)*

*March 5, 1998*

*Hearing Volume No. 105-75*

*Background*

On March 5, 1998, the Committee on Science held the third in a series of four separately published hearings entitled, "Road from Kyoto, Part III: State Department Overview." This hearing was the

third in a series to examine the outcome and implications of the climate change negotiations concluded at the Third Session of the Conference of Parties to the UN Framework Convention on Climate Change (COP-3) held in Kyoto, Japan from December 1–11, 1997. On December 11, COP-3 adopted the Kyoto Protocol, which requires that the U.S. reduce its net greenhouse gas (GHG) emissions to 7 percent below 1990 levels.

The hearing's sole witness was the Honorable Stuart E. Eizenstat, Under Secretary for Economic, Business and Agricultural Affairs, U.S. Department of State and the U.S. delegation's chief negotiator at Kyoto.

*Summary of hearing*

Mr. Eizenstat testified that there was a scientific consensus that humans are changing the climate by increasing the global concentrations of greenhouse gases. He stated that the Kyoto Protocol is a work in progress, but that it does contain two of the three objectives that the President and Vice President insisted be addressed: (1) realistic targets and timetables for reducing greenhouse gas emissions among the world's major industrial nations; and (2) flexible market-based mechanisms for achieving those targets cost-effectively. The third objective—meaningful participation from key developing countries—has not been met and will be the focus of future work in the coming months and years. He stated that the U.S. intends to sign the Protocol by mid-March of next year to “lock in” the progress made thus far. He also addressed what he described as some “misconceptions” about the Kyoto Protocol.

*4.1(o)—National Science Policy Study, Parts I–VII (Defining Successful Partnerships and Collaborations in Scientific Research)*

*March 11, 1998*

*Hearing Volume No. 105–60*

*Background*

On March 11, 1998, the National Science Policy Study Task Force conducted the second in a series of seven hearings entitled, “National Science Policy Study, Parts I–VII” to identify aspects of successful research partnerships and collaborations that can be applied to federal science programs. It examined different partnering models among Federal and State Governments, universities, and industry in an attempt to discern what factors are common to successful collaborations. With the amount of interdisciplinary research increasing, understanding how to organize effective joint research efforts to increase the likelihood of success has become of growing importance.

This was the second of seven hearings held by the Committee on Science as part of the National Science Policy Study led by Congressman Vernon Ehlers, Vice Chairman of the Committee.

Witnesses included: Dr. Lewis Branscomb, Professor Emeritus, Harvard University; Dr. Charles Vest, President, Massachusetts Institute of Technology; Dr. David C. Mowery, Professor, Univer-

sity of California at Berkeley; Mr. Jim McGroddy, former Senior Vice President for Research at IBM.

*Summary of hearing*

Dr. Branscomb discussed the need for collaboration when each individual or group has a common purpose, but “diverse and complimentary” skills and research. Also, collaboration is more suitable in like fields and interests where the final product is a common goal and a partnership is more beneficial economically. Finally, Dr. Branscomb discussed opportunities for collaboration in the interest of improving foreign relations and foreign policy.

Dr. Vest testified that the Federal Government must continue to be the fiscal basis of support for cooperative efforts and could steer science toward more partnerships through budgetary policy. He also discussed the need for flexibility in partnerships, noting that it can not be a “one size fits all” policy. Dr. Vest also testified that universities, and the industry organizations relevant to their research, have begun developing these partnerships. He cited factors that make solid partnerships include recognition of each organization’s role, talents and resources, concise expectations and an agreement on mutual management.

Dr. Mowery testified that analyzing the purpose of partnerships and evaluating the roles in a partnership must be flexible, and added that even after a partnership had begun, that it must have flexibility in its frame work to be accommodating as new alternatives develop. He suggested some changes in Federal regulations and requirements placed on university research to allow increased flexibility.

Mr. McGroddy discussed funding issues involved in determining whether a partnership is feasible. Other alternative factors such as management must also be analyzed before establishing a collaborative effort. Mr. McGroddy also talked about deriving a motivation for partnerships and research and development in general to replace the goals of Cold War research. Finally, he discussed openness and its benefits to the science community and suggested this had to be the foundation by which these partnerships are built.

*4.1(p)—National Science Policy Study, Parts I–VII (International Science)*

*March 25, 1998*

*Hearing Volume No. 105–60*

*Background*

On March 25, 1998, the National Science Policy Study Task Force conducted the third in a series of seven hearings entitled, “National Science Policy Study, Parts I–VII” to examine why the United States should participate in international scientific collaborations, when they are likely to be effective, and how to prevent them from being manipulated to meet goals other than scientific goals. The hearing identified reasons why international collaboration is often in the United States’ interest, highlighted factors common to successful collaborations, and discussed recommendations to promote science priorities abroad and international collabora-

tions in the U.S. While the United States still leads the world in the largest number of research disciplines, it has become increasingly clear in recent years that researchers in foreign nations are performing top-notch work and that our scientists and engineers can benefit greatly from working together with their international counterparts.

This was the third of seven hearings held by the Committee on Science as part of the National Science Policy Study led by Congressman Vernon Ehlers, Vice Chairman of the Committee.

Witnesses included: Admiral James D. Watkins, President, Consortium for Oceanographic Research and Education and former Secretary of Energy; Dr. Bruce Alberts, President, National Academy of Sciences; Dr. J. Thomas Ratchford, Director, Center for Science, Trade, and Technology Policy, George Mason University; Professor Homer A. Neal, Director, Michigan ATLAS Project, University of Michigan; and Ms. Caroline Wagner, Senior Analyst, Critical Technologies Institute at RAND.

*Summary of hearing*

Admiral Watkins highlighted the difficulties that foreign policy poses for continuous international collaboration in science. This not only hurts the country we are trying to influence, but also burdens our own scientific community while giving the United States a reputation of being an unreliable science partner. To remedy this situation, Admiral Watkins suggested we be more inclusive of science and technology leaders when determining the course of our foreign policy. He also encouraged Congress and the Administration to make a commitment to these fields and structure a broad, yet effective, scientific mission instead of focusing entirely on environmental issues.

Dr. Alberts urged a policy that maintains better communication between our scientists and those from other nations, including improvements in international telecommunications technology. As communications improve and ideas are shared, better less expensive technologies will become more available and bring other developing countries into the 21st century, allowing them to become less dependent upon the industrialized nations. Dr. Alberts testified that the National Academy of Science has started new programs, such as "Frontiers of Science," that encourage younger scientist from around the globe to develop closer ties so that as they become the leaders in these fields. A clearer professional atmosphere will assist in sharing and swapping ideas, methods and technologies. He also endorsed the idea that the U.S. needs to make science and technology a focus of our national and foreign policy.

Dr. Ratchford discussed a series of trends in research and development that show a decreasing role in government funding that has conversely affected the efficiency rate at which corporate funding is used. This, along with a growing "inter-relationship" in research and development, has "pushed the globalization of research and technology." He explained that companies make more sound investments in developing technologies to ensure the greatest return. He also addressed problems that have arisen as companies fill short-term, low-load strategies which leave long-term technology funding to governments which, as earlier stated, have been

reducing the amount of funding they invest into research and development projects. He suggested that we develop more effective science and technological policies and improve implementation of these policies internationally.

Dr. Neal proposed economic factors would encourage international science collaboration. As the scientific community works to solve obstacles through R&D, our society would see greater benefit if funds and ideas were shared so that, as less overlapping research was done, less individual expenditure could yield greater technological benefit at a faster rate, because of the larger professional talent pool. He also weighed the potential downsides of international collaboration, such as the greater complexity of management, and the reduction in spots for our own undergraduate and graduate students in these research arenas. However, he reiterated that the most important goal was to continue to explore the vast frontiers of science. Dr. Neal also stated that greater abilities in our communication network would increase international scientific progress.

Ms. Wagner spoke on specific budget policies that probe inadequacies in the status quo. Of current federal R&D expenditures, only \$3.3 billion dollars, 4.5 percent of the total R&D budget, are allocated to initiatives involving international cooperation. She outlined the criteria that have encouraged past and current cooperative research projects such as the expense and size of the project, the scope and what aspects of our environment would benefit, such as oceanic and atmospheric programs. Also, she discussed the measurement of collective vs. comparative individual benefits. Ms. Wagner concluded that greater interagency cooperation within our own government may also eliminate some of the obstacles and ultimately improve international collaboration.

*4.1(q)—National Science Policy Study, Parts I–VII (Math and Science Education, Part II: Attracting and Graduating Scientists and Engineers Prepared to Succeed in Academia and Industry)*

*April 1, 1998*

*Hearing Volume No. 105–60*

*Background*

On April 1, 1998, the National Science Policy Study Task Force conducted the fourth in a series of seven hearings entitled, “National Science Policy Study, Parts I–VII” to investigate how best to prepare scientists and engineers for their future careers, from research, engineering, and management positions in academia and industry to positions in finance, teaching, policy, law and journalism. The hearing also addressed the issues of how best to attract enough well-qualified students to pursue graduate scientific or engineering degrees, how to gain insight into the types of skills industry looks for in the scientists and engineers they hire, and how to review recommendations from the 1995 report (“Reshaping the Graduate Education of Scientists and Engineers”) from the National Academy of Sciences’, Committee on Science, Engineering, and Public Policy (COSEPUP).

This was the fourth of seven hearings held by the Committee on Science as part of the National Science Policy Study led by Congressman Vernon Ehlers, Vice Chairman of the Committee.

Witnesses included: Dr. David Goodstein, Vice Provost, California Institute of Technology; Ms. Catharine Johnson, Graduate Student, Johns Hopkins University; Dr. Earl Dowell, Dean of Engineering, Duke University; Mr. Michael Peralta, Executive Director, Junior Engineering and Technical Society; and Dr. Phillip Griffiths, Director, Institute for Advanced Study and former Chairman of the National Academy of Sciences' Committee on Science, Engineering, and Public Policy.

*Summary of hearing*

Dr. Goodstein opened his testimony by stating that the U.S. has a surplus of highly selected and trained Ph.D's in science and engineering, but also a shortage of scientifically and technically trained people. He stated that the number of Ph.D's increased throughout the 20th century until about 1970. Since 1970, however, the percentage of science and engineering college students who have decided to go on to graduate school has steadily decreased. Dr. Goodstein noted, however, that the number of students from overseas has increased to a point that now 50 percent of graduate students in science and engineering are from abroad. Dr. Goodstein compared the selection process for science and engineering professorships to the process of mining gems—the good ones are kept and all the rest are discarded. He suggested that this may be why the country has wonderfully trained professors and a scientifically illiterate workforce. According to Dr. Goodstein, a second problem with the current education system is that graduate students are trained to be professors, while the number of professorships is not increasing. He suggested that a result of this system is that everyone other than the scientific elite is left out and presently undergraduate enrollment in physics is at a 40-year low. He noted that this is a real problem because undergraduate work is probably the best preparation for the professions that will be created in the next few decades. In addition, the system has resulted in a lack of qualified middle school and high school teachers. Dr. Goodstein stated that this system must be reformed, changes must be made to the culture of our education system, and we must end the mutual disdain that exists between scientists and non-scientists. Dr. Goodstein concluded his testimony by stating that this will take a tremendous amount of work, and the reforms must not harm our nation's ability to produce top-notch scientists.

Ms. Johnson stated that American science is in a rapid state of evolution. She stated that the present system of education is designed to replenish the ranks of academic faculty but as the scientists' sphere of influence in our society expands, this system does not adequately prepare young scientists for the future. Ms. Johnson stated that most post-graduate science students spend close to ten years after college finding what she referred to as a "real job." According to Mr. Johnson, during this time most graduate students work for their faculty advisor. As a result, the current system is designed to benefit the faculty rather than the interests of the students. Ms. Johnson quoted several polls showing a growing interest

in non-academic science by graduate students. The same polls suggested, however, that less than 50 percent of the graduate students believed that the faculty is supportive of students who are interested in non-academic careers. Ms. Johnson stated that this must change. She suggested the degree of "Master of Science" should be reinstated. Ms. Johnson also discussed the financial burdens of science graduate students in comparison to those of law and business students. She ended her testimony with four recommendations: (1) expand the career paths of young scientists; (2) increase the scientific flexibility and reduce the time to receive a degree; (3) revalidate the Master's programs; and (4) reduce the opportunity costs for pursuing advanced degrees in science and math.

Dr. Dowell opened his testimony by stating that science and engineering schools are facing serious challenges such as attracting young people, preparing them for careers in both academia and in industry, giving them the depth, but also the breadth to participate in multidisciplinary teams, and the people skills to be involved in a multi-national economy where business relationships cut across boundaries. Dr. Dowell stated that although 50 percent of Ph.D. students are from abroad, the majority of them remain in the United States and become American citizens. He also stated that undergraduate engineering degrees are in demand with many graduating seniors getting "signing bonuses" like NBA athletes, of course however, for not as much money. Dr. Dowell pointed out, however, that over the last several years, enrollment in undergraduate engineering programs has fallen by 15 percent. Dr. Howell focused much of his remaining testimony on academic-industry relations. He highlights several federal programs that facilitate such relationships such as: NSF's Visiting Scholar Program; NSF's Action Agenda for Systemic Engineering Educational Reform; and, the NSF-funded Engineering Research Centers. He concluded his testimony by thanking the Congress for its investment in engineering and science and by stating that he believes this has been a prudent investment.

Mr. Peralta testified that the engineering educational system is shifting to accommodate industry more and more. His organization, Junior Engineering and Technical Society (JETS), plays an important role in supporting this shift. His organization allows high school students to apply their knowledge of concepts to real engineering situations. The goal of the JETS programs is to show these students that engineering is fun and relevant. Mr. Peralta discussed the results of the TIMSS study and stated that the U.S. must do more to improve our country's overall standing. JETS, which was founded in 1950, helps this cause by running various hands-on engineering programs for high school students. Mr. Peralta outlined several of these programs. He concluded his remarks by stating that these programs are designed to show students the wonders of engineering.

Mr. Griffiths testified that if we are to maintain American leadership in science and engineering, then we need to give our students the best possible preparation for that leadership. He addressed a series of myths concerning science and engineering education. According to Mr. Griffiths, the first myth is that most Ph.D.'s spend their careers in academic positions. The truth is that

more than 50 percent of Ph.D.'s go on to jobs that are not primarily academic. The second myth is that there is high unemployment and underemployment among Ph.D.'s. The truth is that unemployment among scientists and engineers is about 2 percent. The third myth is that we are training far too many Ph.D.'s for the available jobs. The truth is that enrollment in science and engineering Ph.D. programs is declining, so the growth in the Ph.D. population may be moving towards some kind of equilibrium. However, there needs to be some changes in the education of scientists and engineers, such as shortening the length of time to degree, and that focusing more on the need to teach students more interpersonal, communication and management skills. Mr. Griffith quoted a report prepared by his organization that recommended that graduate programs should be made more flexible and more career information should be given to students. He also discussed the NSF Integrated Graduate Education and Research Training (IGERT) program. He said that the program has been an improvement and concluded his testimony by stating that he has been impressed with the recent innovations in science and engineering education.

*4.1(r)—National Science Policy Study, Parts I–VII (The Irreplaceable Federal Role in Funding Basic Scientific Research)*

*April 22, 1998*

*Hearing Volume No. 105–60*

*Background*

On April 22, 1998, the National Science Policy Study Task Force conducted the fifth in a series of seven hearings entitled, “National Science Policy Study, Parts I–VII” to receive testimony on the performance, funding, and use of basic scientific research. The hearing examined the unique federal role in funding research that, owing to its risk and lack of clearly defined outcomes, industry is ill-prepared to support. While it is clear that industry does fund a substantial amount of basic research, and that the Federal Government has and in certain circumstances should continue to fund research of a more applied nature, because the results of industry basic research are almost always proprietary, the Federal Government has an irreplaceable role to play in generating new knowledge that is available for widespread dissemination. The hearing also looked at the role of private foundations in funding innovative, far-sighted research, and the role of state-based partnerships in the dissemination of research results for economic development purposes.

This was the fifth of seven hearings held by the Committee on Science as part of the National Science Policy Study led by Congressman Vernon Ehlers, Vice Chairman of the Committee.

Witnesses included: Dr. Claude Barfield, Director of Science and Technology Policy Studies, American Enterprise Institute; Mr. George Conrades, President, GTE Internetworking; Dr. Michael P. Doyle, Vice President, Research Corporation; Mr. William Todd, President, Georgia Research Alliance.

*Summary of Hearing*

Dr. Barfield discussed the Vannevar Bush report and described its shortcomings regarding its description of the so-called “linear model” of innovation and how it completely divorced basic research from any considerations of practical ends. He then proceeded to discuss the findings of two important recent science policy studies for comparison. Dr. Barfield also described some of the important economic rationales that should support our national civilian research enterprise, and some of the considerations that should underlie intellectual property policies and the appropriate role of the states.

Mr. Conrades testified regarding the results of the report written by the Committee for Economic Development, “America’s Basic Research: Prosperity through Discovery.” Their report argued that the success of our basic research enterprise has grown from its uniquely American organization, not simply as a result of the amount of money that has been spent on research. They believe it is vital that the Federal Government maintain its commitment to funding basic research because basic research has provided the intellectual and technological foundation for many practical inventions. Mr. Conrades said that our basic research establishment must constantly renew itself, as today it faces important questions about the priorities and balance of its basic research missions, the consistency of government support, the global dissemination of new knowledge, and the collapse of Cold War rationales for massive investments in defense research. Their report attempts to make a compelling case for supporting basic research, and in his testimony Mr. Conrades lists twelve findings and fourteen recommendations included in the upcoming report.

Dr. Doyle described some of the history of the Research Corporation, how it operates, the disciplines in which it grants awards, and the amount of grants it awarded in 1997. He also discussed the seven categories in which they offer grants, as well as the process they use to review the proposals they receive. In particular, Dr. Doyle testified about the difficulty they had in finding sufficient qualified investigators to receive their new Research Innovation Awards, only awarding 48 of the 60 they had planned, even though they received 185 applications. He also discussed their Cottrell Award that integrates research and teaching, and their focus on awarding grants in the physical sciences. Dr. Doyle closed by providing information on the modest overall level of private foundation support for basic research into the physical sciences.

Mr. Todd described how the Georgia Research Alliance model for developing local technology industries has been effective in its mission, pointing out the importance of managing their investments as a portfolio, including a commercialization center in each of the new initiatives they develop, and being able to rely on the Federal Government to fully participate in early stage research. Mr. Todd discussed the portfolio in terms of a pipeline that must be kept full at all stages of the innovation process, and discussed some of the lessons they have learned regarding business incubation and commercialization. Mr. Todd emphasized in his testimony that the federal government should renew its commitment to being the primary sponsor of early-stage research, and the importance of the Federal and State Governments working together to maintain a

full pipeline of basic research in order to reap the maximum economic benefits.

*4.1(s)—International Space Station, Parts I–V (The International Space Station: Problems and Options)*

*May 6, 1998*

*Hearing Volume No. 105–79*

*Background*

On May 6, 1998, the Committee on Science held the second in a series of five hearings entitled, “International Space Station, Parts I–V.” The hearing focused on the analysis of the NASA Advisory Council’s Cost Assessment and Validation (CAV) Task Force, which had recently audited the International Space Station (ISS) program in order to develop a more complete and accurate cost assessment. The CAV Task Force also identified the principal causes of continuing cost growth and schedule delays in the ISS program.

Witnesses included: Mr. Jay Chabrow, Chairman, NASA Advisory Council’s Cost Assessment and Validation Task Force; Mr. Daniel Goldin, NASA Administrator; Dr. Duncan Moore, Associate Director for Technology, White House Office of Science and Technology Policy; Mr. Franklin Raines, Director, White House Office of Management and Budget; Lt. General Thomas Stafford, Chairman, NASA Advisory Council’s Stafford Task Force.

*Summary of hearing*

Mr. Jay Chabrow, Chairman of the NASA Advisory Council’s Cost Assessment and Validation Task Force, summarized his group’s findings: (1) Continued Russian non-performance is the single biggest threat to the program; (2) The ISS has been underfunded since its 1993 redesign and requires another \$130 to \$250 million annually in order to achieve the baseline program (leading to a total cost estimate of about \$24.7 billion, an increase of \$7.3 billion from NASA’s original estimates); and (3) The Fiscal Year 1999 budget request for ISS development is too low.

Mr. Daniel Goldin, NASA Administrator, testified that U.S. and Russian progress on the first two ISS flight elements (the FGB and Node 1) was proceeding well and all signs pointed to their readiness for launch on schedule. Problems in developing the software for the U.S. laboratory continued. Russian government funding for the Service Module continued to be inadequate and the Russian Space Agency (RSA) had admitted that the Service Module would not be ready for launch before March/April 1999. (At the time of the hearing, the Service Module was scheduled to be launched in December 1998.) Mr. Goldin declined to comment on the CAV Task Force report at the hearing, instead asking for time to review it and assess its findings, which he promised the agency would complete by the second week of June. Finally, Mr. Goldin confirmed that NASA did not believe that the Russians could sustain ISS and Mir at the same time. Consequently, NASA and RSA had developed and agreed to a plan to de-orbit the Mir by December 1999.

Dr. Duncan Moore, Associate Director for Technology in the White House Office of Science and Technology Policy, noted that

the Administration had requested multi-year funding for the International Space Station in its Fiscal Year 1999 budget request and that it had provided the International Space Station with \$1.2 billion more in this budget than had been contained in earlier budget profiles. He stated that the decision to bring Russia into the International Space Station program was made in the belief that the Russians could make positive contributions in the areas of science and technology, based on their years of experience with Russian space stations, and that the Phase I Shuttle-Mir program had been successful in improving the working relationship between NASA and RSA.

Mr. Franklin Raines, Director of the White House Office of Management and Budget, indicated in his prepared statement that the Administration remained committed to building the International Space Station. He confirmed that the Administration had felt compelled to lift its annual \$2.1 billion ISS budget cap in Fiscal Year 1997 and that the Administration had budgeted an additional \$1.2 billion for ISS during the period FY1999–2003 and would make another \$200 million available to the ISS program by cutting some of NASA's other programs. Finally, Mr. Raines indicated that if additional resources were necessary for ISS, the Administration would seek to identify those resources from within NASA's overall budget.

Lt. General Thomas Stafford reported in his prepared statement that his Task Force on the Shuttle-Mir and ISS programs had concluded that the June collision of a Progress resupply vehicle with Mir was the result of multiple causes, and not simply the fault of the crew, which the Russia media had reported. He also indicated that the decision to launch astronaut Dave Wolf to Mir for an extended stay in September 1997, had been the right one and that NASA was continuing to conduct science aboard Mir, was learning about long-duration spaceflight, and was proving itself a reliable partner to the Russians.

*4.1(t)—National Science Policy Study, Parts I–VII (Communicating Science and Engineering in a Sound-Bite World)*

*May 14, 1998*

*Hearing Volume No. 105–60*

*Background*

On May 14, 1998, the National Science Policy Study Task Force conducted the sixth in a series of seven hearings entitled, "National Science Policy Study, Parts I–VII" to receive testimony on ways to improve the communicating of science and engineering in the media, the classroom, and before the public. The hearing examined the challenges of communicating increasingly complex topics to the American people. For many well-informed Americans, the last time they were exposed to math or science was in their last high school or college course in algebra or chemistry. Today most Americans get their science and technology information from print and broadcast journalism. Much of the hearing, therefore, focused on ways to improve the ability of journalists to report accurately on science, the problems scientists, engineers and other technical experts often

face when they communicate with journalists, and some of the important factors that determine whether or not science and technology stories are eventually printed or aired. At the same time, because improving the communication of science and technology can also be looked at as a form of “continuing education” for the American people, the hearing will also investigate other ways to communicate vital information that do not rely on the mass media.

This was the sixth of seven hearings held by the Committee on Science as part of the National Science Policy Study led by Congressman Vernon Ehlers, Vice Chairman of the Committee.

Witnesses included: Mr. Jim Hartz, former co-host, the “Today Show”; Dr. Rich Chappell, Director of Science and Research Communications, Vanderbilt University; Ms. Deborah Blum, Professor of Journalism, University of Wisconsin; Dr. Stuart Zola, Professor of Psychiatry, University of California at San Diego; and Dr. David Billington, Gordon Y. S. Wu Professor of Engineering, Princeton University.

*Summary of hearing*

Mr. Hartz testified that a survey conducted by the First Amendment Center and published in “Worlds Apart: How the Distance Between Science and Journalism Threatens America’s Future” (co-authored with Dr. Chappell), shows that there is a wide gulf between the views of scientists and journalists. Scientists were generally deeply distrustful of the media and viewed poorly the way in which scientific issues were reported, but these problems were not seen as insurmountable. The journalists viewed the scientific community as being both arrogant and prone to jargon. They also noted that many science stories were felt to be beyond the comprehension of their audiences and to be of little relevance. Nevertheless, scientists recognized the need to do a better job of communicating science stories to the American public, and many scientists expressed an interest in taking communications or journalism courses to improve their skills. Mr. Hartz also noted that many journalists do not see themselves as educators but made the point that if the media are not involved in reporting on science issues, the public will be left in the dark. This could be accomplished by expanding media coverage of science and technology issues, he said.

Dr. Chappell emphasized that scientists can do a number of things to improve relations with the media, but that scientists will ultimately be dependent on the media in taking the message to the public. He noted that scientists spend most of their time communicating with students and peers, and spend very little time communicating with the general public. Many indicated, however, that they would be willing to spend more time talking with journalists and the public. He made four recommendations: (1) The scientific community as a whole must recognize the need to communicate better and invest time in doing so. (2) Universities should train science and engineering students in communication. (3) A new category of science communicators should be developed who could work as journalists, public information officers, and public outreach professional for industrial firms, hospitals, and laboratories. (4) The science journal process should include a new requirement re-

quiring authors to submit with a research paper a plain-English abstract of the paper's findings and its significance. Dr. Chappell added that the science community needs to develop spokesmen so that the media will be able to get "a good sound bite, but get a sound bite that's got good content." He suggested that different scientific societies could develop Internet sites that could act as vehicles to deliver this information.

Ms. Blum began her testimony by stating that science changes the world around us and that people need to be aware of changes in science. She compared science to politics, saying that both are forces that change people's lives. But while politics may seem relatively straightforward, science is often mysterious and off-putting. While noting the importance of improving science education for non-scientists, Ms. Blum stressed the importance of regional media in informing the public about science and technology issues. However, she stated that most journalists are not comfortable with science. To improve science reporting, Ms. Blum made two recommendations: (1) increase the number of science journalists and the number of university programs to train science journalists; and (2) expand scientist job descriptions to include science communication. Ms. Blum ended her testimony by pointing out that journalists and scientists need to build bridges with each other so that they can minimize misunderstandings and develop an appreciation for how the other profession thinks and operates.

Dr. Zola, a neuroscientist who performs basic research involving monkeys, testified to his experience in countering a campaign by animal rights activists to limit his research. He noted that these activists were very good at discrediting basic research, pointing to the lack of any applied results. Dr. Zola said he was shocked at the response of the public, who he felt was being misinformed about the value of his work. With the support of the University of California at San Diego's administration, which was vital, Dr. Zola and his colleagues began a concerted effort to inform the public about what the university researchers were actually doing. With the help of media experts, Dr. Zola developed effective techniques to counter criticism and educate the public about the nature of his work. Dr. Zola also testified to the importance of scientists visiting legislators to give their side of the story. Dr. Zola closed by noting that scientists are beginning to come to terms with the importance of communicating the excitement and utility of science to the general public and decisionmakers.

Dr. Billington approached the issue of communications from the perspective of a university teacher trying to instill an appreciation for and understanding of engineering in non-technical students. He addressed three issues: (1) how to make connections between the humanities and engineering; (2) how to attract students to take these courses; and (3) how to make engineering accessible to a non-technical audience. Concerning the issue of making connections, Dr. Billington said his courses focused on great engineering works that have transformed society in significant ways. He cited as examples Fulton's steamboat, the Wright Flyer, and Kilby's and Noyce's microchip. Concerning the issue of attracting students, he said that students are attracted to his courses because they are based on scholarship, the lectures are done visually, and the

courses have become part of the core curriculum and satisfies the science requirement. Concerning the issue of making engineering accessible, he said that the courses are relevant because they emphasize the work of individual innovators who made their work as simple as possible. This allows the innovators main ideas to be accessible and presented in easily grasped mathematical formulas. Dr. Billington noted that the stories of individual engineers and their work, such as Gustave Eiffel's Tower, can be coupled with scientific principles to make engineering accessible and understandable to all students.

*4.1(u)—National Science Policy Study, Parts I–VII (The Role of Science in Making Effective Decisions)*

*June 10, 1998*

*Hearing Volume No. 105–60*

*Background*

On June 10, 1998, the National Science Policy Study Task Force conducted the final in a series of seven hearings entitled, "National Science Policy Study, Parts I–VII" to examine the role of science in helping to inform legal, legislative, and policy decisions that have significant scientific and technological components. Because the number of these types of difficult decisions will continue to increase significantly, it is vital that the Executive, Legislative, and Judicial branches of government develop effective techniques to identify, analyze, and resolve these important matters. Policy and legal decision makers will increasingly rely on the science and engineering establishment for assistance, requiring clear, effective communication between scientists and policymakers, regulators, judges and juries.

This was the last of seven hearings held by the Committee on Science as part of the National Science Policy Study led by Congressman Vernon Ehlers, Vice Chairman of the Committee.

Witnesses included: Dr. John Graham, Founding Director, Harvard Center for Risk Analysis; Dr. Roger McClellan, President and CEO, Chemical Industry Institute of Toxicology; Dr. Mark Frankel, Director, Scientific Freedom, Responsibility, and Law Program, American Association for the Advancement of Science (AAAS); Dr. Dennis Barnes, President, Southeastern Universities Research Association.

*Summary of hearing*

Dr. Graham began his testimony by stating that, "the science of risk analysis can help regulatory organizations make better decisions." Using mandated automobile airbags as a case study, Dr. Graham said that better use of science in the regulatory process could have resulted in airbag design and policies that are less risky and more effective than current design and policies. He noted that estimates of the number of lives saved through use of airbags has dropped substantially for three reasons: (1) Airbags can be dangerous to small passengers, which was suggested by automobile industry researchers in the 1970s, whose analyses were not taken seriously by Federal authorities. (2) The ability of airbags to protect

unbelted adults were overly optimistic. (3) The consequences of the airbag safety for the safety of women, the elderly, and short drivers are not known. Dr. Graham said that the lesson from this experience is that regulators should tell the public about the risks as well as the benefits of this type of regulation. The government's decision mandating airbags was, he said, an adversarial one, with lawyers and politicians exerting as much influence as scientists and engineers. He added that technical experts in government and industry did not trust each other. The general lessons of the airbag case study were twofold: (1) Government and industry need to support an academic research community with expertise in automobile safety, risk analysis, and injury prevention. (Such an independent source of knowledge was not available to help resolve some of the issues surrounding airbags.) (2) Legislation is needed requiring regulators to analyze not only the benefits of their regulatory proposals, but also their risks, called substitution risks.

Dr. McClellan's testimony focused on environmental, occupational, and health issues. He noted the huge costs involved in regulation and said that the impact of errors can be great. Good decisions to protect the environment and human health require sound scientific information, and the development of this information requires time, planning, and resources to conduct targeted research. He suggested that the development of improved scientific information can be facilitated by four paradigms. (1) The use of a risk paradigm, that includes risk research, assessment, and management should be part of any research program. He also noted the importance of risk assessment in setting or altering the research agenda, as well as the risk communication element. (2) Potential sources of toxicants need to be linked with human health responses of concern, recognizing the complex nature of the issues involved and the need for a multi-disciplinary approach. (3) Information obtained at different levels of biological organization—from the molecular level to cells, tissues, etc.—needs to be integrated. (4) Government, academia, and industry need to coordinate the planning and conduct of research needed to improve the information base of decision-makers. International efforts in this area also should be considered. Dr. McClellan testified that he believes adopting these four paradigms would improve the scientific basis for regulatory decisions.

Dr. Frankel testified on the use of science in the courts. He began by citing a speech by Associate Supreme Court Justice Stephen Breyer, who observed that the law increasingly requires access to sound science because society is becoming more dependent for its well being on complex technology. In the face of this, questions have been raised about the ability of judges or juries to make reasoned decisions. The primary method of getting technical information to judges and juries today is through the use of expert witnesses, who are almost always hired by one party to the suit or the other. The issue for judges and juries is whether the parties' experts are really experts or scientific guns-for-hire. Rather than trying to clarify technical matters, what often occurs is that the experts are pitted against one another with the aim of destroying the credibility of the opponent. In the "Daubert v. Merrill" decision, the Supreme Court ruled that Federal trial judges have the responsibility to determine whether the reasoning or methodology under-

lying scientific testimony is valid and will assist the trier of fact. Subsequently, the “General Electric v. Joiner” decision held that methodology and conclusions may be considered as linked; if an expert’s conclusions are not supported by valid reasoning, they may be excluded. Since the 1970’s, courts have had the option to call on scientific experts but have not done so consistently. Recognizing the need for expert advice in the courtroom, AAAS and the American Bar Association have proposed a joint demonstration project that would identify highly-competent, impartial experts to advise the courts on science and technical issues.

Dr. Barnes testified on the potentially chilling effect of scientific research on recent civil claims against researchers and their universities, often for research that was conducted decades ago. Dr. Barnes stressed that he was not referring to research conducted in relation to the manufacture of a product, but research that has been conducted by university scientists to increase the public pool of knowledge that has been subject to peer review and open publication. Two recent cases, one involving Carnegie-Mellon University and Syracuse University, were discussed. Both of these cases were dismissed and the importance of free inquiry recognized, but Dr. Barnes also noted the issue is not settled and other cases are bound to arise. Dr. Barnes concluded by urging the Congress to provide a legal remedy so that researchers will not have to divert time and resources to defending themselves.

*4.1(v)—International Space Station, Parts I–V (“Houston, We Have a Problem:” The Administration’s Plan to Fix the International Space Station)*

*June 24, 1998*

*Hearing Volume No. 105–79*

#### *Background*

On June 24, 1998, the Committee on Science held the third in a series of five hearings entitled, “International Space Station, Parts I–V.” This hearing was held as a follow-up to the Committee’s May 6 hearing on the International Space Station (ISS) in order to receive NASA’s responses to and analysis of the NASA Advisory Council’s Cost Assessment and Validation (CAV) Task Force on the International Space Station and to review a report by the General Accounting Office on the International Space Station’s total cost.

Witnesses included: Mr. Daniel Goldin, NASA Administrator; Mr. Jay Chabrow, Chairman, CAV Task Force; Mr. Allen Li, Associate Director, U.S. of the General Accounting Office.

#### *Summary of hearing*

The NASA Administrator, Mr. Daniel Goldin, essentially confirmed that NASA agreed with the bulk of the NASA Advisory Council’s Cost Assessment and Validation (CAV) Task Force’s findings about the International Space Station, i.e., continued Russian non-performance is the single biggest cost-threat to ISS; the program has been underfunded; and its development costs are climbing to roughly \$24.7 billion from NASA’s initial \$17.4 billion esti-

mate. He testified, however, that the Fiscal Year 1999 budget request was sufficient to achieve acceptable risk levels. He also noted that a delay in the assembly sequence announced since the May 6 hearing largely addressed the near-term risks identified by the CAV Task Force in April. Mr. Goldin further testified that the Russian Space Agency had made ISS its top priority and that the Service Module had been shipped from Khrunichev to Energia for completion and checkout. However, Mr. Goldin noted that the 1998 Russian Space Agency budget was inadequate to meet Russia's ISS core contributions. (It should be noted that RSA's "core contributions" are a subset of the total contributions that Russia was to make to the ISS program.) While confirming that the CAV report was largely on target, the NASA Administrator concluded by stating that any additional funds required for ISS would be provided from within NASA's Fiscal Year 1999 budget request, requiring cuts to other programs, and that the Administration would consider implementation of the CAV Task Force's long-term recommendations in the Fiscal Year 2000 budget process. Mr. Jay Chabrow, Chairman of the CAV Task Force, welcomed NASA's acceptance of his group's findings, but stated several concerns based on NASA's actions in response to the problems. First, he noted that NASA was failing to take proactive action to deal with the known problems in Russia and that it was "hard to understand why NASA and the Administration are not identifying the immediate steps they will take to protect the U.S. investment." Second, Mr. Chabrow stated a concern that NASA had not yet identified annual funding profiles to accommodate any of the cost growth it now accepted would occur. Third, Mr. Chabrow stated that NASA continued to take an optimistic position relative to completion of the assembly sequence and that "the level of funding profile NASA is projecting in 1999 does nothing to convince us that anything is being done differently." Mr. Chabrow re-stated the CAV Task Force findings that NASA's budget request was inadequate to cover currently estimated future costs for ISS.

Mr. Allen Li, Associate Director of the General Accounting Office, testified that the total ISS costs had risen from \$93.9 billion to \$95.6 billion, figures which include associated Shuttle launch costs, operating costs, the science program, and NASA overhead. Mr. Li indicated that the bulk of the cost growth had occurred within the ISS development budget, which is consistent with the general scope of the CAV Task Force's findings. Mr. Li further testified that costs would increase if the assembly completion date slipped beyond 2003 (which the CAV Task Force expected) and that the program was likely to require more Shuttle flights than were contained in the current baseline. GAO estimated that each month's delay in the assembly sequence cost an additional \$100 million. Mr. Li further noted that GAO continued to have a concern that the ISS program reserves were inadequate to address known risks. Mr. Li concluded by noting that several factors were not counted in its estimate of ISS total costs, including: potential debris tracking and the impact of a recently announced delay in the assembly sequence.

*4.1(w)—China: Dual-Use Space Technology**June 25, 1998**Hearing Volume No. 105–81**Background*

On June 25, 1998, the Committee on Science held a hearing entitled, “China: Dual-Use Space Technology.” The purpose of the hearing was to (1) discuss the significance of information that may have been transferred by Loral and Hughes to the People’s Republic of China; (2) examine the implications of an improved Long March on U.S. national security, U.S. launch industry competitiveness, and the U.S. industrial base; and (3) review components of space-related agreements that the Administration has been negotiating with the People’s Republic of China. Actions by Loral and Hughes were the catalyst for the controversy surrounding potential missile technology transfer to China. The 1996 participation of Loral and Hughes in a launch failure investigation resulted in the May 1997 Pentagon Report and the investigation by the Justice Department. Due to the Justice Department investigation, the February 1998 waiver by President Clinton for export of a Loral-built satellite for launch in China also became part of the controversy. Several Congressional hearings focused on the export control process, including the differences between the Bush Administration and the Clinton Administration. The primary purpose of the Science Committee hearing was to examine the issue from the standpoint of the U.S. launch industry.

China’s Great Wall Industry Corporation has been China’s space launch company since 1986. It is a state-owned corporation and belongs to China Aerospace Corporation which oversees China’s space and missile research and development establishment. China Aerospace Corporation develops strategic and tactical ballistic missiles, space launch vehicles, surface-to-air missiles, cruise missiles, and military and civilian satellites. China reportedly launched its first satellite on April 24, 1970. By May 31, 1998, China had conducted 60 launches, eight of which were complete failures and four placed satellites into incorrect orbits. On April 7, 1990, China Great Wall Industry Corporation launched its first commercial foreign satellite, Asiasat 1. The entry of China, Russia, and Ukraine into the commercial launch market has confronted U.S. launch providers with non-market economy competitors who are able to undercut U.S. launch bids significantly even under the terms of existing launch service trade agreements. The United States currently has launch trade agreements with all three countries. The purpose of the agreements is to manage the international market for launch services and reduce the impact of low prices charged by non-market economies on U.S. launch providers. Two of the conditions included in the 1989 agreement were that China would seek to launch no more than nine international satellites between 1989 and 1994, and that it would charge prices “on a par” with other launch service providers. The six-year agreement signed in 1989 expired at the end of 1994. A new seven-year agreement was signed on March 13, 1995, allowing China up to 11 new launches for international cus-

tomers to geostationary orbit. Existing contracts for four launches under the 1989 agreement were incorporated into the agreement, thus a total of 15 launches are allowable in the 1995–2001 time-frame. The 1995 agreement stipulated that China was to charge no less than 15% below what Western companies charge or a U.S. review of the price would be triggered.

Witnesses included: Mr. Gary Milhollin, Director, Wisconsin Project on Nuclear Arms Control; Mr. Oren Phillips, Vice President Business Development, Thiokol Propulsion; Mr. John Pike, Director of Space Policy, Federation of American Scientists; Mr. Leon McKinney, President, McKinney Associates; and Mr. Paul Ross, Group Vice President of Space and Strategic Systems, Alliant Techsystems.

#### *Summary of hearing*

Mr. Gary Milhollin, Director of the Wisconsin Project on Nuclear Arms Control, testified about the origin of India's largest nuclear-capable missile, the "Agni." He stated that India learned how to build the first stage from the United States, and how to build the second stage from France and Russia. The U.S. and French help was supposed to be for peaceful space exploration, but it wound up helping India's missile program. Mr. Milhollin testified that the first rockets in both India and Pakistan were launched by NASA under a policy of peaceful space cooperation. But the result of the cooperation has been long-range missiles tipped with nuclear warheads. He also testified about the Administration's invitation for China to join the Missile Technology Control Regime (MTCR) and the consequences if China joins.

Mr. Oren Phillips, Vice President Business Development for Thiokol Propulsion, testified about Thiokol's business of designing, developing, and producing solid rocket motors for various military, civil, and commercial applications. He noted that with the opening of the U.S. commercial satellite market to foreign launch vehicles, the U.S. launch industry is facing unprecedented price competition from the non-market economies of Russia, China, and Ukraine. These countries have current labor costs at one-tenth of those in the U.S. Thus, there is no way for the U.S. to compete directly, regardless of the advanced state of American technology or the efficiency of the production processes.

Mr. Phillips testified that the impact of these space-launching, non-market economies on the U.S. defense capability and industrial base are being ignored. The same technologies, facilities, people and products support both the strategic defense and commercial space business. He noted that at the same time as the U.S. defense capability is deteriorating, launches of U.S. commercial satellites on launch vehicles of former adversaries greatly subsidizes their military. He testified that exports of satellites for launch in non-market countries may not necessarily involve technology transfer, but it does harm U.S. interests because with each launch the non-market country becomes a little smarter, a little more capable, a little more reliable, and ultimately more competitive.

Mr. John Pike, Director of Space Policy, Federation of American Scientists, testified that American companies dominate the commercial communications satellite industry globally and thus the

American launch vehicle industry has perhaps a less compelling claim on the attention of decision-makers. He noted that spacecraft (i.e. satellites) continue to be a design-intensive high-technology sector whereas the launch vehicle industry is characterized by “routine metal-bashing” that would tend to migrate towards lower-wage areas such as China just as other sectors like textiles and footwear have migrated. He noted that the nature and volume of technical data alleged to have been transferred by American companies is surely trivial compared to the extensive Soviet aid that facilitated Chinese efforts in launch vehicles. Mr. Pike testified that there is no indication that U.S. technical information related to ICBM’s has been transferred to China. In conclusion, he discussed the opportunities presented by closer cooperation with China’s space program, including China becoming a partner in the International Space Station and a critical player in the effort to extend human presence to the Moon, Mars, and beyond.

Mr. Leon McKinney, President, McKinney Associates, testified about there being virtually no difference between a launch vehicle and a missile. Thus, if improvements have been made to launch vehicle guidance technology, simultaneous improvements have been made to missile guidance technology. He noted that very small improvements in boost trajectory accuracy result in big gains in targeting accuracy. Mr. McKinney discussed the risks of technology transfer through technical discourse. It would have been of immense help to Chinese engineers to have American engineers with knowledge about similar launch vehicle failures, make suggestions or ask particular questions about specific subsystems. He also discussed the potential earth science agreement between the U.S. and China, noting that detailed models of atmospheric winds or the earth’s geodetics would definitely improve the accuracy of China’s launch vehicles and missiles.

Mr. Paul Ross, Group Vice President of Space and Strategic Systems, Alliant Techsystems, testified that the company’s production lines are increasingly used for commercial space launch boosters instead of missiles. The Federal Government benefits from solid rocket motor manufacturers and their lower tier suppliers being so heavily involved in the commercial market because it helps to maintain a vital capability that would otherwise be much more expensive to support. Mr. Ross noted that the Chinese launch vehicle industry has demonstrated a willingness to substantially undercut the U.S. domestic launch vehicle industry through its pricing of satellite launches. He has not seen or heard of a scenario where the U.S. space launch industry, using domestically produced launch vehicles, is not able to satisfy the launch manifest for the U.S. satellite manufacturers. Mr. Ross testified that a loss of satellite launch business to foreign competition diminishes companies that support the U.S. strategic deterrent, while at the same time subsidizing the development of a foreign capability.

4.1(x)—*International Space Station, Parts I–V (The White House Perspective on the International Space Station’s Problems and Solutions)*

August 5, 1998

Hearing Volume No. 105–79

*Background*

On August 5, 1998, the Committee on Science held the fourth in a series of five hearings entitled, “International Space Station, Parts I–V.” The hearing was announced as a follow-up to the June 24 hearing and to receive the testimony from the White House Office of Management and Budget and Office of Science and Technology Policy, which both White House offices had committed to deliver at some point in lieu of their appearance before the Committee on June 24. At the conclusion of the June 24 hearing on the International Space Station, Chairman Sensenbrenner and Ranking Minority Member Brown sent the President a letter asking him to direct the Office of Management and Budget (OMB) to develop a plan for implementing the recommendations of the NASA Advisory Council’s Cost Assessment and Validation Task Force and for OMB to deliver that plan to Congress in 30 days so that it could be assessed and implemented in the Fiscal Year 1999 budget cycle.

Witnesses included: Mr. Jacob Lew, Director, White House Office of Management and Budget; Dr. Duncan Moore, Associate Director for Technology, White House Office of Science and Technology Policy; Mr. Daniel Goldin, NASA Administrator.

*Summary of hearing*

Mr. Jacob Lew, Director of the White House Office of Management and Budget, testified that the Administration had increased ISS funding \$250 million over the \$17.4 billion baseline during Fiscal Years 1997 and 1998 by cutting other NASA programs and that in the Fiscal Year 1999 request, the White House increased the ISS budget another \$1.2 billion for the period FY1999–2003 by cutting NASA’s other programs. As an initial step to deal with some of the problems caused by Russian non-performance on the ISS program, the White House had adopted NASA’s recommendation to fund the Interim Control Module and approved on August 4, 1998, NASA’s request to submit a reprogramming request to Congress in order to begin modifying the Space Shuttle fleet to perform some of the ISS reboost functions originally to be provided by the Russian Progress vehicles. Nevertheless, Mr. Lew testified that the White House thought it was premature to take steps to remove Russia from the ISS critical path. In the meantime, he stated that the White House believed the Fiscal Year 1999 budget request was adequate to meet NASA’s ISS obligations in Fiscal Year 1999 and that any additional funds required by the ISS program would come from within NASA’s total budget and would be made available by cutting other NASA programs.

Dr. Duncan Moore, Associate Director for Technology in the White House Office of Science and Technology Policy, testified that NASA concurred with the findings of the CAV Task Force and that

the Administration had developed and implemented specific measures to deal with continuing Russian problems in the ISS program. Dr. Moore testified that NASA's plan contained four elements. First, NASA was pressing Russia to launch the Service Module "on-time" in April 1999 and to deorbit Mir safely. (The Service Module was originally scheduled to be launched in April 1998. As of November 1998, the Service Module is scheduled for launch in July 1999, but NASA has indicated it may not be launched until the fall of 1999.) Second, the Administration wanted to begin modifying the Space Shuttle in order to enable it to perform some of the reboost functions that Russia committed to provide, but appeared unlikely to provide. Third, the Administration wanted to explore using additional Russian Soyuz vehicles for assured crew return to fill the gap between the time when ISS is expected to be capable of sustaining 6 crew and the time when NASA expects its own operational crew return vehicle to be available. Finally, the Administration sought to address the lack of aggressive Multi-Element Integrated Testing (MEIT) throughout the program by taking undetermined corrective measures. Finally, Dr. Moore confirmed that the Administration would seek to meet any ISS requirements for additional funds from within NASA's budget by cutting other NASA programs.

Mr. Daniel Goldin, the NASA Administrator, testified that the Russian Space Agency had a requirement for \$340 million in 1998 just to meet its ISS obligations, but the Russian government had budgeted only \$160 million, and RSA had received only \$20 million. He conceded that this situation put the April 1999 launch date of the Service Module at some risk. Mr. Goldin further noted that RSA could not sustain both the Mir space station and ISS in orbit at the same time and that Russia had an obligation to safely deorbit Mir at some time. Mr. Goldin continued by noting that NASA had developed and started implementation of a contingency plan to enable ISS development to continue in the face of continued Russian funding problems. That plan's initial step was to consult with the Russians regarding mechanisms for improving RSA's funding situation. According to Mr. Goldin, the second element of the plan was to develop capabilities necessary to provide backup for Russia's contributions, including taking the step of requesting Congressional concurrence the day of the hearing to reprogram funds in order to modify the Shuttle fleet and enable it to conduct some of the Russian reboost functions. Mr. Goldin also noted that the U.S. Crew Return Vehicle (CRV) effort was proceeding at pace with a successful flight test of the X-38 technology demonstrator in March and a scheduled re-flight in October. Nevertheless, he confirmed that a U.S.-developed CRV would not be ready until 2003 at the earliest and that NASA was considering the use of Russian Soyuz vehicles to enable the Station to sustain a 6-person crew before the U.S. CRV was developed. Mr. Goldin concluded by noting that delays in the ISS assembly sequence had led NASA to rephrase the purchase of spare parts for ISS by pushing the process out in time.

4.1(y)—*International Space Station, Parts I–V (International Space Station: The Administration’s Proposed Bail-Out for Russia)*

October 7, 1998

Hearing Volume No. 105–79

*Background*

On October 7, 1998, the Committee on Science held the last in a series of five hearings entitled, “International Space Station, Parts I–V.” On September 29, 1998, the NASA Administrator sent the Committee a request for Congressional support of NASA’s decision to begin paying the Russian Space Agency (RSA) \$60 million immediately, ostensibly in return for some of Russia’s research time aboard the International Space Station (ISS), but in reality in order to provide the Russian Space Agency (RSA) with funding to continue work on the Service Module. Normally, Congress has 30 days to review such requests, but NASA asked the Committee to provide a response in a time frame that would enable NASA to begin making payments to Russia on October 9th. The Chairman promptly announced a hearing on the subject to review NASA’s request and its implications. On September 29, witnesses were informed by phone of the Committee’s intention to hold a hearing on October 7, 1998. Formal invitations followed on October 2, 1998.

Witnesses included: Mr. Daniel Goldin, NASA Administrator; Mr. Jay Chabrow, Chairman, NASA Advisory Council’s Cost Assessment and Validation (CAV) Task Force; Professor Judyth Twigg, Virginia Commonwealth University; Mr. James Oberg, an independent aerospace consultant.

*Summary of hearing*

Mr. Daniel Goldin, NASA Administrator, testified that a General Designer’s Review (GDR) had taken place in Russia on September 28, 1998, to review the status of the International Space Station (ISS) in preparation for the scheduled first element launch on November 20, 1998. As a result of the GDR, the Service Module’s scheduled April 1999 launch date had been delayed to “no earlier than summer 1999.” Mr. Goldin testified that this delay was the result of a lack of funding. He noted that NASA’s approach to deal with Russian uncertainties was one of “incrementally buying down risk.” One example of NASA’s approach was the decision to develop the Interim Control Module. Mr. Goldin testified that research was a key goal of the ISS program. In order to improve the program’s research capabilities, Mr. Goldin announced that additional delays in the International Space Station’s research capabilities would be compensated for by adding a new Shuttle mission to NASA’s plans in 2000 to give researchers more access to space. He also noted that NASA signed a protocol with the Russian Space Agency to purchase Russian crew time at the September 1998 GDR. Additionally, Mr. Goldin testified that NASA would pay the Russian Space Agency \$60 million for this research time and that RSA would use these funds to continue making progress on the Service Module. If additional funds proved necessary, the Administration would make such adjustments in the initial Operating Plan for Fiscal Year 1999

and in the budget request for Fiscal Year 2000. Mr. Goldin also noted that NASA was seeking to develop its own capabilities to reduce the impact of Russian failures to meet its obligations. These steps included modifying the Shuttle orbiters to enable them to perform some of the Russian reboost functions and completing the Interim Control Module. NASA has completed a technical definition study for an independent U.S. propulsion capability and is evaluating the near-term initiation of long-lead procurements for this module. Mr. Goldin also expressed his hope that European development of the Ariane Transfer Vehicle or the Japanese Hope Transfer Vehicle would provide some options for replacing continued reliance on Russia for various propulsion functions. Mr. Goldin also noted that the Russian financial situation had not improved, yet all of the ISS partner countries supported a decision to continue with the existing launch schedule. Mr. Goldin concluded by noting that resource issues would be dealt with in the initial Operating Plan submission to Congress for Fiscal Year 1999 and the Fiscal Year 2000 budget request.

Mr. Jay Chabrow, Chairman of the NASA Advisory Council's Cost Assessment and Validation Task Force, testified that nothing had happened in Russia to improve the Russian financial situation with regard to the International Space Station. He also testified that Russian space capabilities continued to be critical to the International Space Station and that NASA remained dependent on Russia for propulsion, command and control, crew habitability, and crew return. Russia's failure to provide these capabilities will increase ISS costs. Mr. Chabrow testified that in the near term, finding a mechanism to enable Russia to successfully make its near-term contributions would be less expensive than proceeding with the International Space Station as planned without the Russian contributions. With that in mind, Mr. Chabrow stated that he supported NASA's near-term decision to provide RSA with \$60 million in order to continue working on the Service Module. He did, however, express concern that NASA was not taking the steps recommended by the CAV Task Force to eliminate long-term dependence on Russia by beginning the procurement of long-lead items for a U.S. propulsion module. Mr. Chabrow stated, "Each month that passes by without developing the capabilities necessary to achieve U.S. independence, puts the program at further risk for additional cost growth."

Dr. Judyth Twigg, Assistant Professor at the Virginia Commonwealth University, testified that the Russian aerospace industry is in a state of collapse and that additional funding for the Russian aerospace industry was necessary to improve its health, but that funding alone was not sufficient to solve the problems that the Russian aerospace industry was experiencing. She noted several factors contributing to the collapse of the Russian aerospace industry, including: (1) a flight of experienced and knowledgeable personnel; (2) a general neglect of infrastructure; and (3) a lack of modernization potential due to personnel loss and the neglect of infrastructure. Professor Twigg also noted that the Russian space program did not appear to be a high priority for the Russian government or population. Consequently, Professor Twigg concluded that a lack of funding was not the sole cause of Russia's failures

to meet its obligations. She then offered alternative explanations for Russia's continuing failures to meet its obligations to the ISS program. First, the possibility existed that the Russian government was purposely introducing problems into the ISS program to express dissatisfaction with U.S. foreign policy related to NATO expansion. Second, the possibility existed that Russian industrial and programmatic "culture" simply did not take deadlines and schedules, which NASA is accustomed to using as management tools, seriously. Third, the Russians might be missing deadlines because they felt that the relationship with NASA was not in their best interests. Finally, delays might also be explained by Russia's own internal budgetary politics as a result of changes in government personnel, notably the departure of Prime Minister Viktor Chernomyrdin. For the future, Dr. Twygg concluded that additional short-term funding for the Russian space program would not resolve the systemic problems that were contributing to Russia's inability to meet its obligations to the International Space Station. Instead, she noted, "bailouts from the West may, in fact, serve only to prolong the agony before Russia is forced to face the real work of significant financial and industrial restructuring."

Mr. James Oberg, an independent aerospace consultant and author of several books and articles dealing with the Russian space program, testified that: (1) Russia's inability to fulfill its promises was not the result of any temporary conditions in Russia; (2) the "wobbly" assembly strategy for ISS was a clear warning that something is fundamentally wrong with the program; (3) based on the recent history of Russian space missions, alarm bells should be ringing that the Service Module will be reliable once delivered; (4) NASA overestimates the effectiveness of cash infusions on the Russian space program, in part due to "deliberate blindness" towards evidence of corruption within the Russian aerospace industry; (5) recent Russian attempts to extend the lifetime of Mir would violate agreements between RSA and NASA and shatter RSA's ability to support the International Space Station; (6) every promised benefit from bringing Russia into the program has collapsed; and (7) the rush to launch the first ISS element in six weeks was an attempt to prevent proper independent assessment of the situation.

*4.1(z)—Road from Kyoto, Part IV: Kyoto Protocol's Impact on U.S. Energy Markets and Economic Activity (Road from Kyoto, Parts I-IV)*

*October 9, 1998*

*Hearing Volume No. 105-76*

*Background*

On October 9, 1998, the Committee on Science held the last in a series of four separately published hearings entitled, "Road from Kyoto, Part IV: The Kyoto Protocol's Impact on U.S. Energy Markets and Economic Activity" to examine the outcome and implications of the climate change negotiations concluded at the Third Session of the Conference of Parties to the UN Framework Convention on Climate Change (COP-3) held in Kyoto, Japan from December 1-11, 1997. On December 11, COP-3 adopted the Kyoto Proto-

col, which requires that the U.S. reduce its net greenhouse (GHG) emissions by 7 percent below 1990 levels. In particular, this hearing examined the Protocol's impacts on U.S. energy markets and economic activity.

Witnesses included: The Honorable Jay E. Hakes, Administrator, Energy Information Administration, U.S. Department of Energy; Dr. W. David Montgomery, Vice President, Charles River Associates, Inc.; and Howard Geller, Executive Director, American Council for an Energy-Efficient Economy.

*Summary of hearing*

Dr. Hakes presented an analysis by the Energy Information Administration (EIA) that showed that the Kyoto Protocol would likely have significant negative impacts on U.S. energy use, prices and the economy in the 2008–2012 time frame. Dr. Montgomery compared the EIA study, an earlier analysis by the Administration, and a report by Charles River Associates on the impacts of the Kyoto Protocol. Mr. Geller testified that the EIA's new study was seriously flawed and that promoting greater energy efficiency and support for innovative energy technologies could reduce U.S. greenhouse gas emissions.

4.2—SUBCOMMITTEE ON BASIC RESEARCH

*4.2(a)—Fiscal Year 1998 Budget Authorization for the National Science Foundation (NSF), Parts I–III (The National Science Foundation's Fiscal Year 1998 Authorization, Part I)*

*March 5, 1997*

*Hearing Volume No. 105–10*

*Background*

On March 5, 1997, the Subcommittee on Basic Research held the first in a series of three hearings, entitled, "Fiscal Year 1998 Budget Authorization for the National Science Foundation (NSF), Parts I–III," to receive testimony on the Administration's fiscal year (FY) 1998 budget request for the National Science Foundation (NSF). NSF is a key supporter of U.S. scientific strength by funding research and education activities in all fields of science and engineering at more than 2,000 colleges, universities and research institutions throughout the United States. NSF provides approximately 25 percent of basic research funding at universities and over 50 percent of the federal funding for basic research in certain fields of science, including math, computer sciences, environmental sciences, and the social sciences. Moreover, NSF plays an important role in pre-college and undergraduate science and mathematics education through programs of model curriculum development, teacher preparation and enhancement, and informal science education.

Witnesses included: Dr. Richard Zare, Director, National Science Board, and Dr. Neal Lane, Director, National Science Foundation, accompanied by Dr. Joseph Bordogna, Acting Deputy Director, National Science Foundation.

*Summary of hearing*

Dr. Zare's testimony focused on the research and education activities supported by the NSF as well as the work of the National Science Board (NSB) in developing the NSF budget for FY 1998 and in achieving a better understanding of how federal agency research programs fit into the broader national picture of federal support for research. According to Dr. Zare, NSF's FY 1998 budget will fund thousands of research projects and efforts to improve the education in science, mathematics, engineering, and technology. Dr. Zare highlighted a new NSF initiative, Knowledge and Distributed Intelligence (KDI), which seeks to improve the connection between research, teaching and learning technologies. He noted that the NSF's investments in the Next Generation Internet will be a part of the KDI package, but added that although NSF will have an important role in the development of the Next Generation Internet, NSF is looking beyond that project. Dr. Zare also indicated the NSB's intention to adopt revised criteria for proposal review, reducing the number of criteria from four to two, for NSF project selection. In addition, he announced that the revised plan has been open for public comment from the scientific community. The NSB, added Dr. Zare, will also be providing oversight of NSF as it develops methods and processes to comply with the Government Performance and Results Act. Dr. Zare pointed out that aside from the oversight of NSF, the NSB has a role in monitoring the health of science and engineering in the U.S. and in providing advise on national policy in research and education.

Dr. Lane stated that the \$3.367 billion budget request for the NSF in FY 1998 allows for investment in more than 19,000 science and engineering research and education projects and emphasized the budget's compliance with the NSF Strategic Plan. He emphasized the NSF's efforts to develop performance measurements so that the next budget submission complies with the Results Act. Dr. Lane indicated that numerous innovations, from biotechnology to high-speed computational and communications technologies, have roots in the fundamental research and education supported through the NSF and other agencies and are the key to productivity in a wide array of industries and sectors. In addition, Dr. Lane pointed out that the NSF's role in support of university-based research and education, a vital link to the competitive position of U.S. industry, is among the most productive of all public investments. Responding to concerns over the recompetition and planned reduction in the number of the NSF's supercomputing centers, Dr. Lane indicated the NSF's goal for a seamless transition for high-end users under the new plan and stated that detailed information on the impact of the down-selection would be available later. Dr. Lane highlighted priorities in the FY 1998 request, including: a focused, multidisciplinary \$58 million program of activities in support of KDI research, infrastructure development, and education; continued development of the program for the study of life in extreme environments; and support of innovative, systematic approaches to education and training at all levels to address the challenges of the changing scientific landscape facing students of the 21st century. Further, Dr. Lane indicated the NSF's understanding of the need for investment in research facilities to support the ac-

tivities of researchers and educators. Addressing concerns of cost-overruns in the construction of new NSF-funded facilities, Dr. Lane informed the Subcommittee that the NSF is not only aware of the problem, but is actively designing a plan to minimize cost-overruns.

*4.2(b)—Fiscal Year 1998 Budget Authorization for the National Science Foundation (NSF), Parts I–III (The National Science Foundation’s Fiscal Year 1998 Authorization (Part II): Math, Science, and Engineering Education Programs)*

*March 13, 1997*

*Hearing Volume No. 105–10*

*Background*

On March 13, 1997, the Subcommittee on Basic Research held the second in a series of three hearings entitled, “Fiscal Year 1998 Budget Authorization for the National Science Foundation (NSF), Parts I–III,” to receive testimony on the Administration’s fiscal year (FY) 1998 budget request for the National Science Foundation (NSF). Witnesses were asked to assess the NSF’s science, math, and engineering education programs. In addition to examining the budget requests for these programs, witnesses were also asked to address the impacts and expectations of the initiatives.

Witnesses included: Mr. Richard P. Mills, Commissioner of Education, New York State Department of Education, and President of the University of the State of New York; Dr. Edward A. Friedman, Director, Center for Improvement of Engineering and Science Education, Stevens Institute of Technology; Dr. Nathan S. Lewis, Professor of Chemistry and Chemical Engineering, California Institute of Technology; and Dr. Alfredo de los Santos, Jr., Vice Chancellor for Student and Educational Development, Maricopa County Colleges.

*Summary of hearing*

Mr. Mills emphasized the importance of NSF education initiatives, not only as a source of revenue, but also as a strategic resource to improve the achievement level of New York State’s students. According to Mr. Mills, as result of NSF’s urging and the State’s own needs, The New York State Systematic Initiative (NYSSI), from its inception in 1993, has evolved from an attempt to improve math, science, and technology education in New York’s challenging urban schools to become the focus of the statewide effort to implement new learning standards in math, science, and technology. He explained that SSI is a philosophy of changes that help teachers develop habits of planning and teaching that guide students to a deeper understanding of concepts and an application of knowledge. Mr. Mills pointed out that the NSF’s \$10 million investment has been the driving force to bringing together the capacity to meet these higher standards. He added that NSF has brought vision and discipline to elementary and secondary education, an insistence upon results, and a systematic approach that allows students to engage in inquiry-based learning. However, Mr. Mills indicated that in addition to NSF’s contribution to the establishment of higher standards, the curriculum, the teacher training,

and the links with higher education are factors necessary for achieving better results in the education of the nation's children.

Dr. Friedman expressed frustration that school systems currently lag behind industry and higher education in integrating information technology into the educational process. He also indicated his concern that some schools are in danger of moving ahead with hardware without the capability to implement the technology into classroom learning. According to Dr. Friedman, NSF should play a leadership role in transforming schools into technological front runners by developing an effective strategy and incorporating the technology into the mainstream of NSF's various educational programs. He stressed a need for the participation of practicing scientists in NSF education programs as well as support for multidisciplinary team efforts. As these programs develop, Dr. Friedman emphasized that they will need mechanisms to facilitate timely, wide-scale dissemination requiring coordination with publishers, educational television producers, and state departments of education. In addition, he indicated the advantage of regional centers where teachers and school systems can receive guidance and support for the integration of technology. Dr. Friedman suggested NSF engage in the implementation of an infrastructure that makes use of distance learning technologies with on-site support from such regional resource centers. He emphasized these training centers should be pursued in parallel with curriculum development, teacher enhancement, evaluation, and other programs which NSF supports. Mr. Friedman added that although teachers and students in some foreign countries, like Bulgaria, have superior training and education in math and science, the U.S. leads the world in the use of technology in the classroom. According to Mr. Friedman, the U.S. has a real opportunity to expand its effectiveness in math and science education by capitalizing on this resource.

Dr. Lewis commended NSF for allowing Caltech to establish a national model for a coordinated, institution-wide effort to incorporate multimedia materials into the routine course experiences of the science and engineering student. His testimony focused on the new NSF-supported Teaching and Interdisciplinary Education program (TIDE) at Caltech which was designed to foster institute-wide development of multi-media educational tools involving the combined teaching skills and technical backgrounds of undergraduate students and Caltech faculty. Although the program was primarily designed to enhance the educational experience of Caltech students, according to Dr. Lewis, the project is now involved in expanding the effort to make the new media and technology widely available for many science and technology disciplines in order to educate the broadest cross section of students at different educational levels. Dr. Lewis cited the Caltech Chemistry Animation Project, one example of an effective teaching resource developed at Caltech, which is used in six countries by over half a million students to help teach chemistry to students and teachers. In addition to its support of education programs at Caltech, Dr. Lewis commended NSF for not putting all of its eggs into one basket and allowing for experimental technology integration programs at all educational levels. He added that networking among teachers is the highest leverage that the U.S. has to improve its entire educational

system and advocated a teacher training center at which educators from the K–12 and community college level can share experimental ideas and results.

Dr. de los Santos noted that increasingly, as adults must return to school to obtain new skills and upgrade old ones, the task of providing that education falls upon undergraduate institutions, especially community colleges. He explained that NSF, through their Division of Undergraduate Education, supports institutes, laboratories, and curriculum development projects that are having a substantial effect on the ability of community colleges to provide the high level of education and training necessary for a technology-based society. According to Dr. de los Santos, one of Division's programs, the Advanced Technology Education (ATE) program, is a unique partnership designed for associate degree-granting institutions to promote improvement in advanced technological education through the support of curriculum development and program improvement, and by targeting technicians being educated for employment that requires the use of advanced technologies. He explained that the ATE program's success can be measured in several ways: It produces new ways to train and educate the workforce; it brings business and education together in new and productive ways; and, it stimulates innovation among those competing for the grants. Dr. de los Santos added that ATE's greatest strength is the very close partnerships between industry and educational institutions it fosters, and he indicated that companies such as Motorola and Intel are contributing equipment, software and scholarships. He praised NSF for fostering a fundamental change in the relationships between community colleges and business and industry.

*4.2(c)—Fiscal Year 1998 Authorization of the United States Fire Administration (USFA)*

*March 18, 1997*

*Hearing Volume No. 105–14*

*Background*

On March 18, 1997, the Subcommittee on Basic Research held a hearing entitled, "The Fiscal Year 1998 Authorization of the United States Fire Administration (USFA)," to receive testimony on the Administration's FY 1998 budget request for the programs of the USFA and the National Fire Academy (NFA). In addition, the Subcommittee questioned witnesses about the effects of the repeal of the reporting requirements in the Hotel-Motel Fire Safety Act (P.L. 101–391) that occurred in the FY 1997 Department of Defense authorization (P.L. 104–206).

In 1974, Congress created the USFA and the Fire Academy in response to the dismal assessment of the nation's fire problem presented in a report by the President's National Commission on Fire Prevention and Control, entitled "America Burning." The USFA, which is housed in the Federal Emergency Management Agency (FEMA) building, is currently charged with helping to prevent and control fire-related losses. The USFA also administers the National Fire Academy which provides management-level training and education to fire and emergency service personnel in fire protection

and control activities. The Fire Academy, located in Emmitsburg, MD, trains tens of thousands of fire and emergency personnel a year through its on- and off-campus programs.

Witnesses included: The Honorable Carrye Brown, Administrator, United States Fire Administration (USFA), Federal Emergency Management Agency (FEMA); Mr. Steve Robinson, Executive Director, National Fallen Firefighters Foundation; Mr. Tracy Boatwright, State Fire Marshal of Indiana, and Chairman, National Association of State Fire Marshals; and, Mr. Kenneth Newton, Director, National Volunteer Fire Council, Fireman's Association of New York.

#### *Summary of hearing*

Administrator Brown stated the USFA's mission is to reduce the nation's loss of life and property due to fire by focusing on data collection and analysis, public education and awareness, technology and research, and fire service training. She commended Members of the Subcommittee for their continued support of the most visible program of the USFA: the state-of-the-art leadership and management training at the National Fire Academy in Emmitsburg, MD. Administrator Brown stated that 83,000 members of the fire and emergency communities received training by the National Fire Academy through all of its programs in 1996, and announced the USFA's goal to triple the number of trained firefighters within five years through the use of distance education programs. According to Mrs. Brown, self-study courses on CD ROM, interactive Internet, satellite transmitting courses, and other technologies will be utilized by the Fire Academy, in partnership with state and local training academies, to allow greater flexibility in when, where and how firefighters can receive training. Administrator Browner added that the USFA-sponsored a counter-terrorism training needs assessment symposium featuring a panel of domestic and international terrorism experts who developed a plan for training courses aimed to prepare personnel to mitigate and respond to the consequences of terrorism. In addition, she announced that the President's National Arson Prevention Initiative, headed by FEMA Director James Lee Witt, will be merged into the USFA's program to provide public education and promote public-private partnerships.

Administrator Brown addressed the impact of the changes to the Hotel/Motel Fire Safety Act and assured the Subcommittee that while the USFA will continue to collect and publish the master list of hotels that comply with the 1992 Act, the Fire Administration will also work in partnership with stakeholders to improve the Act's implementation or augment the compliance section of the Act.

In response to questions on the implementation of the Government Performance and Results Act, Ms. Brown stated that the mission of the USFA is very much performance-based and reported that results from the agency's self-assessment have been translated into priorities for the next two years: mitigation and prevention programs; stronger partnerships with the private and public sector; and, marketing prevention and mitigation efforts to individuals, communities and businesses.

Mr. Robinson discussed the National Fallen Firefighters Foundation's efforts to follow the priorities set forth by Congress in 1992, including sponsorship of the annual National Fallen Firefighters Memorial Service in Emmitsburg, Maryland; necessary expansion of the memorial site; promotion of state and local efforts to recognize firefighters who die in the line of duty; support of families of firefighters so that they may attend the national tribute; and establishment of programs to assist families of fallen firefighters with a family support network and scholarships for education and job training. He reported that through private donations, the Foundation has paid for a substantial amount of the costs associated with the annual memorial service in Emmitsburg, Maryland. In addition, Mr. Robinson announced that the Foundation will soon assume responsibility for the direction, planning, and management of the annual memorial service in cooperation with the U.S. Fire Administration. He also highlighted the Foundation's plans to work in partnership with government agencies and fire organizations to make information on federal, state, and local benefits available to all fire emergency service departments.

Mr. Boatwright explained that the National Association of State Fire Marshals (NASFM) has established a partnership with the USFA at the state and local levels to assist firefighters and other emergency personnel in preparing to respond to fires as effectively, efficiently and safely as possible. Mr. Boatwright highlighted four important functions of the USFA: collecting and analyzing national data on fires to establish fire prevention and protection priorities; training by the National Fire Academy which provides key management and professional skills which are crucial supplements to local training academies of the NASFM; public fire safety education aimed at reaching populations most at risk; and technical guidance and support for innovative work in areas from arson prevention and investigation to data analysis and research into the causes of arson. He indicated that a critical part of the technical guidance and support from USFA is the fire research performed by the Building and Fire Research Laboratory at the National Institute for Standards and Technology (NIST). However, Mr. Boatwright pointed out the NASFM's difficulty in working with NIST. He expressed concern that the NIST laboratory's priorities are targeted more toward serving industry than firefighters, leaving firefighter research needs unanswered. Mr. Boatwright recommended that the fire research facilities remain at NIST, but suggested that the USFA be given the authorization for those activities as well as the accountability for ensuring that the research agenda is responsive to the needs of the emergency responders entrusted to protect the lives and property of citizens.

Mr. Newton stated that the National Volunteer Fire Council (NVFC) represents the interests of the nation's 800,000 volunteer fire and emergency personnel who generally have full-time professions in addition to donating their time and expertise for the safety of their communities. He pointed out that as more urban dwellers move to suburban and rural areas they will create an increased demand on the volunteer fire service. However, in spite of this trend, Mr. Newton reported that the ranks of volunteer fire service membership are dwindling at a rate of two to three percent each year.

In order for the Nation's shrinking volunteer fire service to provide adequate protection for an increasing population, he indicated that programs of the USFA and the NFA have become increasingly important to provide education and training to fire and rescue personnel throughout the United States. According to Mr. Newton, the most visible and direct benefit that the USFA provides to the volunteer fire service is the hosting of the Volunteer Incentive Program at the Academy which compresses two weeks' worth of courses into an intense six-day session. In addition to the extensive training and educational programs, he stated that the USFA provides assistance to the NVFC in the form of cooperative agreements that provide the resources necessary to support local training and education programs. He commended the Academy's outreach program for allowing volunteers to remain in their communities for training without incurring travel expenses. Mr. Newton highlighted that as partners in the President's National Arson Prevention Program, the USFA and the NVFC conducted a workshop designed to give emergency responders the skills they need to combat arson in their communities.

*4.2(d)—Fiscal Year 1998 Budget Authorization for the National Science Foundation (NSF), Parts I–III (The National Science Foundation Fiscal Year (FY) 1998 Authorization, Part III)*

*April 9, 1997*

*Hearing Volume No. 105–10*

#### *Background*

On April 9, 1997, the Subcommittee on Basic Research held the last in a series of three hearings entitled, Fiscal Year 1998 Budget Authorization for the National Science Foundation (NSF), Parts I–III," to receive testimony on the National Science Foundation's (NSF) fiscal year (FY) 1998 authorization. Witnesses testified on the results of the National Science Board's Partnership for Advanced Computational Infrastructure (PACI) program as well as the new proposed facilities within the Major Research Equipment (MRE) Account of the NSF budget and the Internet II/Next Generation Internet (NGI) initiative.

Witnesses included: Dr. Richard Zare, Chairman, National Science Foundation; Dr. Neal Lane, Director, National Science Foundation; Dr. Paul Young, Senior Advisor, Computer and Information Science and Engineering (CISE), National Science Foundation; and Dr. Shirley M. Malcom, Member of the Executive Committee, National Science Board. Testimony on programs within the MRE Account and the Internet II/Next Generation Internet (NGI) initiative was received from Dr. Graham B. Spanier, President, Penn State University; Dr. Michael Kelley, Professor, School of Electrical Engineering, Cornell University; and Dr. Paul A. Vanden Bout, Director, National Radio Astronomy Observatory.

*Summary of hearing**Partnership for Advanced Computational Infrastructure (PACI) Program*

Dr. Zare announced the National Science Board's (NSB) approval for selection of two awardees for the PACI program and the phase out awards for two existing supercomputer centers. Dr. Zare emphasized that the rapidly shifting world of computer science and engineering has forced the Board to make difficult choices to curtail support for good projects and initiate support for others with promise to produce better results. According to Dr. Zare, this is why the NSB requested that the NSF develop a plan for supercomputing designed to take advantage of the newly distributed environment in information science and technology. He indicated that the new PACI program is made possible by breakthroughs in high-speed networking and advance computer architecture and is consistent with the Board's vision of the future in information science and technology. According to Dr. Zare, the program will keep the U.S. ahead in all fields of science and engineering while also pushing the technological advances that will fuel economic growth. Dr. Zare stated that the program will also allow students and scientists at all levels to enjoy a vast resource for education and training through the multitude of new participating PACI institutions. He emphasized that innovative partnerships, which increase the opportunities for more people to use these resources and push the frontiers of knowledge, are the core of the PACI program.

Dr. Lane stated that NSF's PACI program goes well beyond the current paradigm of supercomputing centers and was carefully designed to build the infrastructure needed for both education and training of future generations of world leaders in science and technology. He stated that after ten years of the successful Supercomputer Centers Program, the NSB asked whether NSF should continue support for the current program or phase out the existing program to make room for a new one. To answer that question, Dr. Lane appointed the Hayes Task Force, comprised of high performance computing experts from academia, industry and government. It presented a vision of the future of supercomputing and proposed that NSF announce a new competition for a restructured High Performance Computing Centers program that would permit funding of selected sites for a period of five years. Dr. Lane stated the two major changes to the existing program recommended by the task force: (1) support of national "leading-edge sites" with a balanced set of high-end hardware and software capabilities, coupled with appropriate staff; and (2) partnering of each leading-edge site with experimental facilities at universities, NSE research centers, and/or national and regional high performance computing centers. According to Dr. Lane, the task force also urged that the new PACI program support the needs of the national computational science community through leading edge sites and their partners, rather than through independent basic research. He highlighted the report's recommendation that the computational capability of the leading edge centers should be one or two orders of magnitude beyond what is available at leading research universities. According to Dr. Lane, it was clear that a reduction in the number of sites

would likely be necessary to achieve such economies of operation and to maintain the very high end capability.

Dr. Young stated that the new PACI program is an important element in the Foundation's future infrastructure for the support of academic science and engineering, research and education. He announced that the selection of the National Computational Science Alliance (NCSA), led by the University of Illinois at Urbana/Champaign, and the National Partnership for Advanced Computational Infrastructure (NPACI), led by the University of California, San Diego, represents the formal beginning of the new PACI Program. Dr. Young indicated that the Hayes Task Force felt that two major technological factors called for a change in the structure of the Centers Program: the increasing dominance of scaleable parallel computers, with their promise of highly cost-effective computing power, and, the expected growth and ubiquity of high speed networks. According to Dr. Young, breakthrough technologies and intellectual challenges led the Task Force to recommend a new program based on extensive partnerships and on selection through a rigorous open competition for the best ideas and minds. He emphasized that the panel's decision was unanimous that two of the organizations had met the requirements in the program solicitation. The two successful proposals were highly complementary, forming together a balanced national program involving some of the best minds and the finest institutions in the country. Dr. Young also stated that the Board approved funds to phase out NSF's support for the current NSF Supercomputer Centers at Pittsburgh and Cornell, convinced that after a transition period, the new program would fully pick up the load and that the new directions were the best way to insure that computation would continue to flourish in the coming environment.

Dr. Malcom provided insight into the processes and workings of the National Science Board in considering the proposals including those presented during the recompetition of the NSF Supercomputer Centers. She stated that in May 1994, the Board delegated to the Director the authority to approve awards up to \$3 million in one year and \$15 million over five years. Dr. Malcom indicated that the NSB reviews and acts directly on the proposals above that threshold. She stated that the NSF staff process includes reviews at higher management levels, including, for packages that come to the NSB, a review by the Director's Review Board (DRB). Once packages are approved by the DRB, they come to the Board and are assigned to one of our committees for in-depth consideration, then presented to the Board for action. According to Dr. Malcom, the NSF staff provided a presentation to the Board on the supercomputer centers' proposal packages, after which a lead reviewer and a secondary reviewer provided detailed reviews, commented on issues for which more information was needed, and made comments as to the fairness of the procedures and the appropriateness of the recommendations from staff. She emphasized that the Board's discussion of the proposals considered issues such as assurance that a diverse set of computer architectures were used by the partnerships, the management of large, far flung partnerships, the effects of budget reductions on the overall coherence of the proposed projects, and the transition process to the new program and

its impact on the user community. Dr. Malcom assured the Subcommittee that the Board asked hard questions, reviewed reports from the merit review process and assured themselves that the review process was thorough, fair and consistent with NSF's high standards.

*Major research equipment (MRE) account programs and the Internet II initiative*

Dr. Spanier explained that in order to continue the rapid growth of the Internet, investment in both basic and applied research in networking will be necessary to meet the expanding information and communication needs of the 21st Century. He emphasized that the "one size fits all" Internet currently used must be overhauled to support a greater variety of uses and that there must also be an organized process through which discoveries at the basic research level are moved into the applied development phase and then transitioned into routine commercial use. Dr. Spanier explained that the Internet II will address the major challenges facing the next generation of university networks by: creating and sustaining a leading edge network capability for the national research community; directing network development efforts to enable a new generation of applications to exploit fully the capabilities of broadband networks; and, integrating the work of Internet II with ongoing efforts to improve production Internet services for all members of the academic community. According to Dr. Spanier, the President's Next Generation Internet (NGI) Initiative's goals are compatible to those of the Internet II; with the joint goal of ensuring that a developmental high performance network is available to the academic and research community at the earliest opportunity. However, he noted that like all partnerships, there are areas of NGI and Internet II that reflect the specific needs of the government and of the universities that will be conducted separately. Finally, Dr. Spanier recommended that the High Performance Connections (HPC) element of the NSF's Very High Performance Backbone Network System (vBNS) be used as the means to fulfill the federal role in implementing the first goal of the NGI program.

Dr. Kelley announced that the proposed Polar Cap Observatory (PCO) will be the next evolutionary step in an existing chain of facilities sponsored by NSF. He indicated the Foundation's support of four existing stations: one at the magnetic equator near Lima, Peru (operated by Cornell University), the second near Arecibo, Puerto Rico (also operated by Cornell University), another near Boston, Massachusetts (operated by MIT) and the fourth station located in southern Greenland (operated by SRI International). According to Dr. Kelly, the need for the completion of this chain with an upper atmospheric observatory near the magnetic North Pole has become clear as scientists have realized the importance of the polar cap. He explained that the capstone instrument at each site is a high power radar, capable of measuring temperature, densities and wind velocity from the top of the atmosphere to thousands of kilometers into space. Dr. Kelley added the PCO will be able to measure the electronic field that originates from solar wind which interacts with the Earth's magnetic field and penetrates downward into the Earth's upper atmosphere sometimes causing disruptions in communica-

tions and satellite transmissions. He emphasized that space weather can also destroy satellites, damage electrical power grids and present a health hazard to astronauts. Dr. Kelley indicated that the PCO will be a major contributor to understanding space weather and assist in making timely and accurate space environment forecasts in order to prevent damage from powerful space storms.

Dr. Vanden Bout stated that the Millimeter Array (MMA) will provide images of astronomical objects as they appear at millimeter wavelengths which exceed the quality of those at optical and infrared wavelengths taken with the Hubble Space Telescope. He highlighted the MMA's capability to provide an unprecedented view of the origins of galaxies, stars and planets. According to Dr. Vanden Bout, the MMA has had an extensive planning history, during which the community developed the concept in response to scientific requirements. He emphasized that no aperture syntheses telescope on the scale of the Millimeter Array has ever been built at millimeter wavelengths, and for that reason, two stages were proposed: a development phase and a construction phase. He explained that during the development phase, the antenna, key electronic and software systems will all be designed and prototyped. Dr. Vanden Bout stated that the goals of the development phase are working prototypes, architectures of software systems, firm cost estimates, schedule and a site, and established arrangements with partners. He added that a number of interested foreign partners for the endeavor are being pursued including Chile, Canada, the Netherlands, Spain and Mexico. In addition, he indicated that a series of workshops have been conducted to forge a possible cooperation between the MMA and a project proposed by Japanese radio astronomers.

*4.2(e)—National Earthquake Hazards Reduction Program*

*April 24, 1997*

*Hearing Volume No. 105–15*

*Background*

On April 24, 1997, the Subcommittee on Basic Research held a hearing entitled, "1998 Budget Request for the National Earthquake Hazards Reduction Program," to receive testimony on the National Earthquake Hazards and Reduction Program (NEHRP). The hearing examined the Administration's FY98 budget request for NEHRP as well as issues related to a multi-year reauthorization of the program. The NEHRP program was created in 1977. Since its inception, NEHRP has focused on earthquake research (physical, seismic, structural, and social) as well as earthquake hazards mitigation. NEHRP activities in research and mitigation are executed by four separate federal agencies: The National Science Foundation (NSF); the National Institute of Standards and Technology (NIST); the United States Geological Survey (USGS); and the Federal Emergency Management Agency (FEMA).

Witnesses included: Mr. Richard W. Krimm, Executive Associate Director and Mitigation Directorate, FEMA; Dr. P. Patrick Leahy, Chief Geologist, USGS; Dr. Elbert L. Marsh, Acting Assistant Director of Engineering, NSF; Dr. Robert Hebner, Acting Director,

NIST; Dr. David Simpson, President, the IRIS Corporation; Dr. Kerry Sieh, Professor of Geology, Seismological Laboratory, California Institute of Technology; Dr. Joanne Nigg, President, Earthquake Engineering Research Institute (EERI); Dr. Daniel P. Abrams, the NEHRP Coalition; and Dr. George Lee, Director, National Center for Earthquake Engineering Research (NCEER), SUNY Buffalo.

*Summary of hearing*

Mr. Krimm testified that FEMA is continuing its support of earthquake risk reduction activities through individual state and multi-state organizations. He noted that FEMA provides \$5.4 million, approximately one-third of its earthquake program budget, as grants or technical assistance to 38 participating states and three multi-state consortiums. He stated that the budget represents a funding decrease for the mitigation activities within FEMA because there had previously been some earmarks in its budget from Congress for the Portland Metro System and for the University Nevada Shake Table. Additional funding for those issues were not requested because they were add-ons by Congress.

Dr. Leahy introduced a new USGS hazard information map for the contiguous United States that depicts how the shaking hazard varies across the country. He stated that federal agencies use the maps to set construction standards for critical facilities, and to allocate assistance funds to states for earthquake education and preparedness. Dr. Leahy noted that USGS develops partnerships that leverage scarce resources and link researchers to the practitioners. He said that these partnerships expedite the application of research results to loss reduction practices. He also expressed frustration with the \$2 million decrease in the External Grants Program from FY 95 to FY 97 (\$8 million to \$6 million) which has decreased that amount of work being conducted with the external community.

Dr. Marsh testified that NSF remains the most important source of government funding for fundamental research in earthquake engineering, and for the investigation of the socioeconomic aspects of earthquake hazards. Dr. Marsh said that due to the success of the Southern California Earthquake Center and the National Center for Earthquake Engineering Research (NCEER) as well as a recommendation from the earthquake hazard reduction research community, NSF initiated a new competition for earthquake engineering research centers. He said that up to three such centers will be funded this fiscal year for a period of five years. Dr. Marsh also stated that NSF remains committed to the integration of research and education and to the wide dissemination of research results.

Dr. Hebner emphasized the important role that standards play in earthquake hazards reduction. He noted that NIST conducts problem-focused research and development needed to link the research to particular standards and practices for buildings and lifelines. He testified that industry participation and partnerships have been very rewarding.

Dr. Simpson praised NEHRP for its success which has impacted the course of research in seismology, engineering, and disaster planning, but stated that within the current funding levels of

NEHRP, they cannot accomplish the work that needs to be done to reach the significant and attainable goals of the program. He noted that after the Kobe earthquake, Japan realized that its earthquake mitigation program, already superior in many ways to the U.S. program, was in serious need of improvement. He suggested that if we heed the warnings given by recent earthquakes we should be investing in hazard mitigation research and implementation at several times the current rate. Dr. Simpson testified that a major upgrade is required of U.S. facilities for earthquake monitoring and the analysis, distribution and archiving of data. He stated that such an upgrade should emphasize the collection of broadband and strong motion seismic data and geodetic data within a coordinated, standardized system for data collection, analysis and distribution.

Dr. Sieh stated that the health of NEHRP is critically dependent on the following activities: (1) the engineers' ability to design safe buildings; (2) FEMA's ability to rationally assess hazards and encourage mitigation efforts; and (3) the private insurers' ability to establish premiums indexed to the real level of risk. He testified that the results of scientific research from the NEHRP program have had tremendous downstream consequences in terms of mitigation expenditures before an earthquake occurs.

Dr. Nigg testified that in order to affect escalating earthquake disaster losses, substantial research efforts need to be undertaken in three principal areas including: (1) retrofitting existing building stock; (2) develop methodologies for assessing community vulnerability; and (3) knowledge transfer. She said that to increase the pace of implementing earthquake risk reduction measures, there must be a balance with research efforts among the earth sciences, engineering, and the social sciences. Dr. Nigg noted that despite these accomplishments, the losses in major recent earthquake disasters continue to exceed the social and economic costs created by other types of disaster events.

Dr. Abrams stated that continuing improvements in our earthquake methods will result in significantly increased earthquake safety as new and replacement structures and infrastructure systems are built. He said achieving the national goals of reducing earthquake risk to an acceptable level, and creating a built-environment that is safe when subjected to earthquakes, requires a continuing long-term commitment of resources which is particularly important in terms of upgrading existing test facilities because of the capital investments required.

Dr. Lee called for the need for more closely coordinated work among the NEHRP agencies, and stressed the importance of collaboration with those non-NEHRP agencies which have concerns about earthquake issues. He said that while we continue to work towards reliable mitigation solutions for the future, it is important to examine critically the practices of the past. Such an effort, says Dr. Lee, will inevitably require state-of-the-art research and state-of-the-art facilities. In this regard, Dr. Lee encourages the continued support and the improvement of the nation's experimental research program and laboratory facilities. He stated that NSF has recognized this need and undertaken a major effort to develop an action plan to upgrade and modernize a network of national earthquake engineering experimental facilities.

4.2(f)—*Internet Domain Names, Parts I and II (Internet Domain Names, Part I)*

September 25, 1997

Hearing Volume No. 105–59

*Background*

On September 25, 1997, the Subcommittee on Basic Research held the first of two hearings entitled, “Internet Domain Names, Parts I and II.” The purpose of this hearing was to review the history and current status of the domain name system, the relationship between the National Science Foundation (NSF) and Network Solutions Incorporated (NSI), NSF’s role in the transition of the domain name system to private sector control at the termination of the cooperative agreement with NSI in 1998, alternative proposals on the process for the DNS transition to the private sector, and role of the Federal Government in the future of the Domain Name System.

Witnesses include: Dr. Joseph Bordogna, Acting Deputy Director, National Science Foundation; The Honorable Larry Irving, Assistant Secretary for Communication and Information, U.S. Department of Commerce; Dr. Jonathan Postel, Director, Computer Networks Division; and Mr. Gabriel Battista, Chief Executive Office, Network Solutions Incorporated.

*Summary of hearing*

Dr. Bordogna stated that the Internet is now the domain of the venture capitalist, not the adventurous academic. He testified that while NSF has determined that their oversight of the Internet should be concluded, they are committed to helping find solutions to the Internet’s “growing pains,” by ensuring that the Internet retain stability, is self supporting and maintains American leadership.

Mr. Irving testified that the Clinton Administration supports the continued privatization and commercialization of the Internet and is committed to completing the transition to private sector governance. They realize, however, that the transition must be accomplished in a way that enhances the stability of the Internet and ensures its continued smooth operation.

Dr. Postel noted that although the agencies of the Federal Government have supported the development of the Internet, it is important to recognize at the outset that this Internet Community was never brought under the control of any single government or other organization. He stated that competition in and expansion of the domain name registration system should be encouraged. He said that conflicting domains, systems, and registries should not be permitted to jeopardize the operation of the Internet. He also said that competition should involve not only the original choice of registrar, but also the continuing use of a registrar.

Mr. Battista stated that NSI feels very strongly that there is an appropriate and necessary role for the United States Government in sponsoring a period of managed transition. He also suggested that the administrative functions of the Internet need to be man-

aged by a body anchored in a legal authority that can assure the stability of the Internet, oversee policy regulations and reflect the concerns of a global community of users.

*4.2(g)—Internet Domain Names, Parts I and II (Internet Domain Names, Part II)*

*September 30, 1997*

*Hearing Volume No. 105–59*

*Background*

On September 30, 1997, the Subcommittee on Basic Research held the second of a two-part series of hearings, entitled “Internet Domain Names, Parts I and II.” The first hearing was held on September 25, 1997. The purpose of this hearing was the review the history and current status of Domain Name Systems, the relationship between the National Science Foundation (NSF) and Network Solutions Incorporated (NSI), NSF’s role in the transition of the Domain Name System to private sector control at the termination of the cooperative agreement with NSI in 1998, alternative proposals on the process for the DNS transition to the private sector and the role of the Federal Government in the future of the Domain Name System.

Witnesses included: Mr. Donald M. Heath, President and CEO, Internet Society; Mr. Anthony M. Rutkowski, Director, World Internet Alliance; Mr. Andy Sernovitz, President, Association for Interactive Media; Ms. Barbara A. Dooley, Executive Director, Commercial Internet Exchange.

*Summary of hearing*

Donald Heath, President and CEO of the Internet Society, opened his testimony by describing ISOC’s involvement in the creation of the International Ad Hoc Committee, known as the IAHC. The IAHC was created to define, investigate and resolve issues resulting from international debate over a proposal to establish global registries and additional generic Top Level Domains (gTLDs). Mr. Heath explained that registrations of domain names were once free. In 1995, Network Solutions Inc., was authorized to charge fees for registrations. According to Mr. Heath, the Internet community was outraged. A proposal to break what many see as NSI’s monopoly on registration was produced and debated internationally. Under this proposal there would be an unlimited number of domain name registrars, the registrars would form a Council of Internet Registrars (CORE) which would operate under a Memorandum of Understanding and would be overseen by a Policy Oversight Committee (POC) made up of individuals from the Internet community. Under this proposal a limited number of new gTLDs would be created, all shared among the registrants with CORE acting as the central data repository for the system. This would assure a level of competition among registrants. However, the fact that at this time the U.S. Government’s policy on this issue is still unclear has made a number of would-be registrants hesitant to get involved. Mr. Heath concluded his statement by saying that the U.S. Government would help build confidence in this process by endorsing the

CORE proposal. He stated that this proposal could be tested and implemented before the NSI agreement expires and that the proposal, written by Internet professionals, is a sound plan under which the Internet could continue to flourish. He concluded by stating that the U.S. Government should state its policy quickly and clearly, so that this process may continue.

Anthony Rutkowski from the World Internet Working Alliance opened his testimony by stating that the Internet's Domain Name System is fairly simple. Namely it is basically a pyramid of service franchises. The main issues concerning the DN, in turn, are issues that deal with public models, antitrust and governance. This hasn't been a problem because the government was basically the one running the system. He argued that one of the main flaws of the CORE proposal was that the plan was being circulated under the auspices of the ITU. A second problem was that the plan did not have the support of the main contractor, the U.S. Government, and in fact, the proposal was strongly opposed by the U.S. Secretary of State. He also described CORE as a Swiss-based cartel that has no external accountability. This is why, he argued, so few company's and countries have endorsed the CORE plan. Mr. Rutkowski argued the NSIUS agreement should be extended to give the U.S. Government more time to make sure that its policy is proper. He suggested that the U.S. Government establish a private-sector driven initiative to transfer the DNS, and stated that the U.S. has an important role to ensure that no group or nation can unduly assert its influence in this area.

Mr. Andrew Sernovitz from the Association for Interactive Media opened his testimony by stating that the primary concern of the entrepreneurs who have invested billions of dollars into this system is the continuous stability of the Internet. Secondly, he stated that the U.S. Government should stop the CORE initiative because it is a threat to the stability of the Internet. He argued that the CORE plan gives too much power to Dr. Jon Postel and other CORE-affiliated individuals. Mr. Sernovitz was concerned that Dr. Postel, the Director of the IANA, which is a contractor of the U.S. Government, has been participating in this process. He also stated that he had concerns about the people that IANA and the CORE group has associated themselves with; specifically, individuals who may have done work with the Libyans and the Iraqis. In conclusion, he stated IANA and CORE are attempting to take over the Domain Name System. He called on the Committee to investigate these activities.

Ms. Barbara Dooley, the President of the Commercial Internet Exchange Association, opened her testimony by explaining the role played by Internet Service Providers (ISP) in registering domain names on the Internet. She stated that ISP are primarily concerned about the stability of the Internet and that many are concerned that the software needed to run a shared registry system as outlined in the CORE proposal does not yet exist. She also stated that the private sector must take the lead in the process of transferring the DNS to the private sector. She concluded her testimony by stating that one of the goals of that process should be the institutionalizing of IANA.

*4.2(h)—Domain Name Systems, Parts I and II (Domain Name Systems: Where Do We Go From Here?)*

*March 31, 1998*

*Hearing Volume No. 105–78*

*Background*

On March 31, 1998 the Subcommittee on Basic Research held the first of two joint hearings with the Subcommittee on Technology entitled, “Domain Name Systems, Parts I and II.” The focus of this hearing was an examination of the Clinton Administration’s “Green Paper” proposal concerning the transition of the Internet’s DNS system to private sector control.

Today’s Internet is an outgrowth of U.S. Government investment in packet-switching technology and communications networks carried out under agreements with the Defense Advanced Research Projects Agency (DARPA) and the National Science Foundation (NSF). As a legacy, major components of the Internet’s Domain Name System are still performed by or subject to agreements with agencies of the U.S. government. Due to the explosive commercial growth of the Internet, a consensus has emerged that further government involvement with the day-to-day operations of the Internet is inappropriate and that the DNS should be transferred to the private sector. Adding urgency to this situation is the fact that the two major government agreements that are critical to the Internet are near expiration. This hearing concerned the Administration’s “Green Paper” proposal to transfer the DNS to the private sector.

Witnesses included: Mr. Ira Magaziner, Senior Advisor to the President for Policy Development, Department of Commerce; Mr. Jim Courter, President, IDT Corporation and Spokesman for the Internet Council of Registrars (CORE); Ms. Barbara Dooley, Executive Director, Commercial Internet Exchange Association; Dr. Robert E. Kahn, President and CEO, Corporation for National Research Initiatives; and Professor David Farber, The Alfred Fitler Moore Professor of Telecommunication Systems, Director, Distributed Computer Laboratory, University of Pennsylvania.

*Summary of hearing*

Mr. Magaziner, Senior Advisor to the President, opened his testimony by stating that the Administration’s proposal, known as the Green Paper, is still a work in progress and is not a final statement of official policy of the Administration or of the Commerce Department. He described the Green Paper as a “discussion draft” that can be modified to address concerns raised during the public comment period. Mr. Magaziner described the goal of the Green Paper process as an attempt to transfer the DNS to the private sector in a way that: (1) ensures the stability of the Internet; (2) allows for market mechanisms where appropriate; and (3) allows for private-sector-led, bottom-up management of the Internet’s DNS. He stated that the Green Paper has already taken into account many of the concerns raised in public comments about the transfer of the DNS and also stated that the Administration would continue to work with interested parties to generate a consensus. Mr. Mag-

aziner stated, however, that due to the nature of the Internet, achieving 100 percent consensus will be extremely difficult. He concluded his testimony by restating that the goal of the Green Paper was to establish a new private sector entity to manage the DNS and to do so in a timely fashion. By moving to a private, more competitive, more international organization the Internet will be improved.

Mr. Courter opened his testimony by stating that, in his opinion, the Green Paper is a step backwards rather than a step forward. He argued that the proposal written by the Internet Council of Registrars (CORE) allows for open competition within the DNS while the Green Paper does not. He argued that the Green Paper's establishment of five new gTLD's, each managed by an individual entity, in effect would create five new monopolies. According to Mr. Courter, the CORE proposal favors non-profit registries, while the Green Paper favors for-profit registries. CORE supports a single dispute resolution process, the Green Paper does not. Mr. Courter closed his testimony by arguing that the Green Paper is anti-competitive, and by comparing the Green Paper's proposed system to a phone system in which if you wanted to change your telephone company, you would have to change your phone-number as well. Mr. Courter argued that the CORE proposal, which was written by a group of Internet stakeholders, is a better proposal than one written by government bureaucrats.

Ms. Dooley of the Commercial Internet Exchange Association opened her testimony by stating that, on the whole, the Green Paper is a fair, reasonable, practical and well-conceived proposal. However, many details still need to be worked out. She outlined her concerns with the Green Paper as follows: (1) commercial users and service providers would be underrepresented on the corporation's board of directors; (2) should there be a need for an increase in gTLDs, the new corporation must have a single, open, transparent and accountable set of standards and processes for adding new gTLDs; (3) the U.S. country code top level domain needs to be reformed; (4) the root server must become professionally managed; and (5) the transition team must have an international participation and adequate resources. Lastly, Ms. Dooley warned against allowing the Internet to be "captured" by one special interest group. The strength of the Internet, according to Ms. Dooley, has been its flexibility, diversity and grassroots organization. Ms. Dooley closed her testimony by arguing that the Internet would suffer if it lost these qualities.

Dr. Robert Khan from the Center for National Research Initiatives opened his testimony by pointing out that the Internet was not an overnight success and is not now in any crisis. According to Dr. Kahn, the U.S. Government and Internet activists should take as much time as necessary to do what is right. He stated that in addition to ensuring the stability of the Internet, the government must also ensure the integrity of IP addresses, openness in the standards setting process and competition among service providers. A community commitment to the overall management of the Internet's infrastructure is also required. Importantly, Dr. Kahn pointed out that the DNS is merely the first addressing system used by the Internet. Over the coming years, many new addressing technologies

will emerge. In transferring the DNS to the private sector, the government and the Internet community must make sure that they do not lock out future Internet addressing technologies. Dr. Kahn closed his remarks by stating that the IP functions and the DNS functions must be kept separate to ensure that the DNS addressing technology does not become bureaucratically locked into the Internet to the exclusion of newer technologies. Lastly, he restated his opinion that the integrity of the IP numbering system and the need for openness in the standards setting process are critical to the success of the Internet.

Dr. David Farber of the University of Pennsylvania opened his testimony by stating that the Internet no longer only connects computers, but now connects people and cultures. As a result, any attempt by one country to control the Internet will be frowned upon internationally. Dr. Farber's testimony focused on some of the social issues that need to be addressed. Dr. Farber stated that the U.S. Government needs to address the fears of non-American Internet users and needs to ensure that representation on the new corporation's board of directors must be international. In addition, the new corporation must ensure basic human rights such as freedom of expression, free association, due process, and nondiscriminatory administration. He stated that the Internet is a public good and should not be used exclusively for private gain, but rather should be managed for the public benefit.

*4.2(i)—Fiscal Year 1999 Budget Authorization Request: National Science Foundation*

*April 22, 1998*

*Hearing Volume No. 105-54*

*Background*

On April 22, 1998, the Subcommittee on Basic Research held a hearing entitled, "Fiscal Year 1999 Budget Authorization Request: National Science Foundation." The purpose of the hearing was to review the National Science Foundation's budget request for Fiscal Year 1999. The Subcommittee heard testimony from the National Science Foundation and the National Science Board.

The NSF request for FY 1999 of \$3.773 billion was \$344 million, or 10.0 percent, above the FY 1998 Current Plan of \$3.429 billion. Of the five directorates, only Major Research Equipment experienced a decrease from the FY 1998 level (-13.8 percent). In its Views and Estimates submitted to the Committee on the Budget, the Committee on Science supported this request, citing the importance of basic research to U.S. economic growth and to maintaining U.S. pre-eminence in fundamental science.

Witnesses included: Dr. Neal Lane, Director of the National Science Foundation; and Dr. John E. Hopcroft, Joseph Silbert Dean of Engineering and Professor of Computer Science at Cornell University and Member and National Science Board.

*Summary of hearing*

Dr. Hopcroft testified that the National Science Board exercises two roles: that of a national science policy body and that of a gov-

erning body for NSF. He alluded to the Board's recent publications on national science education and government funding of scientific research. Concerning the proposed NSF budget, he said that the Board fully supported the 10 percent increase in the NSF budget proposed by the Administration. This commitment to our national science infrastructure will enable NSF to maintain U.S. world leadership in all aspects of science, mathematics, and engineering. The NSF request would provide the means to fund thousands of worthwhile projects and improve science and math education. Dr. Hopcroft noted that NSF's Knowledge and Distributed Intelligence (KDI) and other themes (e.g., Life and Earth's Environment) are exciting initiatives that cut across disciplines. NSF also maintains strong programs in the traditional scientific disciplines, which will allow these multidisciplinary themes to succeed. The NSF budget will allow NSF to improve its core competency while providing the flexibility to take advantage of new opportunities that may arise. The Board also strongly endorses NSF efforts to promote inquiry-based, hands-on learning to train the next generation of scientists and engineers.

Dr. Lane testified that NSF's request of \$3.773 billion represents and investment in keeping U.S. science and engineering at the leading edge of learning and discovery. Much of his testimony focused on NSF's KDI theme. The KDI initiative is designed to turn the flood of information into a "wellspring of discovery, learning and progress." He stressed that this initiative goes beyond hardware to include the workings of the brain, how we learn and the nature of intelligent behavior (i.e., research into the "neck-top computer"). Dr. Lane testified that another aspect of KDI is NSF's support of faster experimental computer and communications networks that will link researchers and educators. He also pointed to NSF's work in support of nanoscale science that has great potential. He credited much of our advances in this area to the biosciences (through work on DNA), noting how nanoscale science is a good example of the integration of the physical and biological sciences. It is these crosscutting aspects of the KDI and NSF's other two themes—Life and Earth's Environments and Educating for the Future—that will provide the foundation for NSF's investment strategy. He also emphasized the Foundation's continued to merit-based investments in learning and discovery that adhere to the highest standards of peer review. Dr. Lane closed by saying that the proposed budget is in keeping with the wealth of opportunity that science and engineering afford the nation and will help position America to retain its world leadership in the information-driven economy of the 21st century.

*4.2(j)—External Regulation Of DOE Labs: Status Of OSHA And NRC Pilot Programs*

*May 21, 1998*

*Hearing Volume No. 105-65*

*Background*

On May 21, 1998 the Subcommittee on Basic Research and the Subcommittee on Energy & Environment held a joint hearing enti-

tled, "External Regulation Of DOE Labs: Status Of OSHA And NRC Pilot Programs." The focus of this hearing was to examine DOE's pilot programs at its laboratories involving the Occupational Safety and Health Administration (OSHA) and the Nuclear Regulatory Commission (NRC). These two pilot programs were designed to help determine the desirability of establishing external oversight of worker safety and nuclear safety at DOE's research and nuclear facilities.

The DOE is the only federal agency whose facilities are essentially exempt from regulation by the NRC for nuclear safety and by OSHA for worker protection. The Atomic Energy Act of 1946 established these exemptions for the Atomic Energy Commission, one of DOE's predecessor agencies, due to national security concerns originating with the production of and research on nuclear weapons and nuclear power. As a result, DOE has been criticized over the years for lax enforcement of its own worker and nuclear safety regulations, as well as for its environmental management practices in general.

Witnesses included: The Honorable Elizabeth Moler, Deputy Secretary of Energy, U.S. Department of Energy; The Honorable Shirley A. Jackson, Chairman, U.S. Nuclear Regulatory Commission; The Honorable Charles N. Jeffress, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor; and Victor S. Rezendes, Director of Energy, Natural Resources, and Science Issues Resources, Community, and Economic Development Division, U.S. General Accounting Office.

#### *Summary of hearing*

Deputy Secretary Moler testified that the Department of Energy is pursuing the transition to external regulation and objected to the conclusion of the General Accounting Office that DOE has an unclear and inconsistent position on external regulation. Instead, she explained an outline of the Department's plan. Before conversion to external regulation several issues will need to be resolved: (1) the individual nature of DOE facilities which make them difficult to conform to universal regulations; (2) the cost of the regulatory transition; (3) DOE stewardship; (4) determination of each licensee; (5) determination that enforceable requirements in current compliance agreements are consistent with those established by external regulating agencies; (6) the cost of retrofitting requirements; and (7) the potential for multiple and/or overlapping regulators. She testified that DOE has begun a pilot program in order to work out these issues, and others that may arise, before the transition. Finally, she stressed the need for OSHA to be a partner in this effort.

The Honorable Shirley A. Jackson, Chairman of the U.S. Nuclear Regulatory Commission, opened her testimony with a status report of the pilot program for the external regulation of DOE facilities. She explained that the all of the current activities the NRC is regulating at DOE facilities have been developed individually, and the NRC has not evaluated the DOE as a whole to identify all of the contributing factors prior to assuming regulatory authority. Benefits realized through the pilot program so far include more effective and consistent safety management, enhanced competitiveness, a strengthened partnership between the DOE and the laboratory con-

tractor, increased credibility and public confidence, and cost savings. She reinforced the testimony of Deputy Secretary Moler that key issues must be resolved before transition from self-regulation to external regulation. She stated the need for adequate congressional appropriation and a clear statutory delineation of its authority as contingent factors for NRC oversight of DOE facilities. She concluded by stating that, based on the results of the pilot program, there are no insurmountable obstacles to external regulation of DOE facilities.

The Honorable Charles N. Jeffress, Assistant Secretary of Labor for Occupational Safety and Health at the U.S. Department of Labor, testified that the ability of OSHA to assume added responsibilities of regulating DOE facilities is limited by both legislation and resources, and could adversely affect the Agency's ability to regulate the private sector currently under its jurisdiction. OSHA has taken steps in order to be able to assume such expanded responsibilities, including establishing an internal transition working group and initiating a pilot program at a DOE facility. Meanwhile, OSHA has been working with DOE in the process of privatization of other facilities. These efforts have given OSHA an understanding of some of the problems that may be encountered due to the external regulation of DOE facilities and OSHA is continuing to work to resolve such issues.

Victor S. Rezendes, of the U.S. General Accounting Office, testified that the actions taken by DOE in preparing for the transition to external regulation have served to delay, rather than move along, this conversion. He gave as an example of such hesitation the pilot program undertaken by DOE. The pilot program does not represent the size and complexity of the DOE facility; therefore, it is unable to provide accurate estimates. Mr. Rezendes added that, although DOE has endorsed OSHA as its external regulator, OSHA is not involved in the DOE pilot program with the NRC. He concluded by testifying that DOE, NRC and OSHA have each created separate internal preparation structures, which are proceeding on different tracks and timetables toward external regulation without an integration of positions or strategies.

*4.2(k)—The National Science Foundation's Statewide Systemic Initiatives: Are SSI's The Best Way to Improve K-12 Math and Science Education?*

*July 23, 1998*

*Hearing Volume 105-64*

#### *Background*

On July 23, 1998, the Subcommittee on Basic Research held an oversight hearing entitled, "The National Science Foundation's (NSF) Systemic Initiatives: Are SSI's The Best Way to Improve K-12 Math and Science Education?". The purpose of this hearing was to discuss the NSF's Systemic Initiatives, one of the primary programs through which the Foundation hopes to improve K-12 science and math education.

The NSF's Education and Human Resources directorate is attempting to improve K-12 science and math education through

“education system reform.” Educational system reform at NSF involves catalyzing co-ordination with states, cities, rural areas, school systems and other organizations involved in education. The goal of the reform is to achieve a comprehensive impact on curriculum, policy, professional development of teachers, assessment or testing, resource allocation and student performance. The programs through which this effort is manifested are the Statewide, Urban, and Rural Systemic Initiatives. NSF has requested over \$117 million for these programs in FY 1999 out of an overall education budget of \$683 million.

Witnesses included: Dr. Daryl E. Chubin, Director, Division of Research, Evaluation, and Communications, Directorate for Education and Human Resources, National Science Foundation; Dr. Stan Metzenberg, Assistant Professor of Biology, California State University Northridge; Dr. Mark St. John, Consultant for the Inverness Research; and Mr. Thomas Baird, Director, Area Centers for Educational Enhancement, Florida Department of Education.

*Summary of hearing*

Dr. Daryl Chubin of the National Science Foundation opened his testimony by stating that, on the whole, the NSF’s Statewide Systemic Initiatives (SSI) have been successful in stimulating comprehensive and associated systemic reform in the districts participating in the programs. He briefly reviewed the standards used for evaluating progress made by SSIs. Dr. Chubin then delineated the key findings detected in the ongoing process of assessing individual SSIs and the program in general: One, systemic reform is arduous and requires more than five years to accomplish. Two, various methods of achieving higher performance standards can be successful. Three, an accountability infrastructure is vital to incremental progress. Four, scale-up of reform to new districts, schools and classrooms is problematic yet crucial. Five, NSF and site-based accountability requirements accelerate the pace of reform and function as an incentive for performance improvement. Six, aligned content instruction and assessment standards, against which to measure student learning and teacher effectiveness, are a central element in successful reform. He concluded by emphasizing the value of NSF support to SSIs, but added that the NSF should not indefinitely support steady state reform efforts.

Dr. Stan Metzenberg testified that the endorsement by the National Science Foundation of the National Science Education Standards and the American Association for the Advancement of Science Benchmarks for Science is a bad decision. He asserted that both of these documents set standards for achievement that are so low as to be ineffective. He stated that the standards do not represent a consensus among scientists or educators nor are they based upon scholarly research. As a result, use of federal funding to promote such standards is an inefficient and even destructive use of resources.

Dr. Mark St. John, who is a consultant for the Inverness Research, which has evaluated several of the National Science Foundation Systemic Initiatives, testified that the condition upon which success of the Systemic Initiatives hinge is not standards, but rather upon the professional development support given to teachers. He

stated that the potential impact made by Systemic Initiatives may be their success in building capacity among those involved in every aspect of educational systems by connecting educators, legislators and professionals at various levels with each other. In addition, he believes the Systemic Initiatives have brought a systemic perspective—a way of thinking about education as a system to those involved in reform. Dr. St. John also pointed out the ability of the SSI's to focus expertise and resources on areas that otherwise might not have had access to them. He noted several issues critical to success. These included the limits of the National Science Foundation to provide expertise to individual school districts, the necessity of accountability of federal funds used at state or local levels and the recognition of the scale of each SSI.

Mr. Thomas Baird spoke to the issue of funding and effectiveness of the Systemic Initiatives, based upon his experience as Project Director and Co-Principal Investigator of the Florida Statewide Systemic Initiative. He outlined several beneficial changes which the SSI spurred in Florida: coordination of funding groups, offices, divisions, and bureaus; support for the development and dissemination of higher student performance standards and curriculum frameworks; increased cooperation between the Florida Department of Education and the higher education community; and, development of model schools and an education infrastructure, including ongoing professional development. Mr. Baird also offered several observations and suggestions for the NSF SSIs. First, because the expectations of states are not commensurate with funding, specific populations should be targeted or fewer state-wide initiatives should be undertaken, thereby freeing up resources to augment the funding levels of SSIs. Second, rather than micromanaging the Systemic Initiatives, the NSF should heed the advice and expertise of the practitioners directly involved with the Initiative and use this knowledge to help states devise strategies. Finally, the NSF must develop a consistency in its expectations of the SSI's.

*4.2(l)—GAO Report On DOE National Laboratory Management Reform*

*September 23, 1998*

*Hearing Volume No. 105-85*

*Background*

On September 23, 1998, the Subcommittee on Basic Research and the Subcommittee on Energy and Environment held a joint hearing entitled, "GAO Report On DOE National Laboratory Management Reform." The focus of this hearing was DOE's progress on management reform of the National Laboratories. A General Accounting Office (GAO) report assessing the agency's progress on management reform, Department of Energy: Uncertain Progress in Implementing National Laboratory Reforms, was released and discussed at the hearing.

DOE manages the largest laboratory system of its kind in the world. Since the days of the World War II Manhattan Project, the DOE laboratories have played a major role in maintaining US leadership in research and development. With 23 laboratories in 14

states, a budget of over \$6 billion a year, and a scientific and technical staff of about 60,000, DOE has a responsibility to ensure the laboratory system is managed in an effective and efficient manner.

Witnesses included: Dr. Ernest Moniz, Under Secretary of Energy, U.S. Department of Energy (DOE); Dr. John P. McTague, Vice President for Technical Affairs, Ford Motor Company and Member of the Secretary of Energy Advisory Board (SEAB), and Vice-Chairman, DOE Laboratory Operations Board; Dr. Charles V. Shank, Director, Ernest Orlando Lawrence Berkeley National Laboratory; and Mr. Victor S. Rezendes, Director of Energy, Natural Resources, and Science Issues Resources, Community, and Economic Development Division, U.S. General Accounting Office (GAO).

#### *Summary of hearing*

Dr. Moniz testified that he agreed with many of the conclusions made in the GAO report on DOE laboratory reform in accordance with the Galvin Report saying that while the Department doesn't agree with every detailed recommendation, there is notable merit in its general endorsements. Dr. Moniz named three areas: establishing stronger business practices and strategic planning, and governance of these programs. He suggested that the Department has already begun to address many of these issues and have even exceeded several of the recommendations found in the report. He concluded that it is his goal to institutionalize the improvements that have been made in the labs throughout the Department, in conjunction with the Laboratories Operations Board.

Dr. McTague testified that changes in the approach used to govern the labs should take place to encourage output. He stated that flexible approaches produce more efficient outputs than prescriptive regulations. He went on to say that the Secretary of Energy's Advisory Board felt encouraged that most significant programs had one or more merit review process in use, and that 85 percent of the research programs rated above average or excellent. The suggestion of the Board is that the DOE focus on the success when addressing and improving procedures and structures. He stated that the labs to have serious management problems on all levels, and that as the labs went towards leaner management, that it must attract and train better managers with a technical understanding of the labs. He concluded that the largest problem facing the labs is a complex management structure throughout, and that the implementation of fundamental structure changes may require legislation.

Dr. Shank testified that the DOE, the SEAB and the laboratories would restructure the labs to eliminate costly administrative systems, unnecessary prescriptive oversight, and diffuse responsibilities. He reported that significant progress has been made in increasing productivity with restructuring. This productivity, he said, was a direct effect of adhering to new operating principles that were "simply common sense". Dr. Shank cited changes that had reduced operational cost and increased overall production. He discussed how these improvements were being developed as institutions within the lab system and that continuing this course would increase efficiency and output.

Mr. Rezendes reported that while the national labs did tremendous research, that often this research was unfocused, micro-managed and incohesive with other research being done in other national labs and at private facilities. He testified that though DOE has suggested that they had begun to restructure the laboratories, it still had not produced a comprehensive road map by which changes to process structure would be made. He testified that studies of the DOE labs each noted the same outcome which is that the problems in accountability that result in unclear chains of command and the inability to manage as an integrated system affect the efficiency and output of the labs. He concludes that though the DOE has made some headway, many actions are still underway or have unclear goals and that if reform is not produced within the structure, legislation with consequences may ultimately be needed.

*4.2(m)—Remote Sensing*

*September 28, 1998*

*Hearing Volume No. 105–87*

*Background*

On September 28, 1998, the Subcommittee on Basic Research held a hearing entitled, “Remote Sensing.” Specifically, the focus of the hearing was to review steps which the research and commercial communities are taking to apply remote sensing technologies for the next century.

Witnesses included: Dr. Rita Colwell, Director, National Science Foundation (NSF); Dr. Thomas M. Lillesand, Director, Institute of Environmental Studies, University of Wisconsin; Mr. Lawrie E. Jordan III, President, ERDAS, Inc.; and, Dr. Scott Pace, Senior Policy Analysis, RAND Science and Technology Policy Institute. Dr. David Brannon, Director of the Commercial Remote Sensing Program at the Stennis Space Center, NASA was invited to testify but was unable to attend due to Hurricane Georges.

*Summary of hearing*

Dr. Colwell testified that she has seen the power of remote sensing technology first hand. As an aquatic microbiologist, she said she spent over 30 years studying the microbial disease, cholera, with the use of remote sensing technologies. Cholera is a disease caused by drinking water contaminated with a bacterium known as vibrio cholerae. Cholera can cause severe diarrhea and dehydration, and in some cases death. The key breakthrough came when she discovered (with the assistance of remote sensing) that the cholera bacterium lives in the gut of microscopic aquatic animals, the zooplankton.

Dr. Colwell said the use of satellite data and remote sensing technologies led to a greater understanding of how global environmental change influences the spread of the cholera disease. Through her research she found that cholera epidemics can now be related to climate and climate events, including ocean warming events such as El Niño. She felt that further refinements of these studies with the use of remote sensing technologies could allow the research to save thousands of lives each year through effective

monitoring and prediction of conditions conducive to cholera epidemics.

Dr. Lillesand began his testimony by noting that several inter-related factors are currently influencing the form and significance of land remote sensing from space. Among these factors are: a continued transition toward an information-based society in general; a recognition of the interdependence between environmental quality and sustainable economic development; and, the continued maturation and application of remote sensing, GIS, GPS and related technologies in the context of an evolving national and international spatial data infrastructure.

Dr. Lillesand also stated that remote sensing and its kindred geospatial technologies are truly enabling technologies. It is beginning to pervade the entire array of disciplines where the spatial dimension of complex interrelated phenomena is important—from geoscience to human epidemiology. Geospatial analysis not only makes the asking of old scientific questions more efficient, it is enabling the science community to address a whole new series of questions over a range of spatial and temporal scales. This is not only providing an improved understanding of how the earth works as a system, it is also providing a new paradigm for the management of natural resources and the environment, as well as the conduct of business.

Mr. Jordan testified that the Federal Government must find a way to enable the commercial remote sensing industry to compete without competing against the private sector. The first step, he said, is to recognize that special algorithm developments should not require the recreation of already existing foundation technology. All government-developed remote sensing software should be object oriented, based upon a commercial off the shelf (COTS) foundation, with fully documented APIs so it can be readily plugged into any commercial software package. Through this “adopt an algorithm” approach, government and academia-based technology development will be commercially viable, thereby allowing mass distribution and technical support.

Mr. Jordan also said that the Federal Government, as an enabler, must not get too caught up with cost reimbursement for the development of both algorithms and geospatial data. If access to TIGER files allows UPS to run 20 percent fewer trucks, the greater good of reducing road maintenance costs and ozone pollutants far exceeds the buying fee of the data.

Finally, Mr. Jordan said the government must adopt data format standards rather than create them. There is nothing wrong with the government providing geospatial data in commercial formats provided the format is open, documented and royalty free. Unfortunately, as data standards proliferate within the government, valuable resources in commercial organizations are siphoned off simply to write I/O routines for the next versions of awkward government specification such as SDTS, NLAPS and others. Commercial data formats are proven, and as most commercial companies share their formats with each other, the appearance of endorsing a given commercial product is negligible.

Dr. Pace said that as remote sensing technologies improved, cost/benefit ratios increased the end users ability to lower production

costs, reduce planning schedules, provide rapid and quantitative assessments of socio-economic and environmental impacts, simulate and model end result opportunities, and allow for a comparative analysis of alternative options.

Dr. Pace stated that remote sensing applications continue to be applied in the field of agriculture and in government research laboratories. The National Oceanic Atmospheric Administration (NOAA), Environmental Protection Agency (EPA), U.S. Department of Interior and the U.S. Department of Defense (DoD) have expressed interest in the use of remote sensing technologies. Private industry, including the forestry, fishery, insurance/disaster management, oil and gas and transportation industries are also utilizing remote sensing technologies.

Dr. Pace believes that cooperative work between the private and public sectors has produced a marked improvement in the ability to manage, transfer, manipulate and interpret large data sets. The newer commercial and government satellite systems in orbit, or about to be launched, have spectral recognition capabilities that are more appropriate for detecting information and developing models with "ground truth measurements." Currently, major studies are underway world wide to evaluate the technology and test the data handling system to see if the right remotes sensing products can be delivered to the end user in a timely and dependable way.

#### *4.2(n)—High Performance Computing*

*October 6, 1998*

*Hearing Volume No. 105-93*

##### *Background*

On October 6, 1998, the Subcommittee on Basic Research held a hearing entitled, "High Performance Computing." The hearing focused on the President's Information Technology Advisory Committee Interim Report to the President and the Administration's and academic community's response to its findings and recommendations. The Subcommittee also examined the current state of high-performance computing throughout the Federal Government, including funding, research needs and priorities, and interagency coordination.

Witnesses included: Dr. Ken Kennedy, Co-Chair, President's Information Technology Advisory Committee (PITAC); Dr. Neal Lane, Assistant to the President for Science and Technology Policy and Director, Office of Science and Technology Policy; Dr. Joseph Bordogna, Deputy Director, National Science Foundation (NSF); Dr. Edward Lazowska, Professor and Chair, Computer Science and Engineering, University of Washington; and Dr. Joe Thompson, William L. Giles Distinguished Professor of Aerospace Engineering at Mississippi State University.

##### *Summary of hearing*

Dr. Kennedy summarized the findings and recommendations of PITAC's "Interim Report". He testified that the principal finding of the report was that over the last decade there has been a pro-

nounced shift in federal funding away from long-term, high-risk projects and toward short-term, applied research. The majority of this funding is confined to mission agencies. He noted that while there has been explosive growth in the size of the information technology (IT) endeavor as a proportion of the economy, federal funding has grown at about the rate of inflation. In addition to its economic importance, IT is also critical to solving problems in business, science, medicine and education. It is PITAC's view that the shift away from fundamental research needs to be reversed if we are to preserve the Nation's economic leadership in the coming decade.

Dr. Kennedy said that reallocating existing resources, while tempting, will not solve the problem and take away from important national needs. Moreover, he noted how difficult it is for start-up companies to find money for fundamental research. To address this problem, PITAC proposes increasing the IT budget to \$2 billion over the next five years. The PITAC "Interim Report" summarizes a number of areas that would benefit from this increased support. These include: secure, robust, and reliable software; scaleable information infrastructure; and high-end computing and communications. The report also recommends funding for the sociological and economic impacts and workforce impacts of IT and calls for a new management structure and funding strategies to coordinate current and new programs.

Dr. Kennedy also spoke to the growth in scaleable parallel computation. He said that this strategy has many problems, and that these problems cannot be solved simply by purchasing more supercomputers. Although he would support a program to replicate the Department of Energy's Advanced Strategic Computing Initiative (ASCI) for use in civilian science, such investments should be accompanied by greater investments in software and architectures to make these machines usable across a wide array of applications. He concluded his testimony by emphasizing that PITAC believes that increasing investment in IT R&D, with an emphasis on fundamental research, is the best way to ensure that the benefits of the information revolution will be enjoyed by the Nation in the decades to come.

Dr. Lane began his testimony by noting that the nation's security, health care, education, and environment all depend on our ability to master the power of IT. However, IT is an industry that requires constant innovation. The rate of change is linked to the ability of businesses to invest in new products, and these innovations are tightly linked to IT research begun decades earlier. In addressing the PITAC "Interim Report", Dr. Lane said that it concludes that we need to increase overall federal support for IT and that we need to manage the effort in a way to take advantage of opportunities when they arise. He said that the Administration agrees with many of PITAC's findings and is working to address their recommendations. Under the Office of Science and Technology Policy (OSTP), an interagency team has been assembled to respond to PITAC's advice. He noted that OSTP was able to build on the foundation of interagency coordination that began with the High-Performance Computing and Communication Program. During the coming months, this group would develop a plan that the President

can bring forward with his budget request. Dr. Lane said that the research problems facing IT are unique and that the interagency group will draw on its management experience in considering new approaches to IT research.

Dr. Bordogna said that the U.S.'s commanding lead in IT was the result of a partnership among government, industry, and academia. Resting on our laurels, however, is not a viable option. R&D conducted by private firms is almost entirely focused on products and activities that yield short-term payoffs. The PITAC report sets out a plan for more long-term research and recommends that NSF play a lead coordinating role. Dr. Bordogna said that NSF can and should play a strong role, but contended that any IT partnership could only proceed through consensus, trust, and close cooperation among participating agencies. He outlines three priorities for NSF in IT: (1) fundamental, high-risk research, including software, scaleable infrastructure, and high-end computing; (2) competitive access to high-end computing and networking; and (3) education at all levels.

Dr. Lazowska testified that IT is more than high-performance computing. He said that the Science Committee has demonstrated an awareness of four things: (1) computing enables all of science and engineering; (2) sustaining the Nation's science effort requires more than just buying hardware and cable—investment in computing and computational research is needed; (3) there is more to IT than enabling other fields of study—computing science and engineering are disciplines of their own; and (4) a broad-based research program is required to support these other goals. What the PITAC report says is that to advance computer science, engineering, and communications requires investment in research in those areas closely coupled to the demands of applications. He said that the PITAC has five bottom-line messages: (1) leadership in IT is critical; (2) the return on past IT research has been spectacular; (3) current Federal support for IT is inadequate; (4) there is too much focus on short-term problems; and (5) critical problems are going unsolved. Dr. Lazowska also supports the report's proposals for a balanced research program. He pointed to the importance of software research, which featured in the PITAC report, and endorsed further research in the other areas identified in the report: scaleable information infrastructure; high-end computing; and socio-economic and workforce impacts. He closed his testimony by noting that the best in IT is yet to come and that, considering the impact of IT on the economy and science, increased federal funding is justified.

Dr. Thompson also endorsed the PITAC "Interim Report" and made two general points: (1) we have neglected to fund software research to the same degree as we fund hardware acquisitions; and (2) we are reaping the fruits of last decade's research while we have neglected research this decade. He noted that high-end computing is not only being used by government and academia; industry is now a big user, with 162 of the top 500 supercomputing sites now being at industrial locations. He added that we cannot allow other nations to exceed our capabilities and that more powerful machines do not increase capability proportionally until software suitable to the hardware is developed. Current software develop-

ment models, which are labor-intensive and prone to error, are no longer adequate. PITAC describes software as the new physical infrastructure of the information age, and Dr. Thompson said that it is among the most complex of human engineered structures.

Dr. Thompson also supported PITAC's suggestion that NSF take a lead role in a multi-agency effort, but said that, because of the multi-disciplinary nature of much of the research, NSF may have to make adjustments. One suggestion he offered was that NSF require individual investigators to associate a proposed research project with a relevant research center, similar to the associates research program of the National Research Council. High-bandwidth connectivity of universities, regardless of location, is also critical to the national research effort and to match efforts overseas. Increased funding for graduate assistantships in IT was also proposed. In concluding, Dr. Thompson said that IT now constitutes fundamental infrastructure, noting that, "Never has such a particular area of research been so critical to the nation in such a fundamental and pervasive way."

*4.2(o)—Domain Name Systems, Parts I and II (Transferring the Domain Name System to the Private Sector: Private Sector Implementation of the Administration's Internet "White Paper")*

*October 7, 1998*

*Hearing Volume No. 105-78*

#### *Background*

On October 7, 1998, the Subcommittee on Basic Research and the Subcommittee on Technology held the second of two joint hearings entitled, "Domain Name Systems, Parts I and II," to focus on the Administration's "White Paper" proposal and how to transfer the Internet's Domain Name System (DNS) from public sector control to private sector control. Specifically, the hearing focused on two issues: (1) an examination of the National Science Foundation and the Commerce Department's involvement in the transition process, and (2) an examination of private sector initiatives to implement the details of the White Paper by establishing a non-profit corporation that, if found acceptable to the U.S. Government under guidelines spelled out in the White Paper, would assume responsibility for the management of the Internet's DNS system.

The National Science Foundation, which has managed part of the DNS since its inception, and most recently through a cooperative agreement with Network Solutions' Inc., is in the process of transferring its authority over the DNS to the Department of Commerce. According to NSF's interpretation of the Administration's White Paper, the Commerce Department will have full legal authority over the DNS throughout the proposed two-year period during which the DNBS will be transferred to a private sector nonprofit entity.

Witnesses included: The Honorable J. Beckwith Burr, Associate Administrator, National Telecommunications and Information Administration, Office of International Affairs, U.S. Department of Commerce; Gabriel Battista, CEO of Network Solutions Inc.; Mr. Joe Sims, Representing Internet Assigned Numbers Authority; and

Dr. Tamar Frankel, Moderator, International Forum on the White Paper and Professor of Law, Boston University Law School.

*Summary of hearing*

Beckwith Burr from the National Telecommunications and Information Administration opened her testimony by giving a status report on the five tasks that the U.S. government has undertaken to fulfill its obligations outlined in the Administration's White Paper. First, the USG has started to ramp down the cooperative agreement with Networks Solutions, Inc. by signing a detailed agreement with NSI on October 6, 1998. Secondly, the US government has received from the private sector, as required by the White Paper, a proposed charter and by-laws of a non-profit corporation to accept responsibility for managing the DNS. The new corporation is known as the "Internet Corporation for Assigned Names and Numbers" (ICANN). Third, the USG has asked the World Intellectual Property Organization (WIPO) to develop recommendations concerning the issues involving trademarks and the DNS. Fourth, the USG will continue to meet with members of the Internet community to discuss the evolution of the Internet. Fifth, the USG has organized an executive branch group to discuss the security issues concerning the Internet's root server system. According to Ms. Burr, significant progress has been made over the past few months, and NTIA is confident that shortly the USG will be able to recognize the authority of a private sector entity and transfer to it the responsibility of managing the Internet's DNS.

Mr. Battista, the CEO of Network Solutions Inc. opened his testimony by stating that the White Paper is a bold step towards global corporate governance of the Internet. He added, however, that the process is an experiment and should be carefully overseen. Mr. Battista went on to outline NSI's activities as part of the International Forum on the White Paper, its negotiations with IANA and its activities with the USG, specifically the Department of Commerce. Under the agreement with the Commerce Department, the NSI cooperative agreement would be extended for two more years and NSI would allow for other companies to register. COM domain names independent of NSI by June 1, 1999. In addition, the agreement also stipulated that NSI will assist WIPO in creating a database to assist the trademark community in domain name/trademark searched and NSI would also continue to manage the Internet's root server system. Finally, when it is established, NSI will enter negotiations with ICANN. Mr. Battista closed his testimony by stating that NSI is proud of its involvement with the Internet and is committed to ensuring its stability.

Mr. Sims, representing John Postel of the Internet Assigned Numbers Authority (IANA), opened his testimony by stating that, as expected, the process up to this point has been somewhat chaotic. He stated that the ICANN proposal that was filed with the NTIA on October 2, 1998 is fully responsive to the guidelines put forth in the White Paper. In support of that premise, Mr. Sims argued that the proposed Board of Directors for the corporation has international representation, the corporation's by-laws allow for separate supporting organizations to address issues of names, numbers and protocols, and allow for a process for electing a permanent

board. In addition, Mr. Sims argued that the by-laws allow for open and transparent decision-making process and also include provisions prohibiting government representation on the board of directors. He stated that this is a critical first step in the process. Mr. Sims closed his testimony by recognizing the leading role of Dr. Jon Postel, the Director of IANA, who could not attend due to heart surgery.

Professor Frankel from Boston University School of Law, the moderator of the International Forum on the White Paper (IFWP), opened her testimony by stating that creating the ICANN corporation has been difficult because the Internet community is extremely diverse. She then described the International Forum on the White Paper process. The IFWP held a series of meetings throughout the summer to discuss the transfer of the DNS to a private sector entity. Meetings were held in Virginia, Geneva, Singapore and Argentina. These meetings produced competing proposals, one of which is the ICANN proposal. Professor Frankel stated that she has a few concerns about the ICANN proposal. Her main concern was about accountability. As presently written, ICANN is not a “membership” organization, so the board of directors has no membership to be accountable to, though it is accountable to the Attorney General of California. She was also concerned about the decision to incorporate the ICANN in California. She closed her testimony by stating that the Internet community has demonstrated a remarkable achievement, but that this is only a beginning and that the ICANN will need to build public trust in order to succeed.

#### 4.3—SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

##### *4.3(a)—Fiscal Year 1998 Budget Authorization Request: Department of Energy—Office of Energy Research and DOE Management of Major System Acquisitions*

*March 6, 1997*

*Hearing Volume No. 105–30*

##### *Background*

On March 6, 1997, the Subcommittee on Energy and Environment held a hearing entitled, “Fiscal Year 1998 Budget Authorization Request: Department of Energy (DOE)—Office of Energy Research and DOE Management of Major System Acquisitions,” to hear testimony on the justification of the DOE’s FY 1998 budget request. This hearing also reviewed the management practices of DOE with regard to their major system acquisitions and the status of these major system acquisitions.

Witnesses included: Dr. Martha A. Krebs, Director, Office of Energy Research, U.S. Department of Energy; and Mr. Victor S. Rezendes, Director, Resources, Community, and Economic Development Division, U.S. General Accounting Office (GAO).

##### *Summary of hearing*

Dr. Krebs testified on the DOE’s FY 1998 Energy Research (ER) budget request of \$2,536,991,000—an increase of \$71,597,000, or 2.9 percent, above the FY 1997 comparable appropriation of

\$2,465,394,000—for ER programs, including Biological and Environmental Research, Fusion Energy Sciences, Basic Energy Sciences, Computational and Technology Research, Energy Research Analysis, Energy Research-Energy Supply R&D Program Direction, High Energy and Nuclear Physics, and General Science Program Direction. Mr. Rezendes testified on the results of a November 26, 1996 GAO report entitled “Department of Energy: Opportunity to Improve Management of Major System Acquisitions” (GAO/RCED-97-17, Nov. 26, 1996), which addressed (1) DOE’s performance in completing its major system acquisitions; (2) the key factors that hinder the timely, cost-effective, completion of the acquisitions; and (3) what is being done to improve DOE’s performance.

*4.3(b)—Fiscal Year 1998 Budget Authorization Request:  
Environmental Protection Agency Research and Development*

*March 11, 1997*

*Hearing Volume No. 105-23*

*Background*

On March 11, 1997, the Subcommittee on Energy and Environment held a hearing entitled, “Fiscal Year 1998 Budget Authorization Request: Environmental Protection Agency Research and Development,” to hear testimony providing justification for EPA’s Research and Development FY 1998 budget request. This hearing also reviewed the peer review practices of EPA. Portions of the EPA budget under the jurisdiction of the Subcommittee on Energy and Environment include the Science Advisory Board (in Environmental Programs and Management), Science and Technology, Superfund R&D, Leaking Underground Storage Tank (LUST) R&D, and Oil Spills Response R&D.

Witnesses included: Mr. Joseph K. Alexander, Deputy Assistant Administrator for Research and Development, U.S. Environmental Protection Agency (EPA); Dr. Mark A. Harwell, Chairman, Ecological Processes and Effects Committee, EPA Science Advisory Board (SAB); and Mr. Stanley J. Czerwinski, Associate Director, Resources, Community and Economic Development Division, U.S. General Accounting Office (GAO).

*Summary of hearing*

Mr. Alexander testified on EPA’s FY 1998 R&D budget request of \$658.2 million—an increase of \$67 million, or 11.3 percent, above the FY 1997 enacted level—and on the Agency’s recently implemented new peer-review procedures to ensure that peer review becomes an integral part of EPA R&D. Dr. Harwell testified on the activities of the SAB, and noted that while the SAB does advise the EPA on the President’s budget with regard to the Office of Research and Development, it had not yet studied the FY 1998 budget request. Mr. Czerwinski discussed the EPA’s implementation of their peer review policy, and stated that the GAO found that EPA continued to implement peer review unevenly.

*4.3(c)—The Science Behind the Environmental Protection Agency's  
(EPA's) Proposed Revisions to the National Ambient Air Quality  
Standards for Ozone and Particulate Matter, Parts I–III*

*March 12, 1997*

*Hearing Volume No. 105–21*

*Background*

On March 12, 1997, the Subcommittee on Energy and Environment held the first in a series of three hearings entitled, “The Science Behind the Environmental Protection Agency’s (EPA’s) Proposed Revisions to the National Ambient Air Quality Standards for Ozone and Particulate Matter, Parts I–III” to hear testimony on the scientific justification for EPA’s proposed standards for ozone and particulate matter levels.

Witnesses included: Dr. Joe L. Mauderly, Chairman, Clean Air Scientific Advisory Committee (CASAC), Director of External Affairs, Lovelace Respiratory Research Institute; Dr. George T. Wolff, CASAC, Principal Scientist, General Motors Environmental and Energy Staff; Dr. Morton Lippmann, CASAC, Professor of Environmental Medicine, Institute of Environmental Medicine, New York University Medical Center; and Mr. Daniel S. Greenbaum, President, Health Effects Institute.

*Summary of hearing*

Drs. Mauderly, Wolff, and Lippmann, all members of CASAC, supported the EPA’s proposal to replace the current one-hour ozone standard with an eight-hour standard. Dr. Mauderly stated that this change is founded largely on information indicating that multiple-hour exposures below the current standard can affect lung function and symptoms in children and adults exercising outdoors. Regarding particulate matter (PM), CASAC strongly recommended that EPA immediately implement a targeted research program to address any unanswered questions and uncertainties with PM. The three witnesses agreed that a five-year study on PM would be beneficial. Mr. Greenbaum, President of the Health Effects Institute (HEI)—a non-profit corporation whose mission is “to provide public and private decision-makers with high-quality, impartial, and relevant science on the health effects of pollutants from motor vehicles and other sources in the environment”—testified on the HEI Particle Epidemiology Evaluation Project, which had reanalyzed key epidemiological studies used as part of the scientific basis for EPA’s particulate matter standards.

*4.3(d)—Fiscal Year 1998 Budget Authorization Request: National Oceanic and Atmospheric Administration (NOAA) and H.R. 437, The Marine Revitalization Act of 1997*

*March 13, 1997*

*Hearing Volume No. 105–18*

*Background*

On March 13, 1997, the Subcommittee on Energy and Environment held a hearing entitled, “Fiscal Year 1998 Budget Authorization Request: National Oceanic and Atmospheric Administration (NOAA) and H.R. 437, The Marine Revitalization Act of 1997,” to hear testimony on the justification of NOAA’s FY 1998 budget request and reauthorization of the Sea Grant program.

Witnesses included: Panel 1—Dr. D. James Baker, Administrator, NOAA, and Under Secretary, Oceans and Atmosphere, U.S. Department of Commerce; and Panel 2—Mr. Frank DeGeorge, Inspector General, U.S. Department of Commerce; and Mr. Joel Willemsen, Director, Accounting and Information Management Division, U. S. General Accounting Office (GAO).

*Summary of hearing*

Dr. Baker testified on NOAA’s FY 1998 budget request of \$2,051.2 million—an increase of \$78.5 million, or 4 percent, above the FY 1997 level—for NOAA programs, including the National Ocean Service, Ocean and Atmospheric Research Service, National Weather Service, and National Environmental Satellite, Data, and Information Service.

Mr. DeGeorge’s testimony focused on the NOAA Fleet and Corps, the Polar and Geostationary satellite programs, the National Weather Service’s modernization program, and the proposed NOAA facility at Goddard Space Flight Center in Greenbelt, Maryland.

Mr. Willemsen testified on the preliminary findings of the ongoing GAO work relating to the National Weather Service’s Advanced Weather Interactive Processing System (AIWPS), and recent GAO reports concerning NOAA’s Geostationary Operational Environmental Satellite (GOES) system and the NOAA Commissioned Corps.

*4.3(e)—FY 1998 Budget Request: Department of Energy, Fossil Energy R&D, Clean Coal Technology Program, and Energy Efficiency and Renewable Energy, and, H.R. 363, to amend section 2118 of the Energy Policy Act of 1992 to Extend the Electric and Magnetic Fields Research and Public Information Dissemination Program*

*March 19, 1997*

*Hearing Volume No. 105–72*

*Background*

On March 19, 1997, the Subcommittee on Energy and Environment held a hearing entitled, “FY 1998 Budget Request: Department of Energy, Fossil Energy R&D, Clean Coal Technology Pro-

gram, and Energy Efficiency and Renewable Energy, and, H.R. 363, to amend section 2118 of the Energy Policy Act of 1992 to extend the Electric and Magnetic Fields Research and Public Information Dissemination Program,” to hear testimony on the justification of DOE’s FY 1998 budget requests and the extension of the Electric and Magnetic Fields Research program.

Witnesses included: Panel 1—the Honorable Patricia Fry Godley, Assistant Secretary for Fossil Energy, U.S. Department of Energy; Panel 2—the Honorable Christine A. Ervin, Assistant Secretary, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy; and Panel 3—Dr. Paul Gilman, Executive Director, Commission on Life Sciences, National Research Council, National Academy of Sciences, and Mr. Charles J. Boeggeman, Senior Engineer, PECO Energy (representing Edison Electric Institute, American Public Power Association, National Rural Electric Cooperative Association, and National Electrical Manufacturers Association).

*Summary of hearing*

Ms. Godley testified on DOE’s Fiscal Year (FY) 1998 Fossil Energy Research and Development budget request of \$346.41 million—a decrease of \$18.30 million, 5 percent, below the FY 1997 comparable appropriations—and on the Clean Coal Technology Program, which has been appropriated at \$2.425 billion as of FY 1997.

Ms. Ervin testified on DOE’s FY 1998 Energy Efficiency and Renewable Energy budget request of \$774.627 million—an increase of \$155.605 million, or 25.1 percent, above the FY 1997 appropriated level of \$619.022 million—which included the Solar and Renewable Resources Technologies and Energy Conservation Research and Development Programs.

Dr. Gilman and Mr. Boeggeman testified on the Electric and Magnetic Fields (EMF) Research and Public Information Dissemination Program. With regard to H.R. 363, Dr. Gilman testified that the extension should continue until 1999, while Mr. Boeggeman testified that an extension of one additional year would be adequate.

*4.3(f)—Fiscal Year 1998 Budget Authorization Request: Department of Energy (DOE)—Nuclear Energy; Environment, Safety and Health; and Environment Restoration and Waste Management (Non-Defense)*

*March 20, 1997*

*Hearing Volume No. 105-61*

*Background*

On March 20, 1997, the Subcommittee on Energy and Environment held a hearing entitled, “Fiscal Year 1998 Budget Authorization Request: Department of Energy—Nuclear Energy; Environment, Safety and Health; and Environment Restoration and Waste Management (Non-Defense),” to hear testimony on the justification of DOE’s FY 1998 budget request.

Witnesses included: Dr. Terry R. Lash, Director, Office of Nuclear Energy, Science and Technology, U.S. Department of Energy; Mr. Peter N. Brush, Principal Deputy Assistant Secretary for Envi-

ronment, Safety and Health, U.S. Department of Energy; and, Mr. James M. Owendoff, Acting Principal Deputy Assistant Secretary for Environmental Management, U.S. Department of Energy.

*Summary of hearing*

Dr. Lash testified on DOE's FY 1998 Nuclear Energy budget request of \$330.667 million—an increase of \$87.798 million, or 36.2 percent, above the FY 1997—for programs including Light Water Reactor, Advanced Radioisotope Power Systems, Oak Ridge Landlord, Test Reactor Area Landlord, Advanced Test Reactor Fusion Irradiations, University Nuclear Science and Reactor Support, Termination Costs, Uranium Programs, Isotope Support, and Program Direction.

Mr. Brush testified on DOE's FY 1998 Environment, Safety and Health (Non-Defense) budget request of \$108.916 million—a decrease of \$937,000, or 0.9 percent, below the FY 97 comparable appropriation of \$109.853 million—which included funding for the Technical Assistance, Policy, National Energy Policy Act, Health Studies and Management and Administration programs, and a Program Direction decision unit for all ES&H employees.

Mr. Owendoff testified on DOE's FY 1998 Environmental Restoration and Waste Management (Non-Defense) budget request of \$684.684 million—an increase of \$91.638 million, or 15.5 percent, above the FY 1997 comparable appropriation of \$597.891 million—for the Environmental Restoration, Waste Management, and Nuclear Materials and Facility Stabilization programs.

*4.3(g)—Fiscal Year 1998 Budget Authorization Request: Department of Energy (DOE), Environmental Protection Agency (EPA) Research & Development, and National Oceanic and Atmospheric Administration (NOAA)*

*April 9, 1997*

*Hearing Volume No. 105-17*

*Background*

On April 9, 1997, the Subcommittee on Energy and Environment held a hearing entitled, "Fiscal Year 1998 Budget Authorization Request: Department of Energy (DOE), U.S. Environmental Protection Agency (EPA) Research and Development, and National Oceanic and Atmospheric Administration" to hear non-government testimony on the justification of all of these FY 1998 budget requests.

Witnesses included: Panel 1—Mr. Fred L. Smith, Jr., President and Founder, Competitive Enterprise Institute; Ms. Anna Aurilio, Staff Scientist, U.S. Public Interest Research Group (U.S. PIRG); Dr. David Baldwin, Senior Vice President, General Atomics; Mr. Ralph DeGennaro, Executive Director, Taxpayers for Common Sense; Mr. Scott Sklar, Solar Unity Network; and Mr. Aris Melissaratos, Vice President, Science, Technology, and Quality Division Westinghouse Electric Corporation; and Panel 2—Mr. Jerry Taylor, Director, Natural Resource Studies Division, CATO Institute; Mr. Michael S. Leavitt, Commercial Weather Services Association; Mr. David R. Smith, Secretary-Treasurer, National Weather Service Employees Organization; Dr. Christopher F. D'Elia, Di-

rector, Maryland Sea Grant College Program, University of Maryland; and Dr. James J. Sullivan, Director, California Sea Grant College System, University of California.

*Summary of hearing*

Panel 1—Mr. Smith, Ms. Aurilio, Mr. DeGennaro and Mr. Taylor stated their views on the government subsidization of industries. Ms. Aurilio also testified against nuclear and fossil energy R&D funding, and supported the EPA funding request. Mr. DeGennaro added that the government should eliminate all energy subsidies and the Department of Energy.

Dr. Baldwin testified that energy research and development funding is needed on a broad front and that all types of energies—renewable, nuclear, and fossil—will be utilized in the future. Mr. Sklar recommended that in order for new technology to succeed, the government should cost share with the companies that have the new technology. Mr. Melissaratos testified on behalf of DOE's Advanced Turbine System and the Advanced Concept Tubular Solid Oxide Fuel Cell Programs, which are intended to advance the state-of-the-art of fossil fuel power generation.

Panel 2—Mr. Leavitt testified on the National Weather Service (NWS), and stated that NWS's emphasis should be on fulfilling its core mission of collecting and archiving raw data and providing severe weather warnings. Mr. Smith stated that the Administration's FY 1998 NWS budget request was inadequate. And Drs. D'Elia and Sullivan both testified on behalf of the reauthorization of the National Sea Grant College Program.

*4.3(h)—The Science Behind the Environmental Protection Agency's (EPA's) Proposed Revisions To The National Ambient Air Quality Standards For Ozone and Particulate Matter, Parts I-III*

*May 7, 1997*

*Hearing Volume No. 105-21*

*Background*

On May 7, 1997, the Subcommittee on Energy and Environment held the second in a series of three hearings entitled, "The Science Behind the Environmental Protection Agency's (EPA's) Proposed Revisions to the National Ambient Air Quality Standards for Ozone and Particulate Matter, Parts I-III" to hear testimony on the scientific justification of the EPA's proposed standards for ozone and particulate matter levels and EPA's PM and ozone research programs.

Witnesses included: Dr. Joseph M. Norbeck, Director of the Bourns College of Engineering, University of California-Riverside; Ms. Lynn Terry, Assistant Executive Officer, California Air Resources Board; Mayor Carl E. Krentz, Mayor of La Porte, IN; and Mr. Mark T. Maassel, Vice President of Marketing and Sales, NIPSCO Industries.

*Summary of hearing*

All four witnesses expressed their belief that more study is needed and that EPA's decision to establish new standards was pre-

mature. Dr. Norbeck expressed his view that the science on which the new standards are based is inconclusive and is not adequate to proceed with promulgating the new standards, and supported more study of fine particulate matter and ozone.

Ms. Terry voiced her concern about the addition of PM<sub>2.5</sub> monitoring stations around the nation and the burden of funding for these new stations.

Mayor Krentz testified that with these new standards the city of LaPorte, as well as other cities across the U.S., will be in non-attainment, and could cause some cities to lose the potential for economic growth.

Mr. Maassel noted that establishing these new standards would create more non-attainment areas—thereby forcing companies to locate to adjacent rural areas with resulting urban sprawl—and could also jeopardize current voluntary programs designed to meet and maintain attainment status.

*4.3(i)—The Science Behind the Environmental Protection Agency's (EPA's) Proposed Revisions To The National Ambient Air Quality Standards For Ozone and Particulate Matter, Parts I-III*

*May 21, 1997*

*Hearing Volume No. 105-21*

*Background*

On May 21, 1997, the Subcommittee on Energy and Environment held the last in a series of three hearings entitled, “The Science Behind the Environmental Protection Agency’s (EPA’s) Proposed Revisions to the National Ambient Air Quality Standards for Ozone and Particulate Matter, Parts I-III” to focus on the science behind the Environmental Protection Agency’s (EPA) recent proposals for new National Ambient Air Quality Standards (NAAQS) for ozone and particulate matter (PM). The Subcommittee heard testimony from the Honorable Carol Browner, Administrator of the U.S. Environmental Protection Agency.

*Summary of hearing*

Ms. Browner testified that “the standard-setting process includes extensive scientific peer review from experts outside of EPA and the Federal Government. Based on our reading of the best available science, I have proposed new standards for particulate matter and ozone that I believe are required to protect the health of the American people.” She also stated that “at this point we have only proposed revisions to the standards for these two pollutants and we are reviewing comments on them” and that she did “not intend to make a final decision until comments on all of those alternative options have been carefully considered.” She also said that “throughout the three-and-a-half year process of developing our proposed standards, we have remained committed to analyzing the science in an open public forum and ensuring broad public input.”

*4.3(j)—S. 417, To extend energy conservation programs under the Energy Policy and Conservation Act through September 30, 2002*

*July 31, 1997*

*Hearing Volume No. 105–44*

*Background*

On July 31, 1997, the Subcommittee on Energy and Environment held a hearing entitled, “S. 417, To extend energy conservation programs under the Energy Policy and Conservation Act through September 30, 2002.” The hearing focused on subsections 1(7), 1(8), 1(9), 1(11) and Section 3 of S. 417, as passed by the Senate on June 27, 1997.

Witnesses included: Dr. Allan R. Hoffman, Acting Deputy Assistant Secretary, Office of Utility Technologies, U.S. Department of Energy; Mr. William H. Peerenboom, Vice President, ATA Foundation; and Mr. David Nemtzow, President, Alliance to Save Energy.

*Summary of hearing*

Dr. Hoffman stated that the Administration strongly supported reauthorization of the Committee on Renewable Energy Commerce and Trade (CORECT) and the Committee on Energy Efficiency Commerce and Trade (COEECT) programs.

Mr. Peerenboom expressed support for the Alternative Fuel Truck Commercial Applications Program, and Mr. Nemtzow addressed the Committee on Energy Efficiency Commerce and Trade (COEECT) Program.

*4.3(k)—Preparing for El Niño*

*September 11, 1997*

*Hearing Volume No. 105–29*

*Background*

On September 11, 1997, the Subcommittee on Energy and Environment held a hearing entitled, “Preparing for El Niño.” The hearing focused on the state of the science regarding the forecasting of El Niño, the potential U.S. impacts of this most recent El Niño event—expected to be the most severe since the El Niño of 1982–1983, and ways in which federal and state agencies are preparing to reduce these impacts.

Witnesses included: Panel 1—Dr. J. Michael Hall, Director, Office of Global Programs, National Oceanic and Atmospheric Administration (NOAA); Dr. Tim Barnett, Research Marine Physicist, Scripps Institution of Oceanography; and Dr. Andrew R. Solow, Director, Marine Policy Center, Woods Hole Oceanographic Institute; and Panel 2—Mr. Michael Armstrong, Associate Director, Office of Mitigation, Federal Emergency Management Administration (FEMA); Dr. I. Miley Gonzalez, Under Secretary for Research, Education, and Economics, U.S. Department of Agriculture (USDA); and Mr. Douglas P. Wheeler, Secretary for Resources, State of California.

*Summary of hearing*

Panel 1—Dr. Hall of NOAA testified on NOAA’s climate and El Niño-related research programs. Dr. Barnett testified on the economic analyses and recent experience with prolonged weather-related extremes which, he said, demonstrated the significant social and economic benefits associated with the development and application of new capabilities to forecast climate conditions up to a year in advance. Dr. Solow estimated the value of the El Niño prediction to U.S. agriculture to be \$300–\$400 million per year.

Panel 2—Mr. Armstrong testified on the readiness of FEMA and the Federal Government to combat the impacts of El Niño. Dr. Gonzalez testified about U.S. Department of Agriculture (USDA) collaboration with NOAA and how the USDA was attempting to provide improved El Niño forecasts to its customers for better decision-making. Mr. Wheeler testified about the State of California’s preparations for El Niño, which included improving emergency response coordination and operation, and improving and expanding existing flood data.

*4.3(l)—Countdown to Kyoto, Parts I–III (Countdown to Kyoto, Part I: The Science of the Global Climate Change Agreement)*

*October 7, 1997*

*Hearing Volume No. 105–46 (Vol. I and II)*

*Background*

On October 7, 1997, the Subcommittee on Energy and Environment held the first in a series of three hearings entitled, “Countdown to Kyoto, Parts I–III,” to hear testimony on the state of understanding of the science of global climate change and the ability to predict the impacts of various climate change policies on the global climate, the uncertainties inherent in such predictions, and further research efforts required to reduce these uncertainties. A particular focus of the hearing was on potential global climate agreements that may be considered at the meeting of the Third Conference of Parties to the United Nations Framework Convention Climate Change to be held in Kyoto, Japan, December 1–10, 1997.

Witnesses included: Dr. Roy W. Spencer, Senior Scientist for Climate Studies, NASA Marshall Space Flight Center; Dr. Alan Robock, Professor, Department of Meteorology, University of Maryland; Dr. Aristides A. Patrinos, Associate Director of Energy Research and Director, Office of Biological and Environmental Research; and Dr. Ronald G. Prinn, TEPCO Professor of Atmospheric Chemistry and Director, Center for Global Change Science, Massachusetts Institute of Technology.

*Summary of hearing*

Dr. Spencer testified on the uncertainties of current climate models and their predictions of global warming. Dr. Robock stated his support for the conclusions of the 1995 Intergovernmental Panel on Climate Change (IPCC) Working Group I report that “the balance of evidence suggests that there is a discernible human influence on

global climate,” and recommended that the current response to the threat of global warming be one of adaptation, improved knowledge, and mitigation. Dr. Patrinos testified on the science of climate change, and, in particular, the current status of large-scale climate models. Dr. Prinn testified that current climate models cannot realistically simulate natural climate changes; that small-scale features like clouds are not individually resolved in these models because the computational demands involved in these simulations already tax the capabilities of the world’s largest computers; and that our knowledge about the relevant physical, chemical, or biological processes is incomplete.

*4.3(m)—Countdown to Kyoto, Parts I–III*

*October 9, 1997*

*Hearing Volume No. 105–46 (Vol. I and II)*

*Background*

On October 9, 1997, the Subcommittee on Energy and Environment held the second in a series of three hearings entitled, “Countdown to Kyoto, Parts I–III,” to hear testimony on the state of understanding of the economics of global climate change and the ability to predict the impacts of various climate change policies on the U.S. economy, the uncertainties inherent in such predictions and further research efforts required to reduce these uncertainties. A particular focus of the hearing was on potential global climate agreements that may be considered at the meeting of the Third Conference of Parties to the United Nations Framework Convention Climate Change to be held in Kyoto, Japan, December 1–10, 1997.

Witnesses included: Dr. W. David Montgomery, Vice President, Charles River Associates; Mr. Marc W. Chupka, Acting Assistant Secretary for Policy and International Affairs, U.S. Department of Energy; Dr. Joseph J. Romm, Acting Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy; Mr. Michael Buckner, Research Director, United Mine Workers of America; and Dr. Stephen J. DeCanio, Professor of Economics, University of California-Santa Barbara.

*Summary of hearing*

Dr. Montgomery testified that the proposals currently being discussed in the climate negotiations could have major negative economic impacts on the countries of the world, including the United States, and that non-participating countries could gain a competitive advantage. Mr. Chupka and Dr. Romm discussed two recent climate change reports sponsored by the Department of Energy (“Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy Technologies by 2010 and Beyond and The Impact of High Energy Price Scenarios on Energy-Intensive Sectors: Perspectives from Industry Workshops”). Mr. Buckner testified on the results of a DRI/McGraw Hill economic forecast that projected severe economic consequences for the U.S. if greenhouse gas emissions were reduced to 1990 levels by 2010. And, Dr. DeCanio testified on the problems of climate change, and its science and economics.

*4.3(n)—Countdown to Kyoto, Parts I–III**November 6, 1997**Hearing Volume No. 105–46 (Vol. I and II)**Background*

On November 6, 1997, the Subcommittee on Energy and Environment held the last in a series of three hearings entitled, “Countdown to Kyoto, Parts I–III,” to hear testimony to examine the President’s proposed negotiating stance—including scientific, economic, and policy considerations—for the upcoming meeting of the Third Conference of Parties” (COP) to the United Nations Framework Convention on Climate Change to be held in Kyoto, Japan, December 1–10, 1997.

Witnesses included: Senator Joseph Lieberman (D–CT); Mr. Marc W. Chupka, Acting Principal Deputy Assistant, Secretary for Policy and International Affairs, U.S. Department of Energy; Mr. Fred L. Smith, Jr., President and Founder, Competitive Enterprise Institute; Dr. Robert T. Watson, Chairman, Intergovernmental Panel on Climate Change; and Dr. Patrick J. Michaels, Professor of Environmental Sciences, University of Virginia.

*Summary of hearing*

Senator Lieberman testified that—in his opinion—global warming is not a myth, and supported President Clinton’s efforts to reduce greenhouse gas emissions worldwide through a balanced and enforceable global treaty. Mr. Chupka described the President’s climate change proposal to reduce greenhouse emissions to 1990 levels by the 2008–2012 time period. Mr. Smith reviewed the science of global warming, its economic impacts and politics, and challenged the Administration’s plan. Dr. Watson testified that human-induced climate change is inevitable, and that unless action is taken, such change could result in an increase of vector-borne diseases, a sea level rise of approximately one meter, and a significant disruption to ecological systems. Dr. Michaels testified on the climatic affects of the President’s proposal to reduce greenhouse gas emissions to 1990 levels, and said that if the entire world accepted the President’s program, the amount of saved warming over the next 50 years would be 0.13 degrees Celsius—an amount so small that it could not be measured by surface thermometers.

*4.3(o)—DOE FY 99 Budget Authorization Request; H.R. 1806, To Provide For The Consolidation Of The DOE Offices Of Fossil Energy, Renewable Energy, And Energy Efficiency; S. 965, To Amend Title II Of The Hydrogen Future Act of 1996*

*February 25, 1998**Hearing Volume No. 105–52 (Vol. I and II)**Background*

On February 25, 1998, the Subcommittee on Energy and Environment held a hearing entitled, “DOE FY 99 Budget Authorization Request; H.R. 1806, To Provide For The Consolidation Of The

DOE Offices Of Fossil Energy, Renewable Energy, And Energy Efficiency; S. 965, To Amend Title II Of The Hydrogen Future Act of 1996” to focus on the Department of Energy’s (DOE’s) Fiscal Year (FY) 1999 budget authorization request for the DOE programs under the jurisdiction of the Committee on Science. In addition, the Subcommittee received testimony on H.R. 1806 and S. 965.

Witnesses included: Dr. Martha A. Krebs, Director, Office of Energy Research, U.S. Department of Energy; Ms. Patricia Fry Godley, Assistant Secretary for Fossil Energy, U.S. Department of Energy; Mr. Dan W. Reicher, Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy; Mr. William D. Magwood, Associate Director, Policy and Analysis, Office of Nuclear Energy, Science and Technology, U.S. Department of Energy; Mr. Peter N. Brush, Acting Assistant Secretary for Environment, Safety and Health, U.S. Department of Energy; and Mr. James M. Owendoff, Acting Assistant Secretary for Environmental Management, U.S. Department of Energy.

*Summary of hearing*

Dr. Krebs testified that the DOE FY 1999 Budget Request is about \$2.7 billion, \$246 million above the 1998 appropriations, and that it includes initiation of the construction of the \$1.3-billion Spallation Neutron Source at the Oak Ridge National Laboratory. Ms. Godley testified that the major portion of the increase in the FY 1999 Budget for Fossil Energy is a project called Vision 21—a venture to develop a future energy concept that continues to use coal. Mr. Reicher presented the DOE’s FY 1999 Budget for the Office of Energy Efficiency and Renewable Energy (EERE) totaling about \$1.2 billion. Mr. Magwood described the \$325.8 million FY 1999 budget request for the Office of Nuclear Energy, Science & Technology. Mr. Brush spoke to the \$150 million FY 1999 budget request for the Office of Environment, Safety, and Health to be, a 6% reduction from the level of funding appropriated in FY 1998. Mr. Owendoff described the \$462 million FY 1999 budget request for the Non-Defense Environmental Management appropriation. In addition, Ms. Godley and Mr. Reicher spoke in opposition to H.R. 1806; and Mr. Reicher stated the DOE endorsed the concept of re-authorizing title II of the Hydrogen Future Act of 1996, as included in S. 965, but recommended inclusion of additional hydrogen production technologies such as wind, solar thermal, hydropower and land-fill gases as other potentially cost-effective approaches to be considered.

*4.3(p)—Fiscal Year 1999 Budget Request: NOAA*

*March 4, 1998*

*Hearing Volume No. 105-77*

*Background*

On March 4, 1998, the Subcommittee on Energy and Environment held a hearing entitled, “Fiscal Year 1999 Budget Authorization Request: National Oceanic and Atmospheric Administration” to hear testimony on the Administration’s fiscal year (FY) 1999 request for programs of the National Oceanic and Atmospheric Ad-

ministration (NOAA) under the jurisdiction of the Committee on Science. This hearing also reviewed the findings of a new GAO report covering the National Weather Service (NWS) “shortfall” during FY 1998 and an update on the NWS’s modernization program.

Witnesses included: Dr. D. James Baker, Under Secretary for Oceans and Atmosphere, U.S. Department of Commerce, and Administrator, National Oceanic and Atmospheric Administration; and Mr. Joel Willemsen, Director, Accounting and Information Management Division, U.S. General Accounting Office.

*Summary of hearing*

Dr. Baker testified that the total FY 1999 budget request for NOAA was \$2.116 billion, a net increase of \$123 million from FY 1998. Mr. Willemsen testified on the GAO’s work regarding updates on AWIPS problems and related Year 2000 computing concerns; on a report GAO issued last year on Weather Service coverage in the Erie, Pennsylvania area; and on the confusion on key events surrounding the Fiscal Year 1997 Weather Service budgets.

*4.3(q)—Fiscal Year 1999 EPA R&D Budget Authorization*

*March 11, 1998*

*Hearing Volume No. 105–48 (Vol. I and II)*

*Background*

On March 11, 1998, the Subcommittee on Energy and Environment held a hearing entitled, “Fiscal Year 1999 EPA R&D Budget Authorization” to focus on the Administration’s fiscal year (FY) 1999 request for Environmental Protection Agency (EPA) research and development (R&D) programs.

Witnesses included: Mr. Henry Longest, II, Acting Assistant Administrator for Research and Development, Office of Research and Development (ORD), U.S. Environmental Protection Agency; Dr. Ishwar Murarka, Vice-Chairman, Research Strategies Advisory Committee (RSAC), EPA Science Advisory Board; Dr. Philip Hopke, Member, Clean Air Science Advisory Committee (CASAC), EPA Science Advisory Board; Dr. Costel Denson, Chairman of the Executive Committee, EPA Board of Scientific Counselors (BOSC); and Dr. Charles E. Kolb, Member, Committee on Research Opportunities and Priorities for the EPA, National Research Council.

*Summary of hearing*

Mr. Longest testified that the Agency’s total FY 1999 request in the Science and Technology (S&T) appropriation account was \$633.5 million and 2,428 total work years, an increase of \$2.5 million and 68.6 work years over FY 1998. Dr. Murarka testified on the RSAC review of the FY 1999 Budget Request for the EPA’s Office of Research and Development, which found that the ORD funding level had decreased dramatically in the last ten years as a fraction of the overall EPA budget. Dr. Hopke reported on CASAC’s review of the EPA’s particulate matter (PM) research program needs and strategies. Dr. Denson provided testimony on two major reviews conducted by the EPA’s Board of Scientific Counselors (BOSC). And Dr. Kolb, testifying as a member of the National Re-

search Council's Committee on Research Opportunities and Priorities for the EPA, advised the EPA to adopt a strategy wherein a large portion of its research budget is devoted to a core environmental research and development agenda.

*4.3(r)—Diesel Technology for the 21st Century*

*March 18, 1998*

*Hearing Volume No. 105-56*

*Background*

On March 18, 1998, the Subcommittee on Energy and Environment held a hearing entitled, "Diesel Technology for the 21st Century," to explore the state of diesel technology today, where we should be ten years from now and how research and development by government and industry over the next decade can help truck owners meet environmental mandates.

Witnesses included: Mr. Dan W. Reicher, Assistant Secretary, Energy and Efficiency and Renewable Energy, U.S. Department of Energy (accompanied by Mr. James J. Eberhardt, Director, Office of Heavy Vehicle Technologies, U.S. Department of Energy); Dr. John C. Wall, Vice President, Research and Development, Cummins Engine Company, Inc.; Mr. Ronald Robinson, President, Technology Division, Texaco, Inc.; and Mr. Robert J. Crites, Chairman and CEO, Condor Freight Lines.

*Summary of hearing*

Mr. Reicher testified that the DOE was working to make diesel engines for heavy and medium trucks more fuel efficient and less polluting and was also working on the design of low-emission diesel engines that can replace gasoline engines in light trucks. Dr. Wall stated that the developing diesel technologies will reduce NO<sub>x</sub> and particulate matter emissions, and will provide clean diesels. Mr. Robinson testified that the largest advances in diesel technology include engine improvements and after-treatment devices, and that Texaco was continuing to evaluate and develop several gas-to-liquids technologies using advances in catalyst technologies, reactor design, and process control. Mr. Crites testified on the importance of the diesel engine to Condor Freight Lines and the trucking industry as a whole, and suggested that a more innovative and reward-based approach was needed for the trucking industry to meet Clean Air Act goals.

*4.3(s)—Fiscal Year 1999 Budget Authorization Request for the Department of Energy, Environmental Protection Agency Research & Development, and National Oceanic and Atmospheric Administration*

*March 25, 1998*

*Hearing Volume No. 105-63*

*Background*

On March 25, 1998, the Subcommittee on Energy and Environment held a hearing entitled, "Fiscal Year 1999 Budget Authorization Request for the Department of Energy, Environmental Protection Agency Research & Development, and National Oceanic and Atmospheric Administration," to hear testimony from non-Federal witnesses on Fiscal Year 1999 budget authorization requests for the DOE, EPA and NOAA.

Witnesses included: Dr. Joel N. Myers, President, AccuWeather, Inc.; Mr. Joe F. Colvin, President and Chief Executive Officer, Nuclear Energy Institute; Mr. Scott Sklar, Executive Director, Solar Unity Network; Dr. Donald L. Klass, President, Biomass Energy Research Association; and Mr. Fred L. Smith, Jr., President and Founder, Competitive Enterprise Institute.

*Summary of hearing*

Dr. Myers testified that a strong commercial weather industry was the key to both the future downsizing of the National Weather Service and improvements in their severe weather warnings capability. Mr. Colvin testified that there is a vital link between nuclear energy and the environment. Mr. Sklar testified on the importance of continued research in renewable energy programs. Dr. Klass described the importance of biomass energy consumption and summarized BERA's recommendations regarding DOE's FY 1999 budget for mission-oriented biomass research. Mr. Smith testified to the validity of Federal funding of R&D in DOE, EPA and NOAA.

*4.3(t)—Electric Utility Deregulation: Implications for Research and Development*

*March 31, 1998*

*Hearing Volume No. 105-43*

*Background*

On March 31, 1998, the Subcommittee on Energy and Environment held a hearing entitled, "Electric Utility Deregulation: Implications for Research and Development," to examine the effects of electric utility deregulation on electricity research and development. This hearing focused on the changes in R&D funding by the utility industry, by utility industry consortia and government/private sector partnerships, by electricity generation equipment manufacturers, and by high-tech companies. In addition, witnesses provided their perspectives on the continuing role of the federal government in funding electricity R&D.

Witnesses included: Mr. Victor S. Rezendes, Director, Energy Resources & Science Issues, U.S. General Accounting Office (GAO); Dr. Robert L. Hirsch, Executive Advisor to the President of Advanced Power Technologies, Inc.; Mr. Kurt E. Yeager, President and CEO, Electric Power Research Institute (EPRI); Mr. David Rohy, Vice Chair, California Energy Commission (CEC); and Dr. Robert Shaw, Jr., President, Aretê Incorporated.

*Summary of hearing*

Mr. Rezendes summarized the 1996 GAO report, "Federal Research: Changes in Electricity-Related R&D Funding," and presented an updated analysis of changes in the DOE's electricity R&D appropriation using more recent data, including DOE's 1999 budget request. Dr. Hirsch testified to changes in the electric power industry and related R&D impacts, trends in electricity related to R&D, the future of electricity R&D, and the public sector role. Mr. Yeager testified on R&D collaboration among private and public institutions, and on the importance of R&D investment incentives. Mr. Rohy testified on the implications for R&D and the renewable energy industry from electric industry restructuring, including collaborative efforts among states, the DOE, EPRI, GRI and other parts of the industrial community; and on renewable energy in California. Dr. Shaw testified on the financial investment and regulatory environment of the utility industry, and discussed the impact of restructuring and the move toward micro-generation technologies.

*4.3(u)—EPA's Rule On Paints And Coatings: Has EPA Met The Research Requirements Of The Clean Air Act?*

*May 20, 1998*

*Hearing Volume No. 105-51*

*Background*

On May 20, 1998, the Subcommittee on Energy and Environment held a hearing entitled, "EPA's Rule On Paints And Coatings: Has EPA Met The Research Requirements Of The Clean Air Act?," to examine the science behind the EPA's proposed new rule to control volatile organic compounds in Architectural and Industrial Maintenance (AIM) paints and coatings. This hearing focused the status of the scientific study mandated in Section 183(e)(2) of the Clean Air Act (CAA) Amendments of 1990, and on EPA's contention that while a complete scientific study of VOC's has not been done, the hazards posed by VOC's are nevertheless compelling enough to proceed with the new rules.

Witnesses included: Mr. Robert Brenner, Acting Deputy Assistant Administrator for the Office of Air and Radiation, U.S. Environmental Protection Agency; Mr. C. Boyden Gray, Former White House Counsel; Dr. William L. Chameides, Professor, School of Earth and Atmospheric Sciences, Georgia Institute of Technology; and Mr. Dennis Fitz, Manager, Atmospheric Processes Research, Center for Environmental Research and Technology, University of California-Riverside.

*Summary of hearing*

Mr. Brenner discussed the science issues associated with EPA's study of emissions from consumer and commercial products and the proposed rule to reduce emissions of VOCs from architectural coatings. Mr. Gray testified on the 1990 Clean Air Act Amendments that include provisions regulating the content of volatile organic compounds ("VOCs") in paint and other "consumer and commercial products." Dr. Chameides testified on the impacts of VOCs and how they are produced. Dr. Fitz testified on instrumentation to measure gaseous and particulate pollutants and the management of environmental chamber laboratories.

*4.3(v)—The Human Genome Project: How Private Sector  
Developments Affect the Government Program*

*June 17, 1998*

*Hearing Volume No. 105-66*

*Background*

On June 17, 1998, the Subcommittee on Energy and Environment held a hearing entitled, "The Human Genome Project: How Private Sector Developments Affect the Government Program," to focus on a recent announcement of the formation of a new private-sector genomics company that would complete the entire sequencing of the human genome within three years at a fraction of the cost of the 15-year government program. This hearing explored changes that should be made to the government program in light of this development.

Witnesses included: Dr. Aristides A. Patrinos, Associate Director of Energy Research for Health and Environmental Research, U.S. Department of Energy; Dr. Craig Venter, The Institute for Genomic Research; Dr. Francis Collins, Director, National Human Genome Research Institute, National Institutes of Health; Dr. David Galas, President and Chief Scientific Officer, CHIRO Science R and D, Inc.; and Dr. Maynard Olson, Professor of Medicine, Division of Medical Genetics, University of Washington.

*Summary of hearing*

Mr. Patrinos testified on the future of the Federal Human Genome Project (HGP) and how the new private sector venture would help that effort. Mr. Collins testified on the progress of genetics and encouraged a partnership with the private sector on the HGP. Dr. Venter testified on the impacts of the Institute for Genomic Research's new developments on the federally-funded human genome effort. Dr. Galas stated that he did not believe that it was sensible for the federally supported project either to continue unchanged with the strategy currently in effect, or to reduce the level of effort; and supported a partnership between the public and private sectors. Dr. Olson suggested that the public effort on the HGP be maintained to preserve a high scientific standard.

*4.3(w)—The Science of Risk Assessment: Implications for Federal Regulation*

*July 15, 1998*

*Hearing Volume No. 105–62*

*Background*

On July 15, 1998, the Subcommittee on Energy and Environment held a hearing entitled, “The Science of Risk Assessment: Implications for Federal Regulation,” to examine the state of risk assessment in the Federal Government and how it might be modified to better protect public health and safety. Legislation before both houses of Congress have proposed to change the way the government evaluates risks and then creates and enforces regulations to protect the environment, and public health and safety based on those risks.

Witnesses included: Dr. Gil Omenn, Chairman, the Presidential/Congressional Commission on Risk Assessment and Risk Management and Executive Vice President of Medical Affairs, University of Michigan; Dr. George Carlo, Chairman, the Science and Public Policy Institute, George Washington University; Dr. George Gray, Deputy Director, Center for Risk Analysis, School of Public Health, Harvard University; and Dr. Lois Gold, Director, the Carcinogenic Potency Project, National Institute of Environmental Health Sciences (NIEHS), Center for Environmental Health Sciences, University of California, Berkeley, and Senior Scientist, Lawrence Berkeley National Laboratory.

*Summary of hearing*

Dr. Omenn explained that risks cannot be measured and described the risk management framework devised by the Presidential/Congressional Risk Commission. Dr. Carlo testified on the trends in both environmental and public health legislation and the ability of those legislative actions to protect public health. Dr. Gray testified that risk assessment is a tool for considering scientific information in important social decisions; however, risk characterization needs to be improved for a better appreciation of the strengths and limitations of risk assessment for informing risk comparisons. Dr. Gold stated concerns about regulatory policy from her experience in cancer risk assessment.

*4.3(x)—S. 1418, Methane Hydrate Research and Development Act of 1998*

*September 15, 1998*

*Hearing Volume No. 105–84*

*Background*

On September 15, 1998, the Subcommittee on Energy and Environment held a hearing entitled, “S. 1418: Methane Hydrate Research and Development Act of 1998.” S. 1418, which passed the Senate on July 17, 1998, and on July 20 was referred to the Science Committee with a subsequent referral to the Resources

Committee, would direct the Secretary of Energy to coordinate an interagency research and development program to develop methane hydrate resources.

Witnesses included: Mr. Robert Kripowicz, Acting Assistant Secretary for Fossil Energy, U.S. Department of Energy; Dr. William P. Dillon, Research Geologist, U.S. Geological Survey; and Mr. Arthur Johnson, Senior Staff Geologist, Chevron USA Production Company.

*Summary of hearing*

Mr. Kripowicz described the Department's new effort in hydrates based on prior research on their location and thermodynamic properties, and endorsed S. 1418. Dr. Dillon described methane hydrates, its environment, potential uses and the need to learn more about the processes that influence gas hydrates. And Mr. Johnson offered some industry perspectives on S. 1418.

*4.3(y)—Here Comes La Niña: What To Expect From the Weather in the Winter of 1998–1999*

*October 2, 1998*

*Hearing Volume No. 105–91*

*Background*

On October 2, 1998, the Subcommittee on Energy and Environment held a hearing entitled, "Here Comes La Niña: What To Expect From the Weather in the Winter of 1998–99," to focus on an announcement by NOAA scientists that conditions in the equatorial Pacific point to a strong "La Niña" event and what this means for weather across the United States during the winter of 1998–99, including agricultural impacts. The Subcommittee also looked at lessons learned from El Niño in climate research and inter-agency coordination in preparing for its impacts.

Witnesses included: Dr. D. James Baker, Under Secretary Oceans and Atmosphere, U.S. Department of Commerce, and Administrator, National Oceanic and Atmospheric Administration, U.S. Department of Commerce; Dr. Charles F. Kennel, Director, Scripps Institution of Oceanography; and Dr. I. Miley Gonzalez, Under Secretary for Research, Education, and Economics, U.S. Department of Agriculture, accompanied by Mr. Al Peterlin, Chief Meteorologist, U.S. Department of Agriculture.

*Summary of hearing*

Dr. Baker testified on NOAA's forecast of La Niña. Dr. Kennel testified on Scripps's efforts to support NOAA by providing models of experimental forecasts and perceived impacts of the El Niño/La Niña phenomenon to prepare communities. And Dr. Gonzalez described the effects of weather and climate fluctuations on the agricultural industry.

## 4.4—SUBCOMMITTEE ON SPACE AND AERONAUTICS

4.4(a)—*Fiscal Year 1998 NASA Authorization, Parts I–VI. (NASA Posture Hearing—FY 1998 NASA Authorization)**March 4, 1997**Hearing Volume No. 105–7**Background*

On March 4, 1997, the Subcommittee on Space and Aeronautics held the first in a series of six hearings entitled, “Fiscal Year 1998 NASA Authorization, Parts I–VI.” The National Aeronautics and Space Administration (NASA) was created in 1958 (PL 85–568), largely in response to the Soviet Union’s launch of Sputnik 1 in 1957. 1997 marks the 40th anniversary of this historic launch. The objectives of the agency as laid out by the National Aeronautics and Space Act of 1958 include: expansion of human knowledge, improvement of aeronautical and space vehicles, development of vehicles to travel through space, sharing of knowledge between military and civilian space communities, international cooperation, and preservation of the United States’ role as a leader in aeronautics, space science, and technology.

The Space and Aeronautics Subcommittee is responsible for overseeing and authorizing appropriations for all the activities within NASA as well as the commercial space activities within the Department of Commerce (Office of Space Commerce) and the Department of Transportation (Office of Commercial Space Transportation). The NASA budget is divided into four appropriations lines: Human Space Flight (HSF); Science, Aeronautics and Technology (SAT); Mission Support (MS); and Inspector General (IG). Human Space Flight contains the International Space Station and the Space Shuttle. Science, Aeronautics and Technology funds the research and development activities including science, global monitoring, aeronautics, education programs, mission communication services and direct program support. Mission Support includes the civil service workforce, space communication services, safety and quality assurance activities, and maintenance activities for the NASA facilities.

Witnesses included: Daniel S. Goldin, NASA Administrator.

*Summary of hearing*

Mr. Daniel S. Goldin testified that the President’s fiscal year 1998 budget request of \$13.5 billion, and the funding plan for the outyears will give America a robust space and aeronautics program. He noted that NASA is spending more on research and development and less on overhead. In 1992, NASA spent only 31 percent of its budget on science, aeronautics, and space technology. For fiscal year 1998, Mr. Goldin reported that 44 percent of the budget will now be devoted to those same areas. He reviewed delays currently facing the construction of the International Space Station, but insisted that NASA wanted to continue to work with the Russian government in completing this “most complex mission.” In closing, Mr. Goldin stated that the future of NASA is

about making airlines safer, exploring the solar system, and building the International Space Station.

*4.4(b)—Fiscal Year 1998 NASA Authorization, Parts I–VI (NASA’s Office of Aeronautics and Space Transportation Technology)*

*March 12, 1997*

*Hearing Volume No. 105–7*

#### *Background*

On March 12, 1997, the Subcommittee on Space and Aeronautics held the second in a series of six hearings entitled, “Fiscal Year 1998 NASA Authorization, Parts I–VI.” The Office of Aeronautics has been redesignated this year as the Office of Aeronautics and Space Transportation Technology to reflect the inclusion of Space Transportation and Commercial Technology programs. These two programs were transferred as a result of the dissolution of the Office of Space Access & Technology (Code X). Specifically, the Space Transportation Division (headed by retired Air Force colonel Gary Payton) and the Commercial Development & Technology Transfer Division (headed by Dr. Bob Norwood) of Code X were added to the Office of Aeronautics (Code R, headed by Dr. Robert Whitehead), to create the new office.

The rationale for merging aeronautics and space transportation was that in the future, many of the technologies required for advanced aeronautical systems and next generation space vehicles will overlap, and that considerable synergy will be possible by integrating the efforts. Commercial technology was added because of the Office of Aeronautics’ demonstrated success with technology transfer to the commercial aviation industry.

The new office is, therefore, responsible for carrying out three areas of activity: (1) aeronautics and aviation safety research and development; (2) experimental reusable launch vehicle (X–33 and X–34) demonstration, and advanced space transportation technology programs; and, (3) technology transfer and Small Business Innovation Research programs.

Witnesses included: Dr. Robert E. Whitehead, Associate Administrator for Aeronautics and Space Transportation Technology, NASA; and, Gary E. Payton, Deputy Associate Administrator (Space Transportation Technology), and Director, Space Transportation Division, NASA.

#### *Summary of hearing*

Dr. Robert E. Whitehead, NASA’s Associate Administrator for the Office of Aeronautics and Space Transportation Technology, noted that NASA combined the Aeronautics and Space Transportation Technology enterprises in 1996. He stated that the current enterprise is shaped around three technology pillars for success: (1) global civil aviation, (2) revolutionary technology leaps, and (3) access to space.

Mr. Gary E. Payton, NASA’s Deputy Associate Administrator for Space Transportation Technology and Director of the Space Transportation Division, discussed the accomplishments of the DC–XA

program and the selection of the designs for the X-33 and X-34 vehicles.

*4.4(c)—Fiscal Year 1998 NASA Authorization, Parts I–VI (FY 1998 NASA Authorization: Space Shuttle Program)*

*March 13, 1997*

*Hearing Volume No. 105–7*

### *Background*

On March 13, 1997, the Subcommittee on Space and Aeronautics held the third in a series of six hearings entitled, “Fiscal Year 1998 NASA Authorization, Parts I–VI.” The Space Shuttle program was the principal development program undertaken by the National Aeronautics and Space Administration during the 1970’s. This space transportation system would use, to the maximum extent possible, a reusable components systems approach in order to reduce the cost per pound to orbit. The design authorized was a reusable orbiter which would be propelled into low-earth orbit (LEO) by two solid rocket boosters (SRBs) augmented by the Orbiter’s main engine, all of which were mounted on an expendable external fuel tank. Once aloft, the SRBs would be jettisoned and recovered at sea, while the Orbiter would complete its mission and return to either an east coast or west coast recovery site. At this site, it would land much like a conventional aircraft and then be reprocessed and returned to the launch site for its next mission. The first launch of the Space Shuttle took place in April 1981.

Several successful missions were flown with the system during the next 4½ years, though the projected cost savings and annual launch rate were never realized. Instead of becoming a routine space transportation system, the Shuttle program was still an inherently high-risk operation and remained in a quasi-developmental stage. The public, however, was becoming accustomed to watching the Shuttle missions on television and in the collective mind of the American people the event had become routine.

The Challenger accident in the winter of 1986 was a devastating blow to NASA and the nation. A faulty O-ring in one of Challenger’s two solid rocket boosters failed leading to the catastrophic destruction of the entire vehicle and the loss of the crew. Following the tragedy, the Rogers Commission was formed to examine causal factors of the accident and to recommend changes or improvements to the NASA Administrator. Among these recommendations were: eliminate the isolation of program managers from the engineers, increase the flow of information between the Shuttle workforce and the various program managers and properly staff and support a more robust safety organization within the program.

When the program resumed operations following a lengthy standdown, it did so under the guidelines of a completely restructured safety program. NASA fostered an environment more conducive to open communications among the workforce and moved astronauts into program management. The restructured safety program was accompanied by a vastly increased Safety, Reliability and Quality Assurance (SR&QA) element. Later reports would put the size of this expanded program at some 4,000 individuals at a cost

approaching \$400 million annually. Though there is no doubt that the safety of the program has improved, an undercurrent of dissatisfaction with the cumbersome safety review process and the failure of the program to achieve a certain level of cost-effectiveness and responsiveness to the launch customer remains. Prior to Challenger, the Shuttle had not matured from a developmental program. Since the accident, the program has moved even further away from the goal of routine operations.

Declining NASA budgets have forced the agency into major restructuring efforts in order to continue programs while at the same time avoiding the closure of NASA centers. Accomplishing this goal requires an overall reduction in agency personnel, which in the case of human space flight programs, has led to questions about the impact this reduction will have on safety. Over the past couple of years, the Agency commissioned a series of reviews of both internal and independent teams to provide recommendations for reaching the requisite budget goals while avoiding any compromise to program safety. One of these studies, the Shuttle Workforce Review (completed in 1995) recommended that 3,200 government and contractor jobs could be eliminated from the nearly 30,000 member Shuttle workforce without jeopardizing safety of flight. These cuts would be in addition to ongoing reductions.

The Space Shuttle Management Independent Review Team was formed by the NASA Administrator in November 1994 and chaired by Dr. Christopher Kraft to provide independent recommendations to supplement internal reviews. The study, now referred to as the Kraft report, sought to evaluate the current process and procedures for conducting Space Shuttle operations at the NASA space centers and associated contractor facilities in order to provide recommendations to the Administrator to establish a more efficient operational structure.

The Kraft report made a series of recommendations on efficiency, cost savings, and improved service to customers without jeopardizing safe operation of the Shuttle. The most significant recommendations were to relinquish the operational responsibility of the program to a prime contractor, reducing NASA's involvement in daily operations of the Shuttle, and minimizing modifications to the Shuttle fleet to only those which would improve safety or otherwise reduce operating costs.

In response to the recommendations of the Kraft report, NASA commissioned a study by Science Applications International Corporation (SAIC) to perform a risk-assessment study of the entire Shuttle mission profile in order to assess where concentrated efforts would reduce operating costs without compromising flight safety. The study looked at all the potential events which could lead to a critical failure with the goal of producing a more focused risk reduction effort. Though this process would reduce the potential for a mishap, the inherent risks associated with such a complex program cannot be eliminated. An illustration of this is the report's conclusion that the "median estimate of failure" for a given mission has been reduced to one in 248 launches from one in 78 at the time of the Challenger accident.

Oversight by Congress led to ongoing studies of the restructuring of NASA in general and its effects on the Shuttle program. The

General Accounting Office (GAO) has reviewed the findings of the Rogers Commission and applied them to the current restructuring plans of NASA. GAO has identified a few key principles which it believes should remain as guideposts during the transition of the Shuttle program: open communication of safety concerns; sufficient parallel safety reviews and communications channels; accessible management information systems that provide complete and accurate data in a timely manner; and, program priorities that place safety ahead of schedule or cost.

In following the recommendations of the Kraft report, NASA is in the process of consolidating contracts for the operations of the Space Shuttle Program into a "single prime" contract. This "single prime" concept, which was first used by the Space Station program, is intended to collapse the fee structure (profits paid to contractors) while rewarding the single prime contractor with additional fee incentives for achieving cost reduction goals. Many observers recognize the transition from today's multiple prime contracts to a single prime as the first step in the broad policy goal of privatizing the Space Shuttle program. Under this single prime contract, the firm chosen will obtain general control over the day-to-day operations of the Space Shuttle program, while ultimate authority to certify and fly the system will continue to be held by the Federal Government. Privatization would likely transfer this ultimate authority to the private firm, while NASA's role would be reduced to that of being a "customer" of the privatized system.

On August 21, 1995, NASA held an industry briefing to lay the groundwork for the consolidation of some 85 separate contracts under a single prime contractor. Initial letters of intent, due to the Agency by September 14, 1995, were submitted by Boeing; McDonnell Douglas; BAMS I Corporation; and United States Space Alliance (USA), a Lockheed Martin and Rockwell joint venture. It was NASA's intention to award the contract in October 1996.

NASA abruptly terminated the competition in the spring of 1996 and announced that a sole source contract would be awarded to USA. The consolidation will occur over the course of one to three years, though there will be some contracts of shorter duration which will be exempt and other contracts involving developmental work which will remain under the auspices of NASA managers.

Witnesses included: Mr. Steve Oswald, Deputy Associate Administrator (Space Shuttle), NASA; Mr. Paul M. Johnstone, Chairman, Aerospace Safety Advisory Panel; and, Mr. Kent Black, Chief Executive Officer for United Space Alliance.

#### *Summary of hearing*

Mr. Steve Oswald, NASA's Deputy Associate Administrator for the Space Shuttle program, testified that NASA is flying the Space Shuttle more safely and accomplishing more on orbit than ever before. He maintained that NASA's Space Shuttle program is living up to the promises that were made to Congress and the American people by meeting the commitment of flying safely for less money.

Mr. Paul M. Johnstone, Chairman of the Aerospace Safety Advisory Panel, noted that relations between NASA and United Space Alliance, the Shuttle's single prime contractor, seem excellent. He said that the Aerospace Safety Advisory Panel believes that the

transition to a single prime contract has not changed flight or ground risks of the program. However, Mr. Johnstone pointed out that there is a clear need on the part of both NASA and United Space Alliance to take steps to ensure the availability of a skilled and experienced work force in sufficient numbers to meet ongoing safety needs of the Shuttle program.

Mr. Kent Black, Chief Executive Officer of United Space Alliance, testified that one of the objectives of the Space Flight Operations Contract (SFOC) is to reduce the cost of flying payloads on the Shuttle by adding new customers to reduce the costs. Mr. Black mentioned the Department of Defense (DOD) and commercial customers as potential resources to help defray the costs of operating the Shuttle.

*4.4(d)—Fiscal Year 1998 NASA Authorization, Parts I–VI (FY 1998  
NASA Authorization: Mission To Planet Earth)*

*March 19, 1997*

*Hearing Volume No. 105–7*

*Background*

On March 19, 1997, the Subcommittee on Space and Aeronautics held the fourth in a series of six hearings entitled, “Fiscal Year 1998 NASA Authorization, Parts I–VI.” President Bush initiated Mission to Planet Earth (MTPE) in 1990 to study the earth’s environment, in particular its climate system. At the time, the expectation was that NASA’s budget would grow by 10% per year—peaking at about \$20 billion by fiscal year 2000—to accommodate this new initiative. NASA’s budget, however, has consistently fallen since fiscal year 1993. The fiscal year 1998 request for NASA is \$13.5 billion including \$1.42 billion for MTPE. MTPE is the largest component of the interagency U.S. Global Change Research Program (USGCRP) which exists to study the earth’s environmental system.

Concern has been expressed by General Accounting Office witnesses at Science Committee hearings that Mission to Planet Earth is too heavily weighted in its spending on hardware to collect data, as opposed to paying scientists to analyze existing and new data. Ideally, the program would prioritize scientific research over data collection. For example, at a March 1996 hearing, it was revealed that the USGCRP hopes to spend approximately 30% of its budget on “process studies,” as opposed to data collection hardware. MTPE’s budget for “process studies,” however, was only 9% of its total. Dr. Robert Watson, Associate Director for the Environment at the White House Office of Science and Technology Policy, confirmed that this was not the ideal balance between hardware and science. (Committee on Science, Hearing: U.S. Global Change Research Programs: Data Collection and Scientific Priorities, No. 49, March 6, 1996, pp. 354–355).

The hearing helped Members focus on Mission to Planet Earth, its accomplishments, its goals, its strengths, and its weaknesses during the budget process for fiscal year 1998.

Witnesses included: Mr. William F. Townsend, Associate Administrator for the Office of Mission to Planet Earth, NASA; Mr. Sam

Venneri, Chief Technologist, NASA; Dr. Steven C. Wofsy, Gordon McKay Professor of Atmospheric and Environmental Sciences, Harvard University; and, Dr. Stamatios Krimigis, Head of the Space Department at the Applied Physics Laboratory, Johns Hopkins University.

*Summary of hearing*

Mr. William F. Townsend, NASA's Associate Administrator for the Office of Mission to Planet Earth, provided an overview of MTPE noting that program runout costs for the second series have been reduced by 30 percent due to planned technology infusion; Earth Observing System (EOS) spacecraft are smaller, cost less and have shorter development times; and that the commercial strategy for the program includes partnerships with industry including science data purchase and commercial remote sensing.

Mr. Sam Venneri, NASA's Chief Technologist, discussed the findings and recommendations of the Reshape Implementation Options Study which examined ways MTPE could use advanced technology to design a complete space-to-ground system.

Dr. Steven C. Wofsy, Gordon McKay Professor of Atmospheric and Environmental Sciences at Harvard University, discussed recommendations for the program from Earth Systems Science Applications Advisory Committee (ESSAAC), which he chaired. He noted that ESSAAC was concerned with the balance of funding between space hardware and data analysis in the program.

Dr. Stamatios Krimigis, Head of the Space Department at the Applied Physics Laboratory, Johns Hopkins University, discussed the Ballistic Missile Defense Organization's (BMDO) Midcourse Space Experiment (MSX) and its potential applications to MTPE. Dr. Ed Hudgins, Director of Regulatory Studies at the CATO Institute, conveyed the CATO Institute position that MTPE should not be reauthorized this year because government involvement in the program discourages private sector development of space infrastructure.

*4.4(e)—Fiscal Year 1998 NASA Authorization, Parts I–VI (FY 1998  
NASA Authorization: International Space Station)*

*April 9, 1997*

*Hearing Volume No. 105–7*

*Background*

On April 9, 1997, the Subcommittee on Space and Aeronautics held the fifth in a series of six hearings entitled, "Fiscal Year 1998 NASA Authorization, Parts I–VI." The International Space Station is a multinational effort to create an advanced life and micro-gravity sciences research laboratory using the unique environment of space. In 1993, the Clinton Administration ordered a redesign that led to a station configuration known as Alpha. Shortly thereafter, the Administration invited the Russians to participate in the program in the interest of promoting international cooperation in space. By 1994, NASA settled on a design that included the Russians, who were supposed to build about half of the facility's pressurized space. They joined the United States and its other inter-

national partners, Canada, Japan, and the European Space Agency. The new design was expected to cost \$17.4 billion between 1994 and completion in 2002, after which it was to operate for ten years. Additionally, the Administration placed an annual \$2.1 billion spending cap on the International Space Station in order to impose fiscal restraint on the program. During the 104th Congress, there was strong bipartisan support for the International Space Station and amendments to terminate it were defeated by margins of over 100 votes.

The program is divided into three phases. Phase I involves a series of cooperative flights by the U.S. Space Shuttle to the Russian space station, Mir. NASA is paying the Russian Government approximately \$472 million for this Phase, which includes long-duration stays on Mir by U.S. astronauts and logistics provided by the Space Shuttle. Phase I is well underway and there have been six Shuttle flights to the Mir (1 rendezvous and 5 docking). No funds were requested for U.S.-Russian cooperation in the FY1998 budget request, but not all funds appropriated in the past have been expended.

Phase II constitutes the first stage of construction, in which the United States and Russia launch sufficient elements of their total contributions to enable the Space Station to accommodate a permanent human presence. Phase II was scheduled to begin in November 1997, with the launch of the Functional Cargo Block (FGB) and end in April 1999. However, NASA is now considering delaying launch of the FGB due to Russia's problems in funding development of the Service Module. NASA paid the Russians approximately \$190 million for the FGB through a contract with the Space Station's U.S. prime contractor, Boeing.

Phase III begins with the contributions of our other partners, namely Japan and the European Space Agency. Technically, Phase III ends in the middle of FY2002, before the European Space Agency's Columbus Orbital Facility (COF) is actually delivered to the Station. The Europeans have requested the delay in the launch of COF.

To date, the development program is slightly over 56% complete and NASA's contractors have built over 162,000 pounds of flight hardware. Problems with the U.S.-built Nodes experienced last year have been resolved and NASA is working to meet its Node delivery schedule. Node 2 is already fabricated in the United States. However, NASA recently announced an agreement with Italy in which Italy will provide Node 2 and possibly a third Node not currently baselined in the design. NASA is still working towards a 2002 completion date and has planned for accumulated reserves of about \$2 billion between now and assembly complete. The annual reserves in FY1997 and FY1998, however, are very small.

Witnesses included: Mr. Rick N. Tumlinson, President, Space Frontier Foundation; Dr. Robert Park, Professor of Physics, University of Maryland at College Park; Dr. Larry DeLucas, Director, Center for Macromolecular Crystallography, University of Alabama, Birmingham; and, Mr. Wilbur Trafton, NASA's Associate Administrator, Office of Human Space Flight.

*Summary of hearing*

Mr. Wilbur Trafton, NASA's Associate Administrator for the Office of Space Flight, informed the Subcommittee that NASA is re-scheduling the first element launch for the International Space Station for no later than October 1998. Mr. Trafton reviewed NASA's current contingency plans in light of the impending delay of Russian contributions to the International Space Station including: (1) modifying the FGB to enhance its attitude control capabilities and to make it refuelable; and (2) pursuing development of an existing, proven system built by the U.S. Naval Research Laboratory as an Interim Control Module (ICM). He indicated that a decision must be made by early May 1997 to baseline into the budget either the Russian Service Module or an ICM for launch in December 1998. Finally, Mr. Trafton advised the Subcommittee that these contingency plans will require resources outside of the planned International Space Station program. Specifically, NASA will submit a revised operating plan for fiscal year 1997 that will reallocate \$200 million from the Shuttle program to the U.S./Russian Cooperation funding line (designated U.S./Russian cooperation and program assurance); and will request a similar funding line with a placeholder amount of \$100 million for fiscal year 1998.

Dr. Robert Park, Professor of Physics at the University of Maryland, College Park, argued that the International Space Station is yesterday's technology and its stated scientific objectives are yesterday's science. He maintained that the International Space Station stands as the greatest single obstacle to continued exploration of space. In closing, Dr. Park noted that during the recent trend of cuts to the NASA budget, the Station remains a fixed cost, exempted from these budget cuts. Additionally, cost overruns in construction have been accommodated by postponing what little science is planned for the Station.

Dr. Larry DeLucas, Director of the Center for Macromolecular Crystallography at the University of Alabama, Birmingham, noted that scientific microgravity experiments should be conducted over long periods of time as opposed to current experiments on the Space Shuttle with durations of one to two weeks. He maintained that carrying discoveries through to fruition where research can be used for practical benefit, must be done as an ongoing process. Dr. DeLucas endorsed the International Space Station because it will allow scientists to have a laboratory where research can be conducted 365 days a year.

Mr. Rick N. Tumlinson, President of the Space Frontier Foundation, recommended having a facility in space in which Americans can conduct experimentation on new products, new services and new ideas. He advocated turning the International Space Station over to private interests to begin operating it in the same way that industry operate buildings, ships, ports, and airports. In closing, Mr. Tumlinson maintained that a successful Space Station will use a partnership between government and the private sector.

4.4(f)—Fiscal Year 1998 NASA Authorization, Parts I–VI (FY98  
NASA Authorization: Science Programs)

April 10, 1997

Hearing Volume No. 105–7

*Background*

On April 10, 1997, the Subcommittee on Space and Aeronautics held the last in a series of six hearings entitled, “Fiscal Year 1998 NASA Authorization, Parts I–VI.” The Office of Space Science is responsible for planetary exploration as well as physics and astronomy missions. The Mission Operations and Data Analysis (MO&DA) account is separated into two parts, Mission Operations and Data Analysis. Mission Operations provides funding for ground networks; monitoring the health of spacecraft; and mission data processing, analysis, and archiving. Data Analysis provides funding for individual investigators, interdisciplinary scientists, and researchers. Three-quarters of the Data Analysis funds are spent at hundreds of universities nationwide in the form of grants.

The Office of Life and Microgravity Sciences and Applications is responsible for aerospace medicine, chemical research, and the physical effects of microgravity on the human body. NASA’s Life Sciences program sponsors basic and applied research in biomedicine, biology, and environmental sciences. The program’s goals are to: (1) use gravity, microgravity and other characteristics of the space environment to conduct research; (2) develop scientific and technological foundations for safe and productive human presence in space; and (3) apply knowledge and technology gained to improve our life on Earth. The Microgravity Science Research and Analysis program supports ground-based research and definition studies for flight experiments. The goal of the microgravity research program is to advance fundamental scientific knowledge in physical, chemical and biological processes and to enhance the quality of life on Earth by conducting experiments in the low-gravity environment of space.

Witnesses included: Dr. Wesley T. Huntress, Jr., Associate Administrator, Office of Space Science, NASA; Dr. Arnauld E. Nicogossian, Associate Administrator, Office of Life and Microgravity Sciences and Applications, NASA; Dr. Neal Pellis, Head of the Biotechnology Program, Johnson Space Center, NASA; Dr. Claude R. Canizares, Chair, Space Studies Board, National Research Council and, Director, Center for Space Research, Massachusetts Institute of Technology; Dr. Eugene Shoemaker, Scientist Emeritus, U.S. Geological Survey; and, Dr. V. Reggie Edgerton, Vice Chair, Physiological Science Department, University of California Los Angeles.

*Summary of hearing*

Dr. Wesley T. Huntress, Jr., NASA’s Associate Administrator for the Office of Space Science, discussed five near-term objectives for NASA’s science initiatives. First, to open up a new area in exploring the surfaces of planetary bodies such as Mars, comets, and asteroids. Second, conduct extensive investigations of the surface of

Mars. Third, to complete the initial reconnaissance of our solar system with a mission to Pluto. Fourth, to invest in the technologies required to develop a successor to the Hubble space telescope. Fifth, to invest in technologies required to develop new techniques that we will need in order to search for Earth-like planets around other stars.

Dr. Arnauld E. Nicogossian, NASA's Associate Administrator for the Office of Life and Microgravity Sciences and Applications, mentioned that because of the delay in the assembly sequence of the International Space Station, NASA has started studying remedial actions which include the use of Shuttle flights during the early years of Station assembly. These flights would provide the research community with continued access to space until transition to the Space Station is possible.

Dr. Claude R. Canizares, Chair of the Space Studies Board at the National Research Council and Director of the Center for Space Research at Massachusetts Institute of Technology, reiterated the need for additional Shuttle flight research opportunities because of developing problems with the International Space Station. He insisted that space research provides innumerable benefits that enhance the quality and character of life for the American public.

Dr. Eugene Shoemaker, Scientist Emeritus at the U.S. Geological Survey, discussed near-Earth asteroids and research that NASA is supporting at three separate institutions that survey Earth-crossing asteroids. During his testimony, Dr. Shoemaker argued for the necessity of asteroid research and maintained that a 40 percent budget increase could reduce by as much as two thirds, the time required to discover 90 percent of the Earth-crossing asteroids larger than one kilometer in diameter. Dr. Neal Pellis, Head of the Biotechnology Program at NASA's Johnson Space Center, discussed the benefits of biotechnology and NASA's goal of engineering human tissue, starting from individual cells, using the microgravity environment and advanced technology such as the bioreactor.

Dr. V. Reggie Edgerton, Vice Chair of the Physiological Science Department at the University of California Los Angeles, discussed different strategies for researching the field of neural repair. He argued that continued investment in this type of research is critical to efforts to optimize the recovery of elderly individuals who suffered neural dysfunctions and neural trauma patients.

*4.4(g)—The Commercial Space Act of 1997, Parts I-III (The Commercial Space Act of 1997: Commercial Remote Sensing, Part I)*

*May 21, 1997*

*Hearing Volume No. 105-16*

#### *Background*

On May 21, 1997, the Subcommittee on Space and Aeronautics held the first in a series of three hearings entitled, "The Commercial Space Act of 1997, Parts I-III." In 1992, Congress passed the Land Remote Sensing Policy Act of 1992 (P.L. 102-555). The law established mechanisms by which private entities may obtain licenses to operate commercial remote sensing satellites to image the Earth in a variety of spectral bands. In 1994, President Clinton

signed Presidential Decision Directive (PDD) 23 and announced publicly his policy that U.S. commercial remote sensing companies would be allowed to collect space-based, high-resolution images. Currently, remote sensing imagery collected from government spacecraft and private-sector aircraft is applied to improve life on Earth in a variety of situations, including disaster relief, land use, resource planning, urban development, and precision agriculture. Since the announcement of the 1994 White House policy, the Federal Government has issued seven licenses to U.S. companies to operate remote sensing satellites. Experience with the legal and regulatory environment since 1992 has revealed several possibilities for improving the business environment of remote sensing.

Historically, designing, building, launching, and operating an Earth-observing satellite has been an extremely expensive proposition. Until recently, governments have been the only entities capable of raising the capital required to image the Earth from space. For national security purposes, the U.S. intelligence community has been taking pictures of the planet from low-Earth orbit for decades. During the 1970s, NASA developed and launched the Landsat spacecraft to study the Earth's environment. Landsat 4 and 5 are still in operation today. Landsat 7 is scheduled for launch next year as part of NASA's Mission to Planet Earth program.

In recent years the pace of technological change has dramatically reduced the cost and technical challenge associated with Earth observation from space. Whereas the United States and Soviet Union were the principal owners and operators of Earth observation satellites during the Cold War, several countries currently operate or plan to operate their own remote sensing system. Many of these nations are in the Third World. Canada, China, Brazil, the European Space Agency, France, India, Israel, Japan, and South Africa sponsor remote sensing programs in their respective countries. Other countries that have expressed an interest in purchasing or developing their own remote sensing satellites include South Korea, Spain, and the United Arab Emirates. The current commercial market in remote sensing is estimated to be about \$350 million annually, with expectations that the market could reach \$2 billion by the year 2000. This does not include the value-added industry, which interprets the data and generated \$275 million in revenue during 1994.

The reasons for the explosive growth in the industry are two-fold. First, the aforementioned drop in the price of technology has reduced the cost of designing, constructing, launching, and operating commercial remote sensing satellites. Second, during the course of government Earth observation programs, the user community has developed a wide range of applications for remotely-sensed data that directly benefit people on Earth. This has created a demand pull for the technology and images. Remote sensing technology and images are being used in mineral and oil exploration to focus the work of ground-survey teams and reduce the costs of exploration. Images are also being used for agricultural assessment and precision farming, so that agricultural yields are maximized with greater efficiency, requiring less fertilizer. Remote sensing images are also being used to monitor the environment and assess the environ-

mental damage associated with clear-cut logging in the rain forest. Images have been used to predict, monitor, and assess major flood damage and are proving valuable in policing ocean use. In general, Earth remote sensing is increasingly being used to manage resources more efficiently.

Witnesses included: Mr. Keith Calhoun-Senghor, Director of the Office of Air and Space Commercialization, Department of Commerce; Dr. Susan Moran, Physical Scientist for the Southwest Watershed Research Center, U.S. Department of Agriculture; Dr. Molly Macauley, Senior Fellow for Resources for the Future; Dr. John Townshend, Professor at the University of Maryland; and, Mr. Jeff Harris, President of Space Imaging Incorporated.

#### *Summary of hearing*

Mr. Keith Calhoun-Senghor, Director of the Office of Air and Space Commercialization at the Department of Commerce, discussed a new era that he termed "new space." He maintained that new space differs dramatically from the previous era of traditional aerospace in three significant ways: (1) it is privately funded; (2) it is international; and (3) it will be Earth's new economic frontier. Mr. Calhoun-Senghor also noted that the U.S. government is beginning, and must continue, to treat new space as an industry segment where data is tracked and analyzed in much the same way as commodities futures or crop reports are, so that businesses can intelligently anticipate the future of the aerospace industry.

Mr. Jeff Harris, President of Space Imaging Incorporated, discussed opportunities that commercial remote sensing can offer the U.S. He also explained the reasons for expanding interest in commercial remote sensing, including: (1) adequate technology is available; (2) commercial remote sensing has become more cost-effective; (3) international clientele opportunities; and (4) a U.S. aerospace industry that is poised and ready to further develop this emerging industry.

Dr. Susan Moran, Physical Scientist for the Southwest Watershed Research Center at the U.S. Department of Agriculture, testified regarding applications of remote sensing imagery that help to improve life on Earth and discussed the value of commercial remote sensing to precision farming. Dr. John Townshend, Professor at the University of Maryland, said that to assist development of the commercial remote sensing industry, we (government and industry) should: (1) ensure that the scientific community plays a major role in planning the acquisition of remote sensing data; (2) provide reliable information on the availability of remote sensing data to the scientific user; (3) involve the scientific community in validation and quality assessment of products derived from remote sensing; and (4) assure that remote sensing products are delivered in a timely fashion.

Dr. Molly Macauley, Senior Fellow for Resources for the Future, noted that the profitability of the commercial remote sensing market is going to depend on continued technological improvements and cost reductions in spacecraft and instrumentation. She also suggested that government agencies could "auction" research spacecraft after their original missions were complete. This would help

commercial providers by eliminating expensive research and development costs.

*4.4(h)—The Commercial Space Act of 1997, Parts I–III (The Commercial Space Act of 1997: Space Transportation)*

*May 22, 1997*

*Hearing Volume No. 105–16*

*Background*

On May 22, 1997, the Subcommittee on Space and Aeronautics held the second in a series of three hearings entitled, “The Commercial Space Act of 1997, Parts I–III.” In the early 1980’s, various U.S. private companies (including government contractors and entrepreneurial firms) began to develop expendable launch vehicles and offer commercial launch services to private and public customers here and abroad. The U.S. industry did not grow quickly, however, due to regulatory burdens and competition from NASA’s Space Shuttle. The regulatory problems faced by these companies led to Congress passing the Commercial Space Launch Act of 1984, which created the Office of Commercial Space Transportation in the Department of Transportation. This office has the responsibility of regulating and licensing commercial space launches. Two years later, after the Challenger disaster, the Reagan Administration directed that commercial satellites would no longer be launched by the Space Shuttle, and the three primary Air Force expendable launch vehicle contractors (McDonnell Douglas, General Dynamics, and Martin Marietta) began offering commercial launches using updated versions of vehicles which were derived from Intercontinental Ballistic Missiles (ICBMs). In the decade since, the commercial space transportation industry has grown both domestically and internationally. Technology has progressed to the point where commercial reentry vehicles are now feasible. In the near future, it is expected that private firms will develop their own (multi-stage) reusable launch vehicles. Internationally, the European industry consortium, Arianespace, continues to dominate the world market, launching roughly 70% of the world’s commercial communications satellites to geosynchronous (GEO) orbit. Many other nations have entered the launch market, including China, Russia, Ukraine, and Japan. The market for space transportation has also grown beyond GEO-based communications satellites to include low Earth orbit-based communications, navigation, and remote sensing satellites.

Witnesses included: Mr. Edward A. Frankle, General Counsel for NASA; Ms. Patti Grace Smith, Associate Administrator (Acting) for Commercial Space Transportation, Federal Aviation Administration (FAA); Mr. Edward Brady, Managing Partner, Strategic Perspectives Incorporated; and, Mr. Michael S. Kelly, President & CEO, Kelly Space & Technology Incorporated.

*Summary of hearing*

Mr. Edward A. Frankle, General Counsel for NASA, noted that policy makers need to review several areas before making a decision to regulate in-space transportation. These areas include: inter-

national obligations of the U.S.; public health and safety; safety of property; and national security and foreign policy interests of the U.S. However, Mr. Frankle stated that he did not believe that there is any logical basis for regulating in-space transportation at this time.

Ms. Patti Grace Smith, Associate Administrator (Acting) for Commercial Space Transportation at FAA, testified it was essential that Congress pass authorizing legislation granting FAA the authority to license reentries. Further, she maintained that without such authority, the government would not be able to provide for public safety or ensure adequate oversight of commercial space transportation activities involving reentry or reusable vehicles.

Mr. Edward Brady, Managing Partner for Strategic Perspectives Incorporated, focused on the necessity to establish international standards for commercial space operations. He maintained that commercial space activities cannot be implemented in a cost-effective manner without standards that are nationally and internationally recognized and used.

Mr. Michael S. Kelly, President & CEO of Kelly Space & Technology Incorporated, said that he believed that authority to license reentry should be granted to the FAA and that the government should not continue the practice of financing commercial launch service providers with taxpayer money.

*4.4(i)—The Commercial Space Act of 1997, Parts I-III (The Commercial Space Act of 1997: Commercial Remote Sensing, Part II)*

*June 4, 1997*

*Hearing Volume No. 105-16*

*Background*

On June 4, 1997, the Subcommittee on Space and Aeronautics held the last in a series of hearings entitled, "The Commercial Space Act of 1997, Parts I-III." In 1992 Congress passed, and President Bush signed, the Land Remote Sensing Policy Act of 1992 (P.L. 102-555), which made it possible for the U.S. commercial sector to design, build, launch, and operate commercial remote sensing satellites to image the Earth from space. The Land Remote Sensing Policy Act charges the Secretary of Commerce with carrying out its provisions and establishing a process for licensing these remote sensing satellites. In order to ensure that U.S. national security concerns and international obligations are taken into consideration during the licensing process, the law directs the Secretary of Commerce to consult with the Secretaries of Defense and State prior to issuing any license. The State and Defense Secretaries are then charged with recommending to the Secretary of Commerce any conditions that should be placed on the license to make it consistent with U.S. national security and international obligations. The Commerce Department has 120 days from the time a license application is submitted to work its way through this interagency process and make a ruling on the license application. The National Oceanic and Atmospheric Administration (NOAA) is the agency within the Commerce Department that carries out the Department's responsibilities under the law.

The Global Positioning System (GPS) is a system of orbiting satellites that transmit precise information about their location over the Earth. Using a small receiver, an individual on the ground can determine his or her precise position (within a few feet) on Earth in three dimensions. While GPS is primarily a military system, it provides a slightly less accurate signal to civilian users for various non-military applications. An entire industry that uses the GPS signal has developed as a result and the applications have multiplied well beyond precise navigation. These applications currently include farming, surveying, recreation, and vehicle fleet management. The National Academy of Public Administration estimated that annual revenues from this civil industry were about \$2 billion in 1995 and could grow to \$31 billion by the year 2000.

Witnesses included: Dr. D. James Baker, Under Secretary for Oceans and Atmosphere, U.S. Department of Commerce; Ms. Cheryl Roby, Principal Deputy to the Assistant Secretary for Command, Control, Communications, and Intelligence, Department of Defense; and, Mr. Mike Sweik, Executive Director, GPS Industry Council.

While drafting H.R. 1702, the Commercial Space Act of 1997, the Committee on Science attempted to seek input from various agencies and businesses in an effort to make the bill as favorable, for both the Congress and the Administration, as possible. Therefore, the Department of State was invited to participate in this hearing, but unfortunately, a witness was not sent despite the Committee's attempts over several weeks to obtain a representative who could provide input from the Department. The Committee sought input from the Department of State because the Department makes recommendations, based on U.S. international obligations, to the Secretary of Commerce regarding licenses for commercial remote sensing. Subsequent to the hearing, the Space and Aeronautics Subcommittee Chairman and Ranking Member each received a position paper from the Department of State regarding H.R. 1702. While the Committee appreciates the input from the Department, such input is valuable legislatively only to the extent that members have the opportunity to ask questions and explore issues on the record. The Department's failure to appear before the Committee and offer its comments in a public forum limit the value or import that can be given to the Department's concerns, many of which appear to be inconsistent with existing law in the Land Remote Sensing Policy Act of 1992 and the President's publicly released statements of policy on remote sensing.

#### *Summary of hearing*

Dr. D. James Baker, Under Secretary for Oceans and Atmosphere at the U.S. Department of Commerce, testified that it is the goal of the Department of Commerce, and the Administration, to provide a policy and regulatory regime which nurtures and fosters the development of commercial remote sensing, so that the U.S. does not squander the lead and allow other countries to gain competitive advantage in this high-skill, high-wage industry. Dr. Baker noted industry concerns about the vagueness of the standard for determining when imaging must be restricted. Therefore, he reported that the Department of Commerce is developing regulations

which will achieve a better balance between the burdens on a licensed operator and national security requirements and international obligations of the U.S. regarding remote sensing practices.

Ms. Cheryl Roby, Principal Deputy to the Assistant Secretary for Command, Control, Communications, and Intelligence at the Department of Defense, testified that the recently completed Quadrennial Defense Review commits the Department to maximize the use of emerging commercial remote sensing capabilities. She maintained that for reasons of national security, the Defense Department is convinced that provisions allowing for shutter control in emergency situations should continue. However, Ms. Roby noted that the Defense Department did not anticipate that shutter control would occur often or over significant periods of time.

Mr. Mike Swiek, Executive Director for the Global Positioning System Industry Council, testified that the Global Positioning System (GPS) has become one of the greatest success stories of government and industry cooperation. He noted that proposed language in the Commercial Space Act of 1997 reiterates the need to establish a clear, high-level commitment to a stable policy environment for the development of international standards facilitating both private and public sector investments in GPS. In closing, Mr. Swiek argued that the most important near-term initiative that the government can take to promote long-term GPS growth is through passage of language that supports current efforts to secure international agreements with our allies to establish GPS and its augmentations as an accepted international standard.

*4.4(j)—Space Shuttle Safety*

*October 1, 1997*

*Hearing Volume No. 105-24*

*Background*

On October 1, 1997, the Subcommittee on Space and Aeronautics held a hearing entitled, "Space Shuttle Safety." The hearing focused on the current status of the Space Shuttle program. Specifically, the hearing examined the overall program safety and how improvements instituted since the Challenger tragedy will be maintained during the ongoing consolidation of the program under a single prime contractor. Of particular interest to the Committee was the recent reallocation of \$190 million from the Shuttle program's uncosted carryover funds in FY1997 to the International Space Station (ISS) program. In addition, the Subcommittee was interested in receiving testimony about NASA's future upgrade and maintenance plans for its Orbiter fleet for operations through the next decade, as well as hearing the agency's proposals for the privatization of the Shuttle program.

Witnesses included: Mr. Wilbur Trafton, Associated Administrator, Office of Human Space Flight, NASA; Mr. Paul M. Johnstone, Chairman, Aerospace Safety Advisory Panel; Mr. Allen Li, United States General Accounting Office; and, Mr. Jim Adamson, Chief Operating Officer, United Space Alliance.

*Summary of hearing*

Mr. Wilbur Trafton, Associate Administrator for the Office of Human Space Flight, NASA, testified that the transfer of \$190 million in fiscal year 1997 from the Space Shuttle program to the International Space Station program was generated primarily from prior year operational efficiencies and program restructuring. The savings realized from the Shuttle program restructuring process, started in FY1993, were transferred into reserve accounts. Mr. Trafton stated that these accounts were then used to mitigate the impact of the significant reductions in new obligation authority during fiscal years 1994 and 1995. He also emphasized that Space Shuttle safety, NASA's number one priority, has not been jeopardized by the transfer of funds. Mr. Trafton detailed the near perfect safety record of Shuttle flights in recent years. Mr. Trafton testified that any significant interruption in the International Space Station assembly would drive the Shuttle well below the five to six year minimum rate recommended to maintain a safe schedule. In conclusion, Mr. Trafton believed that transferring the \$190 million was the right thing to do and stated that NASA planned to follow the same strategy in fiscal year 1998.

Paul M. Johnstone, Chairman, Aerospace Safety Advisory Panel, testified that the panel he chairs does not review budgetary matters and relies upon the affected programs to provide assessments of the consequences of funding changes on operations. Mr. Johnstone then stated that the Space Shuttle program had not informed the panel of any functional changes as a result of this uncosted carryover funds transfer. Mr. Johnstone noted that the panel does not have any indication that the transfer of funds will have any impact on the ongoing efforts to reduce risk. Mr. Johnstone also applauded NASA's utilization of the delay in the ISS assembly schedule to perform integrated testing of components on the ground prior to launch. He did indicate, however, that this delay could promote potential strain on Space Shuttle personnel resources. He concluded by stating that despite all of the changes NASA is undergoing, in his panel's estimation, safety remains the number one tenet.

Mr. Allen Li, United States General Accounting Office, testified on the upgrade activities and carryover balances of the Space Shuttle program. Mr. Li stated that upgrade activities are necessary not only to improve safety and reliability, but are also essential to overcome component obsolescence, enhance Shuttle performance, and reduce operating costs. Mr. Li detailed three points about the funding transfer: (1) the \$190 million transfer did not adversely impact current upgrade projects; (2) the money was available because of the large amount of carryover within the Shuttle program; and (3) depending on the upgrades selected, future costs could range from hundreds of millions to several billions of dollars. The questions surrounding funding, in Mr. Li's estimation, will provide the key parameters that will help shape future policy decisions.

Mr. Jim Adamson, Chairman, United Space Alliance, testified that the United Space Alliance has felt no pressure to reduce costs or accelerate production at the expense of savings. Mr. Adamson reported that the Shuttle Flight Operations Contract (SFOC) is on track and proceeding well. In conclusion, Mr. Adamson stated that,

in his opinion, after one full year under the SFOC, the safety of the Space Shuttle program has never been better.

*4.4(k)—NASA’s Study of Space Solar Power (Space Solar Power: A Fresh Look)*

*October 24, 1997*

*Hearing Volume No. 105–37*

*Background*

On October 24, 1997, the Subcommittee on Space and Aeronautics held a hearing entitled, “NASA’s Study of Space Solar Power” to discuss recent developments relating to the concept of space-based collection of solar energy for use on Earth. In particular the hearing focused on a recently-completed NASA study on “Space Solar Power: A Fresh Look”. Testimony before the Subcommittee addressed three main topics: (1) the approach and results of NASA’s “Fresh Look” study; (2) the potential direct and indirect economic, environmental, and space exploration benefits of space solar power; (3) what role NASA can and should play in pursuing the opportunities of space solar power, including carrying out the technology risk reduction roadmap suggested by the Fresh Look study.

Witnesses included: Mr. John Mankins, Manager, Advanced Concepts Studies, Office of Space Flight, NASA; Mr. Greg Maryniak, President, Sunset Energy Council, and Senior Scientist, Futron Corporation; and, Dr. Jerry Grey, Director of Aerospace and Science Policy, American Institute of Aeronautics and Astronautics.

In 1968 a Czech-American engineer at Arthur D. Little, Dr. Peter Glaser, first conceived of a satellite which could collect solar energy in space and beam it down to the Earth using microwaves or lasers. Stationed 22,000 miles above a ground receiving antenna in “geosynchronous” orbit, the Solar Power Satellite (SPS) would use photovoltaic cells to convert the direct, unfiltered sunlight which is available 24 hours a day in space into electrical energy before transmission to the surface.

The energy crises of the 1970’s stimulated both government and private sector interest in the SPS concept, leading to a Department of Energy-led study (with significant NASA participation) which determined the concept was feasible and in line with forecasts of early 21st century fossil and nuclear sources. An oversight study by the National Academy of Sciences released in late 1981, however, declared that the costs and technical risks made SPS unfeasible. In particular, the costs of launching and assembling huge satellites in orbit, the long period of time from initial investment until power could actually be generated (and hence the payback begin), and the risks of pursuing a system which required several new and unproven technologies, all militated against proceeding with full-scale development in the 1980’s timeframe. There were also concerns about the environmental impacts of microwave power-beaming from space to the Earth’s surface.

At the request of the House Committee on Science and Technology, the former Office of Technology Assessment issued its own report in 1981, which indicated that “too little is currently known

about the technical, economic, and environmental aspects of SPS to make a sound decision whether to proceed". It therefore suggested that an "SPS research program could ultimately assure an adequate information base for these decisions."

However, neither the Department of Energy (DOE) nor NASA pursued the SPS concept further for 15 years, apparently believing the idea was politically, as well as economically and technically, unfeasible. Meanwhile, private organizations such as the Space Studies Institute, the Sunsat Energy Council, and the California Space Institute all pursued research into a variety of concepts and technologies for what became the more generic and accepted term of "Space Solar Power."

Still other Space Solar Power advocates, including Dr. Glaser, studied the possibility of shorter-term applications for the basic technologies of "wireless power transmission" (i.e. the means of sending the energy from the satellite to the Earth). Glaser proposed that there were economically viable interim steps along the way to full-scale SPS development which could be pursued earlier, making it possible to reduce the risk and cost of SPS by inventing it piecemeal. Despite the U.S. government's lack of interest during the 1980's, other nations, particularly Japan and France, began hosting conferences and sponsoring preliminary research efforts regarding SPS.

In 1995, after the establishment of the Office of Space Access and Technology within NASA and its subsidiary Office of Advanced Concepts, NASA initiated its first significant look at Space Solar Power since the DOE study. The team included NASA employees from NASA Headquarters, the Marshall and Lewis Research Centers, and the Jet Propulsion Laboratory, as well as experts from the electric power and aerospace industry. The study took account of significant advances in automation and robotics, space launch, small satellites, and photovoltaics in the past 15 years, as well as changes in the world energy forecast, particularly in the developing world.

Starting with a mandate of economic feasibility, rather than a more typical engineering focus, the study identified several potential systems concepts—two of which were determined to be promising—and laid out a measured technology risk reduction strategy. Because of high costs for existing, let alone additional, power capacity in the developing world, the study determined that Space Solar Power would be an important energy option for the 21<sup>st</sup> century, and could begin meeting peak power demands economically in as few as 15–20 years. The study also found that there were significant benefits to other space activities, including in-space transportation and space-based power needs.

In mid-study (late 1996) NASA reorganized its space technology activities, and the Office of Advanced Concepts was abolished. The study activity continued, however, and the final report was issued early in the summer of 1997.

#### *Summary of hearing*

Mr. John Mankins, Manager, Advanced Concepts Studies, Office of Space Flight, NASA, initiated his testimony by stating that NASA is not the lead in the Federal Government for power systems

technology development for earth applications, and that commercial Space Solar Power is not a priority within NASA's current strategic plan. He noted that funding for any focused NASA effort in support of solar power technology is neither included in NASA's existing budget, nor contemplated at this time for future NASA budgets. He indicated that past solar power satellite efforts were deemed too expensive and immense to undertake. However, Mr. Mankins then detailed the latest effort to explore this topic, NASA's Fresh Look Study. According to Mr. Mankins, the study determined that the older modules of a solar power satellite system would cost between \$1 billion and \$10 billion to start commercial operations and would have to produce power at 1 to 10 cents a kilowatt per hour in order to compete commercially. The study, according to Mr. Mankins, also detailed two new concepts: the SunTower and the Solar Disk. These concepts both address a global energy market and are largely self-assembling and self managing. Mr. Mankins also stated that these new systems would cost less to assemble and have a diverse range of commercial space applications. Mr. Mankins concluded by stating that aggressive technology development would be needed to realize the potential of these new space solar power concepts. Based on the conclusions of the Fresh Look Study, the time has come for a reconsideration of power from space as a potential global energy option.

Mr. Greg Maryniak, President, Sunset Energy Council and Senior Scientist, Futron Corporation, testified that terrestrial solar power is critically important throughout the world, especially in residential areas where density is fairly small. Cities and industries, however, require an energy density that exceeds what can be collected in a local area. In Mr. Maryniak's opinion, Space Solar Power solves that problem by collecting the energy and transmitting it to earth. Mr. Maryniak stated that Space Solar Power would also have immediate benefits for wireless power technology, the International Space Station, and future space transportation. Mr. Maryniak believes that NASA's mission in this area should be to improve the technologies and reduce the risk for commercial players. In his opinion, NASA has been reluctant to pursue this strategy because of the intense interest and investment in a manned mission to Mars. In conclusion, Mr. Maryniak believes that research and funds should be balanced to include this potentially important technology.

Dr. Jerry Grey, Director of Aerospace and Science Policy at the American Institute of Aeronautics and Astronautics, testified that in creating the Human Exploration and Development of Space division (HEDS), NASA chose to include two oftentimes very different goals into the same enterprise; exploration and development. Dr. Grey concluded that the mission-oriented hardware needed for a Mars mission are generally not consistent with the equally important developmental goals that are achieved through the use of space technologies. He then noted that these two enterprises could eventually be reconciled because key technologies are shared in both endeavors. To do this, however, NASA must recognize that the development of space by humans for economic return and public access is at least as important as traveling to Mars. In conclusion, Dr. Grey stated that because the technological programs are widely

dispersed throughout the agency's various enterprises, NASA's technology advancement programs need to be coordinated by a single office whose responsibility is very specific: planning for and building the capability for both exploration and development of space by humans.

*4.4(l)—Indemnification and Cross Waiver Authority*

*October 30, 1997*

*Hearing Volume No. 105–36*

*Background*

On October 30, 1997, the Subcommittee on Space and Aeronautics held a hearing entitled, "Indemnification and Cross Waiver Authority" to discuss two different kinds of legal authority being sought by NASA from Congress: (1) indemnify experimental aerospace vehicle (eg, X-33 and X-34) developers against third-party liability claims; and (2) sign mutual waivers of liability with domestic contractors and other entities. The hearing addressed the Clinton Administration's proposed legislative language to provide these authorities and the Senate's alternative approach, as included in S. 1250, the FY1998–99 NASA Authorization bill.

Witnesses included: Ms. June Edwards, Associate General Counsel, NASA; Mr. Jerry Rising, Vice President, Reusable Launch Vehicles, Lockheed Martin Aeronautics Sector; and, Dr. Robert Lindberg, Vice President, X-34 Program, Orbital Sciences Corporation.

*Background (indemnification)*

NASA's X-33 and X-34 experimental reusable launch vehicle projects are leading examples of the space agency's "new ways of doing business." In the case of the X-33, a "cooperative agreement" was signed between Lockheed Martin and NASA which calls for the company to build and flight test the X-33 as an "industry-led" project. Because Lockheed Martin owns the X-33 vehicle itself, it would presumably be liable for any damages caused to third parties during the flight test program. A real-world example would be windows broken in someone's house due to the "hypersonic boom."

But because this flight test program is being conducted for the public good as part of an experimental technology demonstration effort, the Administration and many outside experts believe this liability risk is an unfair expense for the company to bear. NASA, therefore, proposes to amend the National Aeronautics and Space Act (P.L. 85–568, as amended) so they can indemnify or "protect against or keep free from loss or damage" [Webster's New World Dictionary, Third College Edition, 1988] the developers and operators of experimental vehicles such as Lockheed Martin for the X-33. Likewise, NASA would be able to indemnify Orbital Sciences Corporation, the developer of the X-34.

*Background (cross-waiver)*

In order to maximize resources available to space research (by minimizing that spent on legal issues), NASA has historically signed mutual waivers of liability with its research partners,

whether they are domestic or foreign contractors, universities, individuals or government agencies. By agreeing to be responsible for one's own hardware and any damages it suffers, both NASA and the other entity can avoid spending resources protecting themselves against the greatest source of litigation: damages to directly-involved parties.

For example, if a university wishes to fly a payload on the Space Shuttle, the cost of obtaining insurance against the potential damage to the Shuttle orbiter if something went wrong with the payload could well exceed the total cost of the payload and the launch. Because it is in the public interest to encourage the greatest efficiency in use of research funding, NASA and the university would sign a "cross-waiver" of liability claims. If the university was working with several scientists, each of whom contributed part of the payload, the university could extend this cross-waiver to cover them as well.

While NASA has historically claimed the authority to sign these cross-waivers with both domestic and international partners, the Department of Justice has raised questions about this authority vis-à-vis domestic waivers. (The President clearly can delegate his constitutional foreign affairs authority to NASA to reciprocally waive liability rights with international partners.) NASA is therefore seeking the explicit authority to sign such waivers with all domestic partners, again as a permanent amendment to the NASA Act (P.L. 85-568, as amended).

#### *NASA's proposed legislation and S. 1250*

As stated earlier, NASA is proposing that it be granted indemnification and cross-waiver authority through permanent amendments to the NASA Act of 1958 (as amended). In keeping with the broadly empowering nature of the Act itself, the Administration's proposed legislative language gives NASA broad and permanent authority which includes not only coverage of X-33 and X-34 but also the International Space Station and operators of a privatized Space Shuttle.

Senator Frist's and Rockefeller's staff on the Commerce, Science, and Transportation Committee's Subcommittee on Science, Technology, and Space have, after extensive discussions with NASA, experimental vehicle developers Lockheed Martin and Orbital Sciences Corporation, and their own legislative counsel, produced significantly different language which Senator Frist has included in S. 1250. Senator Rockefeller is a co-sponsor of the bill.

S. 1250's language provides much narrower powers, limiting both indemnification and cross-waiver authority to just the X-33 and X-34 programs. Instead of permanently amending the NASA Act (P.L. 85-568, as amended), S. 1250 provides a temporary, stand-alone provision which sunsets in either 2002 or, at the discretion of the Administrator, in 2005.

#### *Summary of hearing*

Ms. June Edwards, Associate General Counsel, NASA, testified regarding the cross-waiver and indemnification concepts located in section 308 of the National Aeronautics and Space Act as contained in NASA's Fiscal Year 1998 Authorization Bill. Ms. Edwards de-

scribed cross-waivers as first or second-party liability where each party agrees to bear its own risk of participation in a joint space activity and is thus freed from the concern that it may be liable for other parties' contributions. She noted that cross-waivers save money and also encourage space activity by reducing uncertainty and risk, especially in the commercial context. Ms. Edwards stated that NASA was seeking an explicit statement of ability to waive claims of the United States Government in its domestic cross-waiver. Without the amendment, Ms. Edwards stated, the commercial aerospace industry supporting NASA's aerospace activities could be placed at a competitive disadvantage vis-à-vis their international partners and their contractors. She noted that under a presidential delegation, NASA can waive these claims in international agreements but may not be able to provide the same level of insurance in domestic activities. Ms. Edwards also testified that new indemnification approaches are needed to meet the new and emerging commercial space initiatives. In conclusion, Ms. Edwards stated that the proposed legislation, which she feels addresses a fair and equitable allocation of risk, would provide a significant benefit to the United States' space program.

Mr. Jerry Rising, Vice President, Reusable Launch Vehicles, Lockheed Martin Aeronautics Sector, testified regarding the X-33 program and the importance for providing for a financial responsibility and risk allocation regime comparable to other current aerospace activities. Mr. Rising testified that in regard to the X-33 program, NASA agreed to fund the high-risk advanced technologies to a level that will most likely include private capital investment for the full-scale operational vehicle. He noted that the X-33 program is being carried out under a cooperative agreement, rather than under a conventional NASA contract. While this agreement has many advantages in terms of flexibility and responsibility of government and industry, it has become evident that there are limits to NASA's authority in the context of this new legal mechanism. Mr. Rising then explained that the NASA X-33 Industry Cooperative Agreement has placed the X-33 flight test program in a gap wherein traditional government coverage for a third-party liability is unavailable. Therefore, in Mr. Rising's opinion, the launch insurance and the indemnification regime provided by the proposed NASA legislation is essential for the continuation of the X-33 program. Mr. Rising testified that Lockheed Martin would like to see the Congress give NASA clear authority to provide for insurance and indemnification for loss in excess of what NASA determines to be reasonable and affordable insurance for the contractor to provide on experimental programs. In conclusion, Mr. Rising stated that the support of experimental programs, like the X-33 and eventually the VentureStar Reusable Launch Vehicle, is essential for affordable space launch capabilities in the future.

Dr. Robert Lindberg, Vice President, X-34 Program, Orbital Sciences Corporation, testified on the impact that indemnification has on the X-34 program. Dr. Lindberg explained that the X-34 is an experimental, air-launched hypersonic rocket-powered vehicle, that will demonstrate new approaches that will dramatically reduce the time and the number of people that are required to process and launch a future reusable launch system. Before even one

flight is conducted, Dr. Lindberg testified, it is necessary to have in place the means of protection against damage, loss or injury that might result for the operation of our experimental vehicle for the benefit of NASA. Dr. Lindberg then explained that the risks involved in the operation of the X-34 exceed the indemnification limits associated with the general risk of hazardous operations within the industry of the United States. Expendable launch vehicle operations conducted for NASA are indemnified by NASA through authority granted in the Space Act. The Space Act, Dr. Lindberg noted, does not extend that authority to a non-commercial but non-government owned reusable launch system such as the X-33 or X-34. Dr. Lindberg testified that if the United States is to develop low-cost access to space in the foreseeable future, the Federal Government must indemnify and provide provisions of cross-waiver of liability for flight programs with experimental technologies. Dr. Lindberg stated that Orbital Science Corporation supports NASA's initiative to seek authority to indemnify these new reusable launch programs, consistent with their authority to indemnify expendable launch vehicles through the Space Act.

*4.4(m)—Status and Cost Overruns of the International Space Station Program*

*November 5, 1997*

*Hearing Volume No. 105-28*

*Background*

On November 5, 1997, the Subcommittee on Space and Aeronautics held a hearing entitled, "Status and Cost Overruns of the International Space Station Program."

Testimony before the Committee focused on: (1) the cost and schedule performance of the International Space Station program to date; (2) the projected fiscal status of the International Space Station program, including cost increases resulting from design changes, contractor performance, and schedule variance; (3) past, current, and projected Russian performance on its commitments to the International Space Station; (4) the reasons the program is experiencing cost growth; (5) the current financial status of Boeing's contract with NASA on the International Space Station; (6) Boeing's plans for containing cost growth in the future; (7) GAO's judgment about NASA and contractor plans to contain cost growth and maintain schedule on the International Space Station in the future; and (8) the issue areas surrounding the International Space Station that may require Congressional action.

Witnesses included: Wilbur C. Trafton, Associate Administrator, Human Space Flight, NASA; Douglas C. Stone, Vice President and Program Manager, International Space Station, The Boeing Company; and, Alan Li, Associate Director, National Security and International Affairs Division, General Accounting Office.

In late 1993, the Clinton Administration initiated a redesign of the Space Station Freedom. Canada, the European Space Agency, and Japan were international partners of the United States at the time. The design that the Administration and NASA settled on was dubbed "Alpha." Just as the redesign was completed in 1994, the

Administration invited the Russian Government to join the program as an international partner. The station was again redesigned to include Russian participation. The first element of the newly redesigned Space Station with Russian participation, now known as the International Space Station (ISS), was to be launched in 1997 with a completion date in June 2002. According to the Administration, bringing the Russians into the redesigned space station would save the American taxpayer \$2 billion and expedite launch of the station's first elements by two years. The total U.S. cost of the program with the Russians was set at \$17.4 billion between FY94 and FY02, with a self-imposed annual spending cap of \$2.1 billion. Additionally, ISS was to have early science capabilities.

The Administration established the Gore-Chernomyrdin Commission (GCC), in which Vice President Gore routinely meets with the Russian Prime Minister Viktor Chernomyrdin, to resolve issues that arise during the course of U.S.-Russian scientific cooperation. Since then, Vice President Gore has been the Administration's "point man" in dealing with Russia on ISS issues.

#### *Russia's role*

At the time of the redesign, Congress was concerned that the Russian Government would not be a reliable partner in ISS for several reasons. First, members were concerned about Russia's political stability as the former Soviet republics worked out their relations as independent states. The possibility that an ultra-nationalist, such as Vladimir Zhirinovskiy, would become President of Russia and pull it out of the ISS program was particularly worrisome. Second, members were concerned about Russia's economic situation, which was chaotic in 1993 and was expected to have an impact on Russia's ability to actually build the hardware it pledged to build. Members also recommended keeping Russia out of the critical path for completing ISS, meaning they wanted Russia to play an enhancing role, not an enabling role. None of the other international partners were in the critical path. Consequently, they would not hold up the space station if they failed to produce their promised hardware.

As the Committee has conducted repeated oversight hearings of this program since 1993, it has become clear that Russia's economic situation is having an adverse impact on the country's ability to meet its ISS commitments, contributing to a seven-month delay in the launch of the first element (from November 1997 to June 1998) and nearly a year and a half schedule slip in the scheduled final launch (from June 2002 to December 2003). Furthermore, it is also clear that the Russians are in the ISS critical path and that the highly-capable station that NASA promised to build for \$17.4 billion cannot be built without the Russians, who are to provide: (1) command, control, living quarters, and reboost capabilities with the Service Module; (2) early space-based power and roll control in the Science Power Platform; (3) crew rescue capabilities in the Soyuz spacecraft; and (4) logistics and resupply through launches of unmanned Progress spacecraft.

In late 1995, the Russian Space Agency (RSA) informed NASA that it was unable to honor its commitments to the International

Space Station due to a lack of funding from the Russian Government. At that point, RSA proposed attaching the U.S., European, Canadian and Japanese components of ISS to Russia's aging Mir space station, which was already in orbit. NASA rejected this option, but revised its relations with RSA by extending its existing \$400 million Shuttle-Mir contract and adding another \$72 million in scheduled payments from the United States to Russia and by agreeing to alter the assembly sequence and provide additional support to Russia's ISS hardware needs. With these new American commitments, Russia renewed its promise to honor its commitments to the ISS. Unfortunately, throughout 1996, RSA and its contractors continued to receive inadequate funding and Russia fell further behind in its work on ISS components.

The Russian fiscal year begins on January 1. Although the Russian Government's budget for RSA and its commitments to the International Space Station totaled 1.8 trillion rubles in 1997, RSA and its contractors did not receive their funding during the first three months of 1997. In February 1997, at the regularly scheduled meeting of the Gore-Chernomyrdin Commission, the Russian Government promised to provide 800 billion rubles to RSA by the end of May. It did not. Consequently, RSA and its contractors continued to fall behind the schedule for building their portions of ISS. During the second quarter of 1997, the Russian government made several promises to provide RSA with its entire budget for the year in cash. It did not keep these promises. In April 1997, NASA announced the first major delay in the construction schedule for ISS partly as a result of Russia's failure to fund its contractors. At that point, the Russian government arranged to borrow funds from private Russian banks to finance some of its space activities. According to a recent NASA briefing, RSA and its contractors have received about 1 trillion of the 1.8 trillion rubles promised this spring, while a decree by Yeltsin has been issued promising another 530 billion rubles for RSA during the last three months of 1997. This would still leave RSA and its contractors 270 billion rubles short of their promised budget. Nevertheless, according to NASA, RSA and its contractors are at work on the near-term Russian contributions to the ISS: Service Module, Science Power Platform, Soyuz, and Progress spacecraft. The Service Module is approximately two months behind schedule in preparing for a December 1998 launch.

*Problems with the U.S. portions of the program*

Most of the attention focused on ISS to date has been on the Russians, largely due to their repeated failures to honor their commitments. In the United States, however, serious programmatic problems have also developed. In this case, they have nothing to do with the government's inability to provide funding, since the Congress has given NASA full funding of the amounts requested in the President's budget as well as another \$100 million that was not requested in FY1998.

Significant cost growth has occurred in the program, but it is not clear how much money is involved or the reasons that NASA is unable to live within its self-imposed \$2.1 billion annual spending cap. One reason for the ambiguity in cost growth is that NASA has

deferred work from year to year while insisting that development costs would not grow in the outyears. For example, in the latest revision of the ISS assembly sequence, NASA delayed the launch of the U.S. habitation module by 22 months, from its original launch in February 2002 to a new launch date in December 2003. Even as it adopted this delay, NASA initiated studies to determine if the habitation module could be replaced with an Italian-built Node 3 not contained in the original ISS design or with something called "Trans-hab" which could serve as a technology test bed for sending people to Mars. Such design changes so late in the program make it difficult to estimate the cost impact of changes to the program until they are finalized and their impact assessed. Nevertheless, changes that have been finalized can be determined. NASA Administrator Goldin testified before the Senate Commerce Committee's Subcommittee on Science, Technology, and Space on September 18, 1997, that "Authorized program changes alone count for application of over \$1 billion in reserves."

It is clear, however, that NASA has required considerably more resources for construction of the ISS than laid out in the program's original budget. One manner NASA has used to acquire additional funds without asking Congress for additional budget authority has been to transfer funds budgeted for early science missions aboard ISS into ISS construction accounts. The following chart summarizes these past, current, and planned transfers.

	Fiscal year—							Total
	1996	1997	1998	1999	2000	2001	2002	
Original science budget FY96 .....	250.8	308.4	400.5	434.5	454.0	314.3	260.7	2423.2
Transfer to construction .....	-50.0	-177.0	-235.0	-70.0	—	+190.0	+165.0	2246.2

The funds transferred from science to construction total \$532 million between FY96 and FY99. NASA currently plans to transfer \$355 million back to science in FY01 and FY02, leaving a \$177 million shortfall in science funding.

In addition to transferring funds from science to ISS construction, NASA also transferred funds from the Space Shuttle budget. On April 9, 1997, NASA announced in testimony before the Subcommittee that it wanted to transfer \$200 million in FY97 funding from the Space Shuttle to ISS construction. In the end, it transferred \$190 million from the Space Shuttle and \$10 million from payload and utilization into ISS construction.

On September 18, 1997, NASA wrote Chairman Jerry Lewis of the VA/HUD/Independent Agencies Appropriations Subcommittee and informed him that NASA required \$430 million in FY98 funding over and above the President's request of \$2,121.3 million for ISS development. In the letter, NASA identified a \$100 million increase in ISS funding provided by House appropriators and the authority to transfer an additional \$150 million from Science, Aeronautics, and Technology into ISS development. NASA did not identify which programs it planned to cut in transferring \$150 million from other programs or where it would obtain the remaining \$180 million shortfall.

House and Senate authorizers asked for similar notice, which NASA did not provide until October 10, 1997 when the agency sent

Chairman Sensenbrenner and Ranking Minority Member Brown a letter summarizing those actions taken by the appropriations conference. Briefly, the appropriators: (1) increased NASA's total funding by \$148 million, \$100 million of which went for ISS; (2) redirected funding totaling \$50 million within Human Spaceflight to ISS construction; and (3) transferred \$80 million from Mission Support to ISS construction. The October 10 letter also did not identify which program NASA intended to cut to come up with the \$430 million it claimed to need. Instead, it indicated that the agency would determine what the impact of a \$230 million increase in ISS construction would be as opposed to a \$430 million increase.

In addition to these funding transfers, NASA has spent a considerable portion of its budgeted reserves on ISS development, even before the first element is launched. In conjunction with a March 28, 1996 hearing on the International Space Station NASA Administrator Dan Goldin confirmed in writing that the ISS program was two weeks behind schedule, that NASA estimated a \$44 million cost overrun because of contract performance, and that the program had \$3 billion in reserves available. At a hearing before the Subcommittee on April 9, 1997, Mr. Wilbur Trafton, NASA's Associate Administrator for Human Spaceflight, testified that the program had \$2 billion in reserves remaining, indicating that approximately \$1 billion must have been spent since Mr. Goldin's March 28, 1996 testimony. Mr. Trafton pointed out in his testimony that most of those reserves were not available until after FY99. This raises the natural question of how NASA managed to spend \$1 billion in reserves that it did not have budgeted between March 28, 1996 and April 9, 1997.

Much has been reported about Boeing's estimate that it will overrun its prime contract on the ISS by \$600 million at completion. An internal Boeing study over the summer estimated that Boeing's cost overrun as a result of inadequate performance on the contract could reach \$800 million, but the company believes that its aggressive destaffing plans could hold the increase down to \$600 million. On October 16, 1997, NASA briefed the Committee staff that it estimated Boeing's overrun at completion would be \$817 million. Both agree that approximately \$400 million of this overrun will have already accrued and been paid for by the end of calendar 1997.

It is important to remember in assessing this overrun that the cost growth in the program is not limited to Boeing's performance. In addition, NASA has incurred new costs as it sought to develop options to accommodate Russia's inability to meet its commitments. For example, NASA is funding an Interim Control Module which could perform some functions of the Russian Service Module. This will cost approximately \$114 million more than NASA planned when it established its program cost of \$17.4 billion. Besides those additions that result from Russian problems, NASA has made design changes to the ISS while it is under development. These also result in programmatic cost growth. The \$72 million extension of the contract between NASA and RSA in early 1996 also came out of the ISS budget. NASA estimates unofficially that it had incurred \$1.4 billion in new costs that were not covered in the original estimate of \$17.4 billion to complete ISS.

*Summary of hearing*

Mr. Wilbur Trafton, Associate Administrator, Human Space Flight, NASA, testified that despite the many variables that increase the likelihood of cost growth, the Space Station developing program has largely been managed within budget for the last four years. Mr. Trafton indicated that as NASA experiences the peak period of development activity, they are without sufficient reserves in Fiscal Year 1998 to address development challenges and potential contractor performance problems. Mr. Trafton testified that NASA has estimated an additional \$430 million will be required above the President's request. He explained that the \$430 million additional funding requirements includes conservative estimates of prime contractor cost growth, adjustments for sustaining engineering, spares, and required changes, additional funds for Russian-driven changes, and adequate reserves to cover the unforeseeable problems likely to be incurred in Fiscal Year 1998. Mr. Trafton detailed two options under consideration if the requisite FY98 funding is not received: (1) Defer work either in the baseline program or in the research program; or, (2) terminate the Russian contingency activity, the interim control module. Mr. Trafton testified that he finds these options place the program at risk to: one, deal with the technological development challenges; two, continue to mitigate the risks of Russian Government problems; and three, maintain an adequate level of research activity as early as possible. Mr. Trafton stated that he is convinced that maintaining the baseline technology and schedule for the Space Station in FY98 is essential to control total costs. In conclusion, Mr. Trafton asked for continued support from the Committee for the International Space Station.

Doug C. Stone, Vice President and Program Manager, International Space Station, The Boeing Company, testified that by the end of FY98, Boeing will be more than 80 percent complete with their portion of the program. He reported that technical issues encountered during the ongoing development phase of the program have created management challenges in both schedule and cost performance which have placed the program approximately five weeks behind schedule. While The Boeing Company has reported cost growth, Mr. Stone testified that the Company has committed to improve performance in six specific areas: (1) a reinforced Space Station management team and structure; (2) improved subcontractor performance; (3) a commitment to meet schedule milestones on time; (4) the creation of special incentives to acquire and retain key software engineers and managers; (5) a \$30 million commitment of capital funds to build a software integration facility; and (6) an addition of more senior management involvement and visibility on the Space Station program. Mr. Stone concluded by stating that with continued support from the Administration and Congress, NASA and Boeing will deliver on the promise to start launching the International Space Station in 1998.

Mr. Allen Li, Associate Director, National Security and International Affairs Division, General Accounting Office, testified in regard to three main issues: cost growth under the prime contract; the impact on NASA of the Russian's performance problems; and, Congressional review of the program and setting realistic funding

limitations. In response to the total cost growth at contract completion, Mr. Li reported that Boeing more than doubled its estimate from \$278 million to \$600 million and subsequently NASA increased its estimate to \$817 million. Mr. Li stated that both parties recognize the seriousness of the cost growth issue and have taken actions to address the problem. NASA reduced Boeing's award fees because of poor performance and Boeing responded by implementing a corrective action plan. In Mr. Li's opinion, these responses will eventually slow the cost deterioration. In regard to Russia's performance problems, Mr. Li reported that Russia's inability to furnish the service module on time increased NASA's costs by over \$300 million. He also testified that should the Russians not meet the revised partnership commitments, the program's costs could increase by billions of dollars. He stated that NASA is monitoring the situation and believes that the projected December 1998 launch date for the service module can still be met. Finally, Mr. Li testified that the Space Station program is limited to \$2.1 billion annually and \$17.4 billion through the completion of Station assembly. He reported that the reduced reserves and the recent and prospective cost increases have put additional focus on this administratively imposed funding limitation. Mr. Li testified that the General Accounting Office recommended in their September report that the use of this financial cap should be discontinued. Mr. Li also stated that if Congress decides that a legislative cap is warranted, it should consider establishing one after reviewing the entire program to determine its future scope and cost level.

*4.4(n)—Fiscal Year 1999 Budget Request for the National Aeronautics and Space Administration, Parts I–IV (NASA Posture)*

*February 5, 1998*

*Hearing Volume No. 105–67*

*Background*

On February 5, 1998, the Subcommittee on Space and Aeronautics held a hearing entitled, "Fiscal Year 1999 Budget Request for the National Aeronautics and Space Administration, Parts I–IV." The hearing focused on the Administration's budget submittal for FY1999 for the National Aeronautics and Space Administration (NASA). The Administration requested \$13.465 billion for NASA in FY1999. The FY1998 appropriated level was \$13.648 billion and the FY 1999 appropriated level was \$13.665 billion. The FY1999 budget request and runout are higher than previous budget requests. The FY1998 budget requested estimated a level of \$13.410 billion for FY1999 and the FY1997 budget request estimated a level of \$12.363 billion for FY1999.

Following are the FY1999 budget requests for some of the major programs within NASA: Space Station—\$2.27 billion; Space Shuttle—\$3.059 billion; Space Science—\$2.058 billion; Life and Microgravity Sciences and Applications—\$242 million; Earth Science—\$1.372 billion; Aeronautics & Space Transportation Technology—\$1.305 billion; Mission Communications Services—\$380 million; Academic Programs—\$100 million; Space Communications Serv-

ices—\$177 million; and Research and Program Management—\$2.099 billion.

Witness included: Daniel Goldin, NASA Administrator.

*Summary of hearing*

Daniel S. Goldin, the Administrator of NASA, testified that the hardware for the first two Space Station launches would be ready in June and July of 1998. Mr. Goldin also reviewed ongoing activities in planetary exploration, aeronautics, and earth science. He testified about the goals of the Reusable Launch Vehicle program and that NASA's intent is to support the development of next-generation systems with appropriate technologies and utilization of NASA facilities, not the operational phase after development. Mr. Goldin testified that the FY1999 budget has funding for Pathfinder, about every 18 months for approximately \$100 million. Funding for Trailblazers is not in the budget. He testified that NASA is currently at a level of 19,200 employees and by the year 2000, the agency has to get down to a level of about 17,800. Mr. Goldin testified that NASA has no plans for a human mission to Mars in 2011.

He stated that eight Shuttle missions are currently planned for FY1999. Further, Joseph Rothenberg, the Associate Administrator of Human Space Flight, is to undertake a study to see if the agency can have rapid-response payloads available to do science or commercial missions if there is a schedule slip in assembly of the International Space Station. Mr. Rothenberg is also working on a Station commercialization plan that will be completed by August 1998. Mr. Goldin testified that NASA is willing to commit up to 30% initially, of the Station resources for commercialization and if it is possible to get to 50%, then that will be pursued.

He stated that there will be almost no NASA funding going to Russia from FY1999 on. In discussing whether or not the Service Module would be launched on time in December 1998, a question was raised about the timeframe for a decision on launching the Interim Control Module as a temporary replacement. Mr. Goldin stated that the decision on the Interim Control Module would have to be made in March 1998. He testified on an inflatable structure known as a Transhab. The Transhab could potentially replace the current habitation module design. Mr. Goldin stated the agency is reviewing the Transhab and a decision will be made before the end of 1998, but Congress will be notified before NASA makes the decision. He stated there is a potential to save up to \$100 million using the Transhab design rather than the current habitation module design.

In questioning about apparent Russian violations of the Missile Technology Control Regime (MTCR), Mr. Goldin stated that he looks for the foreign policy establishment to give NASA guidance on whether the Russians have violated the MTCR and the agency intends to proceed forward with the partnership in the Space Station until it receives such guidance.

4.4(o)—*Fiscal Year 1999 Budget Request for the National Aeronautics and Space Administration, Parts I–IV (Aeronautics and Space Transportation Technology)*

*February 12, 1998*

*Hearing Volume No. 105–67*

*Background*

On February 12, 1998, the Subcommittee on Space and Aeronautics held the second in a series of four hearings entitled, “Fiscal Year 1999 Budget Request for the National Aeronautics and Space Administration, Parts I–IV.” Testimony before the Committee focused on: (1) the Aeronautics and Space Transportation Enterprise with respect to its strategic plan; (2) NASA’s role in the Administration’s Aviation Safety Initiative; (3) the agency’s role in the Next Generation Internet program; (4) the status of NASA’s High Speed Research program; (5) the status of and plans for NASA’s advanced space transportation technology programs; (6) NASA’s proposal to study its “Future Space Launch Architecture” and set aside funds in the outyears for procuring a next-generation, operational space launch system; and (7) the emergence of several commercial initiatives to develop reusable space transportation systems and their role in meeting NASA’s future space transportation needs.

Witnesses included: Mr. Richard S. Christiansen, Acting Associate Administrator, Aeronautics and Advanced Space Transportation Technology; Mr. Gary E. Payton, Deputy Associate Administrator, Space Transportation Technology; and, Mr. Gary C. Hudson, Chief Executive Officer, Rotary Rocket Company.

*Summary of hearing*

The Office of Aeronautics and Space Transportation Technology performs three distinct but related missions for NASA: aeronautics and aviation safety research and development; advanced space transportation technology development, demonstration, and planning; technology transfer; and Small Business Innovation Research programs. These three functions were grouped together in this strategic enterprise as part of a late-1996 reorganization because of the technical overlaps between advanced aeronautics and space transportation R&D and the commercialization orientation of both the aeronautics and the RLV program activities.

*Aeronautics*

NASA’s Aeronautics program primarily consists of the Research and Technology Base and three focused programs of diverse technology initiatives. These include: High Speed Research, Advanced Subsonic Technology, and High Performance Computing and Communications (HPCC). In the FY1999 Budget briefings conducted with NASA, there are plans to create a fourth focused plan beginning in FY2000, Aviation Safety Technology. According to the FY1999 budget, NASA is now proposing that a Phase IIA be funded through FY2007 in order to build a prototype of the engine, thereby reducing technological risks to industry.

On July 25, 1996, the President established the White House Commission on Aviation Safety and Security and assigned it three specific mandates: to assess the future threat to security; to provide a framework for regulation of the aviation industry of the future; and to assess advances in technology and how they can best be utilized. The principle recommendation of the Commission was that the focus of government and industry should be to reduce the rate of accidents by a factor of five within the next decade, and that a national air traffic control system capable of facilitating this be operational by 2005. The agencies which will be involved in this initiative are principally the FAA, DOD, and NASA. NASA's role in this effort will be primarily in the area of human factors research in that the predominance of aviation accidents involve human error. NASA's proposed share of this initiative is \$500 million over the period of FY1998–2002:

*Advanced space transportation technology*

NASA's Space Transportation Technology function includes one major program (Reusable Launch Vehicles consisting of X-33 and X-34), two smaller projects (Bantamliifter/Low Cost Upper Stages and Advanced Space Transportation Technology), and a new Future Space Launch planning activity. In FY1999, NASA is beginning a series of future experimental RLVs called "Future X." NASA intends to begin at least two small (\$100 million cost, 18–24 months for development and flight demonstrations) "Pathfinder" vehicle efforts in FY1999, and perhaps one large X-33-class (\$500 million cost, 3 years for development and flight demonstrations) "Trailblazer" effort sometime in the next decade. In FY1999 and FY2000 NASA is allocating \$20 million each year for Future Space Launch studies.

*Commercial technology programs*

NASA's Commercial Technology Programs function involves three areas of activity: (1) Internally, NASA has pursued an "Agenda for Change" since 1994 to carry out commercial technology transfer as a fundamental NASA mission; (2) Externally, NASA funds a National Technology Transfer Center (NTTC) and various other institutions which serve as "agents" in promoting the transfer of NASA technology to the commercial sector for both aerospace and non-aerospace application; and (3) The Small Business Innovative Research Program is designed to ensure that NASA research contracts are awarded not only to large firms, but also to the small business community, and also to facilitate the commercialization of the results of this research.

Mr. RICHARD S. Christiansen Acting Associate Administrator for Aeronautics & Advanced Space Transportation Technology testified that NASA has stepped up its reprogramming of \$500 million of their budget runout for the Aviation Safety Initiative, and that the FAA is indeed the lead agency for this program. He also testified that, within the High Speed research program, the proper next step was to augment Phase II at an additional cost of a little over \$800 million and bring the component pieces that they have been developing and put a full-scale demonstrator engine together. He also confirmed the NASA Administrator's testimony that he does not ex-

pect to see an operational High Speed Civil Transport (HSCT) until around the year 2020.

Mr. Gary E. Payton, Deputy Associate Administrator (Space Transportation Technology) offered testimony updating the Subcommittee on the progress of the X-33 program, specifically with respect to the environmental impact studies and vehicle technologies. Additionally, he produced a sample of new thermal protection technology for the inspection of the Subcommittee Members, among other examples of new technologies developed by the program. He testified that the NASA Administrator was adamant about the need for competition for any Future-X funding, and that third-party indemnification and cross-waiver authority were crucial to the X-33 flight test program.

Mr. Gary C. Hudson is the Chief Executive Officer of Rotary Rocket Company. He testified that there are at least four privately owned corporations which are putting hundreds of millions of dollars at risk in a quest for private space transportation. Speaking for the other private companies, he expressed his belief that Boeing and Lockheed Martin should be required to spend their own money if they wanted to be a part of the 21st century in space. Further, he criticized the FAA's regulatory approach to their industry and threatened that relocation of the industry may be the only solution unless the process is reformed.

*4.4(p)—Fiscal Year 1999 Budget Request for the National Aeronautics and Space Administration, Parts I-IV. (FY99 Budget Request: The Sciences at NASA)*

*February 25, 1998*

*Hearing Volume No. 105-67*

#### *Background*

On February 25, 1998, the Subcommittee on Space and Aeronautics held the third in a series of four hearings entitled, "Fiscal Year 1999 Budget Request for the National Aeronautics and Space Administration, Part I-IV." The hearing focused on: (1) the current and outyear funding profiles for the science programs at NASA and how they have changed over the last three years; (2) the science program's accomplishments in FY1997 and thus far in FY1998; (3) the programs experiencing developmental problems and NASA's plans for addressing those problems; (4) the new initiatives for science programs in the FY1999 budget request; (5) the consolidation of space technology efforts within Code S; (6) the consequences of funding transfers from life and microgravity research to International Space Station construction; (7) the experiments planned for life and microgravity research during FY99 and aboard the International Space Station during its assembly; (8) NASA's plans for increasing flight opportunities for life and microgravity research given the competing interests of assembling, maintaining, and operating the International Space Station; (9) the transition of the International Space Station from a design being constructed on the ground to an active research platform in space during its assembly; (10) the integration of the Human Exploration and Development of Space (HEDS) strategic enterprise with NASA's other efforts to ex-

plore and understand the universe; (11) the current and historic funding levels for Research and Analysis within the Earth Science budget; (12) the development status for the Earth Observation System Data Information System (EOSDIS); and a specific discussion of how the commercial acquisition of data will be incorporated into the Earth Science program.

Witnesses included: Dr. Wesley T. Huntress, Associate Administrator for Space Science, NASA; Dr. Ghassem Asrar, Associate Administrator for Earth Science, NASA; Dr. Arnauld E. Nicogossian, Associate Administrator for Life and Microgravity Sciences and Applications, NASA; and, Mr. Joseph Rothenberg, Associate Administrator for Human Space Flight, NASA.

#### *Summary of Hearing*

Dr. Wesley T. Huntress, Associate Administrator for Space Science, began his testimony by thanking the Committee for its long-standing, unwavering support of the Space Science Enterprise. He described the Enterprise's accomplishments in 1997, which featured the July landing of Pathfinder on the surface of Mars, and the subsequent exploration of the surface by the robotic rover Sojourner. Other missions experienced significant accomplishments, such as the Mars Global Surveyor, which arrived into Mars orbit in September; Galileo, which continues to return science data from Jupiter; and continued discoveries by the Hubble Space Telescope. Dr. Huntress then discussed missions planned for 1998, and the Space Science budget for FY1999 and beyond. Budget levels for this Enterprise have increased for both FY1999 and the outyears compared to last year's budget submission. Dr. Huntress expressed his appreciation to the Committee for its support which made these budget levels possible.

Dr. Ghassem Asrar, Associate Administrator for Earth Science, described the Earth Science Enterprise as an organization focused around six major functions: (1) teams of scientists who will analyze earth science data; (2) a series of small and medium-sized satellites to acquire the data; (3) a comprehensive information storage and processing system; (4) a technology development program to enable advanced space-based observational capabilities; (5) applications research and a commercial partnership program; and (6) an education program to train the next generation of earth scientists. Dr. Asrar then presented specific science findings from the Earth Science Enterprise, and discussed planned activity for 1998. The long-range plans, he indicated, would focus on smaller, flexible satellite platforms with an increased focus on international partnerships and commercial data purchases.

Dr. Arnauld E. Nicogossian, Associate Administrator for Life and Microgravity Sciences and Applications, highlighted two major accomplishments of 1997: (1) the reflight of the Microgravity Science Laboratory only 5 months after the prior flight had been cut short; and (2) continued science conducted aboard Russia's Mir space station. He described numerous other science achievements in 1997, and discussed upcoming plans for 1998. He testified that long-term research opportunities of particular interest would be conducted on Spacehab, the Space Shuttle, and the International Space Station.

Mr. Joseph Rothenberg, Associate Administrator for Human Space Flight, testified with an emphasis on the scientific aspects of the International Space Station (ISS). He indicated that ISS construction was moving forward, but that the early science research during the construction phase would be very constrained. He testified, however, that the first stages of research would be supported by ISS in the year 2000. Mr. Rothenberg then discussed the formulation of the ISS research strategy, and its incorporation of the interests of a broad constituency of the science community.

*4.4(q)—Fiscal Year 1999 Budget Request for the National Aeronautics and Space Administration, Parts I–IV. (FY99 Budget Request: Human Space Flight)*

*March 19, 1998*

*Hearing Volume No. 105–67*

*Background*

On March 19, 1998, the Subcommittee on Space and Aeronautics held the last in a series of four hearings entitled, “Fiscal Year 1999 Budget Request for the National Aeronautics and Space Administration, Parts I–IV.” Testimony before the Committee focused on (1) funding requirements for the International Space Station (ISS) in FY1998 and beyond; (2) management challenges in terms of Russia’s continuing failures to honor its obligations to the ISS partnership; (3) lessons learned from Phase I of the program and how they are being applied to Phase II; and (4) the steps NASA is taking to ensure that life and microgravity science opportunities are maximized during Station assembly; (5) development status of the International Space Station (ISS); (6) technical challenges to the program for the remainder of FY1998 and FY1999; (7) prospects for additional changes to the design of ISS through the end of the program; and (8) the design implications of Russian failure to provide any elements of the ISS or logistical support after the Service Module becomes available. With regards to the Shuttle program, the focus of testimony was: (1) status and progress of Shuttle upgrade efforts; (2) overall progress in the Space Flight Operations Contract transition; (3) changes in the Shuttle workforce composition, including past and any anticipated workforce reductions; (4) the impact on the Shuttle launch schedule of any additional delays in or changes to the International Space Station (ISS) assembly sequence; and (5) the status of phase 4 upgrades to the Space Shuttle with particular attention to the liquid flyback booster.

Witnesses included: Mr. Rothenberg, NASA Associate Administrator, Office of Space Flight; BGEN (select) Kevin Chilton, NASA Deputy Program Manager, International Space Station; and, Mr. Tommy Holloway, NASA Program Manager, Space Shuttle.

*Summary of hearing*

*The International Space Station*

When the Clinton Administration redesigned the International Space Station in 1993, it invited Russia to participate in the program, noting that Russia’s contributions (the Service Module, the

Science Power Platform, three research laboratories, the crew return vehicles, and logistics support) would save the United States \$2 billion and enable NASA to launch the first element fifteen months earlier. The resulting design was supposed to cost \$17.4 billion to develop and assemble in space between FY1994 and FY2002. Funding in any single year was not to exceed \$2.1 billion. The International Space Station was then predicted to operate for 10 years (through 2012) at an annual cost to the taxpayers of \$1.3 billion per year. As recently as March 4, 1997, NASA Administrator Dan Goldin testified before the Subcommittee on Space and Aeronautics that, "the program continues to perform within the annual funding cap of \$2.1 billion and the \$17.4 billion completion estimate."

During 1997, a series of events have demonstrated that the program is no longer on budget or schedule. In April 1997, NASA announced that it could not continue with the self-imposed annual spending cap of \$2.1 billion and that it would shift \$200 million in FY1997 Space Shuttle funds to the development and construction of the International Space Station. In FY1998, NASA expressed a desire for Congress to add \$100 million to the agency's International Space Station budget over and above the budget request for FY1998. NASA also announced that the Service Module would be delayed from an April 1998 launch to a December 1998 launch. During the summer of 1997, NASA amended its position and indicated that the International Space Station required \$430 million more in FY1998 than was contained in the President's budget request. Congress obliged the agency by providing ISS with \$230 million in additional funds; \$100 million above the President's total request for NASA and \$130 million from other NASA programs. NASA continues to indicate that it requires \$200 million more for ISS in FY1998, and the President's request for supplemental appropriations includes a request for Congress to authorize \$173 million in transfers from other NASA programs into ISS construction during FY1998. (The additional \$27 million would be reallocated from within the Human Space Flight account.)

#### *The Space Shuttle Program*

Of primary interest to the Subcommittee is the safety of the Shuttle program. NASA's overall personnel reductions, the relocation of Code M (NASA's Office of Human Space Flight) from NASA Headquarters to the Johnson Space Center in Houston, Texas, and the transition to the Shuttle Flight Operations Contract are all occurring at the same time. The Aerospace Safety and Advisory Panel (ASAP) has recognized this confluence of major changes as having the potential to affect the morale and efficiency of the Shuttle workforce, and that particular attention should be made by the agency to proceed with such changes cautiously and provide increased communication vertically and laterally to reduce uncertainty among the workforce.

The progress of the Shuttle Flight Operations Contract (SFOC) transition—particularly with respect to personnel reductions within the Shuttle program—has been closely monitored by the Subcommittee since it went into effect on October 1, 1996. Of particular concern is the retention of technicians and engineers with criti-

cal skills and experience levels necessary to ensure the safe operation of all elements of the Shuttle system. The attainment of cost-savings goals through the contract consolidation is the measure of success of this transition, and will provide considerable data to Congress on the feasibility of moving towards privatization of the program in the future.

NASA's plan for Safety and Performance Upgrades to the Shuttle program is also a subject of continuing interest to the Subcommittee. At the present time, NASA is planning to operate the Shuttle well through the next decade. Currently, the near-term upgrade programs (Phase I and II) are being funded. The Phase III and IV upgrades were moved under the Space Transportation Technology program within the Aeronautics Enterprise to take advantage of the research and development efforts in reusable launch vehicle (RLV) technology. The most ambitious of the upgrade programs, the Liquid Flyback Booster, is under the Phase IV upgrade program. NASA has not, to date, defined a requirement for the Liquid Flyback Booster.

The Subcommittee is also interested in is the Shuttle's annual flight rate. NASA's budget submissions generally reflect an annual launch rate of 7 to 8 launches. Due to several factors, the FY1998 launch rate will drop to only 5. Significant fluctuations in the number of launches may run counter to Aerospace Safety Advisory Panel recommendations for less turmoil for the Shuttle workforce.

Mr. Rothenberg is the newly appointed Associate Administrator for the Office of Space Flight in NASA Headquarters. He testified that the Russian FGB module would be ready for a June 1998 launch, and that the U.S.-built Node-1 module would be ready for a July 1998 launch. Additionally, he stated that the U.S. laboratory would be ready for a May 1999 launch. With respect to the Shuttle program, Mr. Rothenberg testified that the program is flying safely more flights at less cost than ever before in the history of the program, and that the upgrade program has decreased risk while increasing payload and efficiency.

BGEN (select) Kevin Chilton is NASA's International Space Station deputy program manager, and did not present testimony.

Mr. Tommy Holloway is NASA's Space Shuttle program manager. He did not present testimony, but responded to several questions posed by members. He stated that the Shuttle program is a stronger, more resilient, and responsive program than it was five years ago, and that the program is increasing its capability and doing a much better job for a lot less resources. He set a floor of \$100 million annually as a requirement for investment in upgrades. With respect to Shuttle program flight rate, he testified that it currently is capable of a 10 to 11 annual rate which may evolve to a higher number over time. Mr Holloway also testified that the program could begin flying commercial payloads in 2001 or 2002.

*4.4(r)—Asteroids: Perils and Opportunities**May 21, 1998**Hearing Volume No. 105-71**Background*

On May 21, 1998, the Subcommittee on Space and Aeronautics held a hearing entitled, "Asteroids: Perils and Opportunities." The hearing focused on: (1) the consequences of an asteroid impacting the Earth; (2) the Shoemaker Near-Earth Objects Survey Working Group findings; (3) the adequacy of the current Near-Earth Object Survey effort; (4) the commercial opportunities of exploiting the minerals in asteroids; (5) the feasibility of launching a mission to one of these objects for commercial applications; (6) the upcoming Leonid micrometeoroid shower and the technical conference held in April 1998 on this subject; (7) the threat posed to satellites in Earth orbit due to this shower; (8) appropriate safety measures that can be taken to minimize satellite damage from this shower; (9) NASA's contribution to the interagency effort to survey and catalog near-Earth objects; (10) the current pace of this effort and the estimated time until completion; (11) the total funding spent on this effort, and a comparison to levels suggested by the Shoemaker Group report; (12) an overview of the interagency effort to survey and catalog near-Earth objects; (13) the current pace of this effort and the estimated time until completion; and (14) the total funding spent on this effort, and a comparison to levels suggested by the Shoemaker Group report.

Witnesses included: Dr. Clark R. Chapman, Institute Scientist at the Space Studies Department of the Southwest Research Institute; Dr. John Lewis, Professor of Planetary Sciences at the University of Arizona's Lunar and Planetary Laboratory; Dr. William H. Ailor, Director of the Center for Orbital and Reentry Debris Studies at The Aerospace Corporation; Dr. Carl Pilcher, Science Director of Solar System Exploration within NASA's Office of Space Science; and, Dr. Gregory Canavan, Senior Scientist at Los Alamos National Laboratory.

*Summary of hearing*

Dr. Clark R. Chapman, Institute Scientist at the Space Studies Department of the Southwest Research Institute, testified on the likelihood and the outcome of an asteroid impacting the Earth. He described the threat of such a collision as a highly unlikely, yet highly catastrophic event. Because the loss of life would be so great under such circumstances, Dr. Chapman testified that the odds of an individual person being killed as the result of an asteroid are greater than his/her odds of being killed in an airplane crash. Further testimony discussed the global aftermath of a collision with near-Earth objects of varying size. Dr. Chapman also discussed current efforts to find and catalog these objects, such activities as "meager" and "ineffective."

Dr. Carl Pilcher, Science Director of Solar System Exploration within NASA's Office of Space Science, discussed efforts at NASA to find and catalog near-Earth asteroids. He described the three

parts of this effort: (1) Spacewatch, a program at the University of Arizona; (2) Near-Earth Asteroid and Tracking (NEAT), a program at Jet Propulsion Laboratory; and (3) Lowell Observatory Near-Earth Object Survey (LONEOS) in Flagstaff, Arizona. Dr. Pilcher reiterated NASA's commitment to find and catalog 90% of near-Earth objects larger than 1 kilometer in the next ten years. Dr. Gregory Canavan, Senior Scientist at Los Alamos National Laboratory, testified on possible responses should an Earth-impacting object be discovered. The fundamental reaction calls for the interception and deflection of an inbound object. Additional testimony added to Dr. Chapman's overview of the implications of a collision with such an object.

Dr. John Lewis, Professor of Planetary Sciences at the University of Arizona's Lunar and Planetary, described some of the possible benefits of intercepting such object and utilizing the natural resources found therein. He described the relative ease of intercepting these near-Earth objects compared to interplanetary missions. The resources to be found in the near-Earth asteroid population, he testified, could support a human population of about one million times the population of Earth indefinitely. The availability of supplies to be found in this population of asteroids is unimaginably vast. For example, enough steel can be obtained there to build a building frame 8,000 stories tall covering all the land area of Earth.

Dr. William H. Ailor, Director of the Center for Orbital and Reentry Debris Studies at The Aerospace Corporation, described the upcoming Leonid micrometeoroid storm, its effect on satellites, and recommended steps to avoid satellite damage. During November 1998 and 1999, this cloud of debris which follows the Temple-Tuttle comet will intersect the Earth's orbit. As a result, meteors will enter the Earth's atmosphere at a rate of 200 to 5000 meteors per hour, considerably more than the 10 to 15 meteors per hour seen under normal circumstances. These particles—tiny grains of sand traveling at over 155,000 miles per hour—burn up in the atmosphere without even getting near the surface of the Earth. Because satellites orbit outside the atmosphere, however, they can experience damage from these particles. Dr. Ailor recommended specific actions to minimize satellite risk from this micrometeoroid storm.

*4.4(s)—Delays in NASA's Earth Science Enterprise*

*September 10, 1998*

*Hearing Volume No. 105-83*

*Background*

On September 10, 1998, the Subcommittee on Space and Aeronautics held a hearing entitled, "Delays in NASA's Earth Science Enterprise." Testimony before the Subcommittee focused on: (1) the status and schedule for major elements of the Earth Science Enterprise including, but not limited to, AM-1, Earth Observing System Data Information System (EOSDIS), and Landsat 7 including explanations for the delays experienced to date; (2) a specific discussion of EOSDIS development including the planned availability date for full, simultaneous analysis capability of all captured data;

(3) uncosted carryover levels—assessing the level of uncosted and unobligated carryover expected at the end of FY 1998 and comparing this level to previous commitments; (4) a detailed discussion explaining how NASA will incorporate data purchases into a routine way of doing business at NASA; (5) NOAA's role in the Earth Science Enterprise, specifically in EOSDIS; (6) NOAA's responsibilities in the archive storage and retrieval of this data; (7) significant schedule milestones that face NOAA in the performance of these roles; (8) any challenges currently facing NOAA in the long-term storage and retrieval of existing archived data; (9) an overview of the commercial remote sensing industry, including both an assessment of current capabilities and an outlook on these capabilities in the near future; (10) a description of the demand side of the equation—scientific investigations at NASA being supported by commercial data products, and additional science demands within government that would be met by commercial data products; (11) strengths and weaknesses of NASA's current procurement infrastructure as it relates to their ability to regularly purchase remote sensing products; (12) industry recommendations on future actions within any branch of government which would help better utilize this expanding capability; (13) a specific discussion of Raytheon's plans to overcome EOSDIS problems including the planned availability date for full, simultaneous analysis capability of all captured data; and (14) significant schedule milestones that face Raytheon in the execution of these plans.

Witnesses included: Dr. Ghassem Asrar, Associate Administrator, Earth Science, NASA; Mr. Robert S. Winokur, Assistant Administrator, Satellite and Information Services, NOAA; Dr. Patrick M. O'Connell, Vice President and General Manager, Raytheon Enterprise Management Systems; and, Mr. Courtney Stadd, President, PixSell Data Brokers, Inc.

#### *Summary of hearing*

Dr. Ghassem Asrar, Associate Administrator for Earth Science, began his testimony with a description of recent scientific accomplishments of the Earth Science Enterprise. These include predicting the recent El Niño event, mapping the Antarctic surface, and cloud mapping of Hurricane Bonnie. Dr. Asrar continued his testimony with a description of the challenges and delays facing the deployment of the major components of the Earth Science program. These include delays in the Earth Observing System Data Information System (EOSDIS)—the computer software which obtains, analyzes, and stores science data; launch delays in the AM-1 spacecraft; and launch delays in the Landsat 7 spacecraft. Further testimony described the other major Earth Science satellites in various stages of development. Dr. Asrar also discussed predicted levels of uncosted carryover, and described recent progress in the implementation of science data purchases.

Mr. Robert S. Winokur, Assistant Administrator for NOAA's Satellite and Information Services, testified on NOAA's contributions to the study of the Earth's environment. Contributions made to the Earth Science effort in the form of data storage responsibilities were detailed. One particular program described, the Environmental Data Rescue Program, is racing the clock to save old envi-

ronmental data stored on paper and magnetic tape before it degrades beyond usability. Mr. Winokur further described additional cooperative efforts with NASA to study the environment.

Dr. Patrick M. O'Connell, Vice President and General Manager of Raytheon Enterprise Management Systems, focused his testimony on EOSDIS, the aforementioned computer software. Raytheon has recently obtained development responsibilities for EOSDIS with its acquisition of several companies from Hughes Electronics. Raytheon is now struggling to restructure the program and deliver a usable version to NASA. Dr. O'Connell's testimony described the current EOSDIS configuration, Raytheon efforts to deliver a working version of the software, and particular challenges which make this task difficult.

Mr. Courtney Stadd, President of PixSell Data Brokers, Inc., testified on matters related to the commercial purchase of remotely-sensed science data. Mr. Stadd discussed the health of the commercial remote sensing industry and its likelihood of increasing contributions to NASA scientists. Further testimony described a Rand study which has identified broad-based demand for remotely sensed data throughout the government beyond NASA. Finally, Mr. Stadd described procurement barriers at NASA which make it difficult for commercial data providers to consider bidding on opportunities to provide such commercially obtained science data.

*4.4(t)—U.S. Spacepower in the 21st Century*

*September 29, 1998*

*Hearing Volume No. 105–88*

*Background*

On September 29, 1998, the Subcommittee on Space & Aeronautics held a joint hearing with the Subcommittees on Military Research & Development and Military Procurement of the Committee on National Security, entitled, "U.S. Spacepower in the 21st Century." Testimony before the Subcommittees addressed the interrelationship of national security, civilian/scientific, and commercial space activities and technologies, and focused particularly on the opportunities and challenges created by rapid growth in the commercial space sector for U.S. national security in the post-Cold War era.

Witnesses included: Mr. Keith Hall, the Assistant Secretary for Space, U.S. Air Force and Director, National Reconnaissance Office; Mr. Daniel Mulville, Chief Engineer, National Aeronautics and Space Administration; Mr. Robert Butterworth, President of Aries Analytics; and, Mr. David Swain, Vice President and General Manager, Phantom Works, Boeing Corporation.

In recent years space activities (and requisite technologies) for national security, civilian government, and commercial space purposes have become more and more interconnected. This is partially caused by the growth of the commercial space sector, which provides cost savings to and causes organizational upheaval in the government space sectors. But it is also a result of continuing budgetary pressures and a lack of clear mandates following the end of the Cold War.

U.S. institutions and policies have been slow to adapt to both these root causes and the resulting overlap in space sectors, with negative impacts on national security, economic competitiveness, and scientific progress. In particular, governmental space sectors are being challenged to focus their investments on revolutionary new capabilities which address their needs, rather than simply building on (or replicating) existing private investments.

*Summary of hearing*

There was considerable discussion of the need to increase coordination, both within the Executive and Legislative branches, among those entities responsible for civil, commercial, and military space activities. Some witnesses argued for recreation of the National Space Council, while others suggested that it either could not address important coordination challenges like budgets or was obviated by recently-established NASA-Air Force cooperation efforts.

There was broad agreement on the importance of increasing federal investments in space technology, although there was concern that such investments should focus on unique federal requirements, instead of seeking to influence private space activities.

Technology transfer, particularly the risks associated with U.S. companies "needing" to buy foreign launch services, was brought up by several Members and witnesses, although witnesses differed on how well current approaches are working, and one suggested that the best remedy is simply to increase R&D investments so that technology is perpetually "obsoleted."

Mr. Keith Hall, Assistant Secretary of the Air Force, testified that increasing economic as well as military reliance on space assets makes them attractive as a target for military threats. At the same time, he pointed out that Air Force investments in space control are in competition with other modernization efforts, as well as increased pressure on readiness and tempo (frequency of military operations). He also commented that the Air Force needs to undergo a cultural change so that the airplane and space responsibilities are merged. Finally, he emphasized the need to better coordinate federal R&D investments, and called for greater coordination among different Congressional committees with funding and oversight responsibilities for federal space activities.

Mr. Robert Butterworth, President of Aries Analytics, asserted that Federal Government dependence on commercial space goods and services may bias federal technology investments in ways which do not serve federal requirements and distort private markets.

Mr. Daniel Mulville, NASA's Chief Engineer, argued that NASA needs to invest in technologies both to meet NASA's unique needs and to assist industry to provide better commercial space goods and services back to the government. He also testified that NASA and DOD have improved their cooperation in recent years, although there are still difficulties in the funding of cooperative programs and the pruning of overlapping facilities.

Mr. David Swain, Vice President and General Manager of Boeing's Phantomworks, a cross-corporation R&D enterprise, noted that more nations are becoming involved in space, this not only challenges U.S. economic leadership, but proliferates space-based

threats to U.S. national security. Commercial space activities are not only growing but increasingly important to the U.S. economy as a whole, and limiting these activities out of concern for national security may actually harm national security in the long run.

*4.4(u)—NASA at 40: What Kind of Space Program Does America Need for the 21st Century?*

*October 1, 1998*

*Hearing Volume No. 105–90*

*Background*

On October 1, 1998, the Subcommittee on Space & Aeronautics held a hearing entitled, “NASA at 40: What Kind of Space Program Does America Need for the 21st Century?.” Testimony before the Subcommittee examined the future of America’s space program and its civil space agency in the context of the 40th anniversary of its establishment. In particular, witnesses addressed four questions: (1) What are the United States’ strategic goals in space for the next 40 years? (2) What are the lessons learned from the last 40 years that can help us achieve these goals? (3) Given how the world has changed since NASA’s establishment, and will continue to change, what institutional changes should we make in our space program to help us achieve these goals? (4) What policies and budget priorities should Congress and the Administration put in place in the near term to help us achieve these goals?

Witnesses included: The Honorable Daniel S. Goldin, Administrator, National Aeronautics and Space Administration; Dr. Howard McCurdy, Professor of Public Administration at American University; Dr. Eilene Galloway, Honorary Director, International Institute for Space Law; Mr. Rick Norman Tumlinson, President, Space Frontier Foundation; and Mr. Charles “Pete” Conrad, Chairman, Universal Space Lines. The National Aeronautics and Space Administration was created by Public Law 85–568 on October 1, 1958, out of the pre-existing civilian National Advisory Committee on Aeronautics and various other civilian and military rocketry and aerospace project offices. At the start, the U.S. space program was largely a response to the Soviet Union’s aggressive space efforts, starting with the launch of Sputnik, the first artificial satellite, and later of Yuri Gagarin, the first human in space and the first to orbit the Earth.

After Apollo XI successfully landed two Americans on the Moon on July 20, 1969, political support for space projects waned, and the end of the Cold War further undercut this support. In recent years several commissions and studies have looked at the goals and organization of America’s civilian space program, generally embracing a “return to R&D” and an increased role for the private sector.

*Summary of hearing*

All of the witnesses agreed that while NASA has been generally successful during its first 40 years, it needs to address different goals and priorities for the future, most notably a different relationship with the private sector regarding both civil and commercial space goals. Witnesses differed somewhat in how much NASA

needs to change to address these topics, and in how much progress NASA has already made in this transition. Several witnesses stressed the importance of privatizing NASA's operational activities so that the space agency can focus on scientific research and technology development. Several witnesses also addressed a potential need to assist the private sector—through some form of investment incentives—in assuming some of the responsibilities currently held by NASA.

Daniel S. Goldin, NASA's Administrator, laid out an extensive vision of the achievements and benefits he believes the space agency can deliver for the American taxpayer over the next 40 years. In particular he focused on the central role that new technologies and approaches for space transportation will play in enabling many of these scientific and economic space goals. Goldin pointed out NASA is consolidating its Shuttle and unmanned operations contracts as a step towards privatization. He also stressed that industry needs government help to take on greater leadership in space operations, and specified four methods: technology development and demonstration, loan guarantees, purchase of services, and tax incentives.

Howard McCurdy, Professor of Public Administration at American University, suggested that in the future multiple "space agencies" will perform different functions: policy coordination, federal financing of space endeavors, and infrastructure development, as well as R&D (i.e. NASA). In the meantime, we will see a transition as NASA moves from being a "multi-mission agency" to one more focused on R&D. He stressed that NASA will need to regain the in-house technical talent and management processes which made Project Apollo successful. He also called for "lump sum" appropriations for NASA projects as a way to encourage flexibility and accountability in project management.

Dr. Eilene Galloway celebrated the success of the architects of NASA in attaining "four decades of peace in outer space and freedom from space wars," an achievement she says is due to the practical benefits of space which make it too valuable to sacrifice in pursuit of aggression. She also noted the increasing role of the commercial space sector, and suggested that the NASA Act of 1958 (and other policies) may need to be updated to deal with new relationships between the government and the private sector. She cautioned that regulation plays an important role in creating a stable framework within which private industry can plan its investments and activities.

Rick Tumlinson, President of the Space Frontier Foundation, suggested that a lack of vision since Apollo has forced NASA to pull back from pioneering the space frontier. Stressing the need for a clarification of responsibilities between the government and the private sector, he declared that "NASA's job is to explore; the people's job is to settle." Specifically, Tumlinson called for early privatization of the Space Shuttle fleet, International Space Station, and many of NASA's field centers, increased investment in experimental technology demonstrations, policies to support entrepreneurial space firms, and a reallocation of resources towards more visionary projects such as exploration and development of the moon.

Pete Conrad, Chairman of Universal Space Lines, argued that the growth of commercial space activities is central to America's future in space, and that government must be careful in "helping" space commercialization. He stressed the importance of NASA focusing on R&D and "getting out of the operations end of businesses." Regarding investment incentives, he warned against the problematic nature of loan guarantees, and argued instead for tax mechanisms.

4.5—SUBCOMMITTEE ON TECHNOLOGY

4.5(a)—*Secure Communications*

*February 11, 1997*

*Hearing Volume No. 105-1*

*Background*

On February 11, 1997, the Subcommittee on Technology held a briefing entitled, "Secure Communications" to receive testimony regarding the need to protect the confidential nature of private communications and to ensure that stored proprietary data remains uncompromised.

Witnesses included: Dr. Daniel Geer, Director of Engineering, Open Market, Inc.; Mr. Daniel Lynch, Chairman, CyberCash; Mr. Tsutomu Shimomura, Senior Fellow, San Diego Supercomputer Center; Mr. Geoff Mulligan, Senior Staff Engineer, Security Products Group, SunSoft; Mr. Daniel Farmer, Independent Security Consultant; Dr. Eugene Spafford, Associate Professor of Computer Sciences, Purdue University.

*Summary of hearing*

Dr. Daniel Geer, testifying as Director of Engineering, Open Market, Inc., testified that the biggest risk to computer systems is from within because the attacker knows what to look for, has motive, and opportunity. He stated that Congress needs to set standards regarding the degree to which every organization has responsibility for protecting information that is entrusted to them, and clarifying the liability rules. He stated that most corporations are aware of the security risks, but they do not want to make the information public.

Mr. Daniel Lynch, testifying as Chairman, CyberCash, Inc., attested that the Internet can be used for both good and bad purposes. Like a global village, the Internet thrives on other people adding their ideas, values, and hopes. He stated that if we had strong cryptography everywhere, individuals would need to buy keys to unlock it. While it would not be the perfect solution, it would prevent children from viewing inappropriate data, since parents usually control a child's money.

Mr. Tsutomu Shimomura, testifying as Senior Fellow, San Diego Supercomputer Center, stated that people are afraid of computer technology since they do not understand it. He testified that many "mechanisms are insecure but we try to use them as if they were secure because we want them to be secure." One way to correct this problem is by increasing education and research in this area. He

also stated that by increasing education we will increase ethical standards.

Mr. Geoff Mulligan, testifying as Senior Staff Engineer, Security Products Group, Sunsoft, indicated that it is important to educate the parents of children so they can monitor what sites their children visit and stop them from viewing inappropriate sites. Also, he stated that individuals “can easily make much more money attacking computer systems because people just do not understand systems today.” In his view, people tend to accept the new technologies without completely understanding the security implications.

Mr. Daniel Farmer, testifying as an independent security consultant, testified that additional education is needed. He stated that “a lot of the problems arise from the fact that we do not put security in the infrastructure, in the products, or in the curriculum. So people view it as something that is alien, difficult, and just not necessary for action.” The real problems that we are facing, he said, are not technical, but social problems. The challenge is not defending and protecting a system, but providing resources and funding education.

Dr. Eugene Spafford, testifying as Associate Professor of Computer Sciences, Purdue University, stated that there is a need to better integrate computer security material into the typical computer science curriculum. The problem with those individuals who are self-taught computer experts is that they are never taught how to responsibly use computers or the effects of hacking. In order to raise awareness of the problem we must increase education. Encouragement is needed in the private sector he said, since it is where products will be marketed and graduates will be employed.

*4.5(b)—Surface Transportation Research Needs for the Next Century, Parts 1-2*

*February 27, 1997*

*Hearing Volume No. 105-9*

*Background*

On February 27, 1998, the Subcommittee on Technology held the first of two hearings entitled, “Surface Transportation Research Needs for the Next Century, Parts 1 and 2.”

Witnesses included: Mr. Mortimer L. Downey, Deputy Secretary, Department of Transportation; The Honorable David L. Winstead, Secretary, State of Maryland, Department of Transportation; Mr. Robert J. Skinner, Jr., Executive Director, Transportation Research Board, National Research Council.

Authorizing legislation for federal surface transportation programs expires at the end of fiscal year 1997. The existing federal framework was created by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). During the 102nd Congress, the House Committee on Science introduced and passed the Surface Transportation Research and Development Act of 1991. Several provisions from the legislation were incorporated into ISTEA.

ISTEA increased annual funding for surface transportation research and development and created new research initiatives in-

cluding the Intelligent Transportation Systems (ITS) program. The legislation also established a framework for cooperation among the federal government, industry, and universities on surface transportation research. Finally, the Act established that the federal role in surface transportation research and development should be to sponsor and coordinate research and development on new technologies that seek to provide safer, more affordable transportation systems for the future.

*Summary of hearing*

Mr. Mortimer Downey, testifying as Deputy Secretary, U.S. Department of Transportation, testified that science and technology are key solutions to many of the challenges in environment, congestion and safety that we face in the twenty-first century. He stated that a one percent improvement in transportation efficiency could save the economy \$100 billion over a decade and make our economy more competitive. The role at the federal level is critical because neither other sectors of government nor industry, which consists of many small providers, have the resources for intensive research.

Mr. David L. Winstead, Secretary, State of Maryland, Department of Transportation, stated that states take the benefits of federal research, apply it to their needs, but also integrate local universities in that effort to make sure that resources and universities are being fully utilized. He testified that last year Maryland had the lowest level of fatalities on their highway system since 1968. Part of the reduction can be attributed to benefits of federal safety programs. He stressed that it is important for the federal government to provide the seed money for research since there is little incentive for industry or state and local governments to make that kind of investment in transportation research and development.

Mr. Robert J. Skinner, Jr., testifying as Executive Director, Transportation Research Board, National Research Council, emphasized that the Transportation Research Board's mission is to promote innovation and progress in transportation through research. Even though highway research programs are decentralized and the overall highway research program is difficult to understand, it does provide a solid foundation for highway innovation given the structure of the industry it serves. He stated that research programs need to be less conservative and more comprehensive.

*4.5(c)—Biotechnology and the Ethics of Cloning: How Far Should We Go?*

*March 5, 1997*

*Hearing Volume No. 105-3*

*Background*

On March 5, 1997, the Subcommittee on Technology held a hearing entitled, "Biotechnology and the Ethics of Cloning: How Far Should We Go?" to receive testimony to review the breakthrough technology which created the recent cloning of the first adult mammal, and to see how cloning technologies are being used presently,

and how they will be used in the future for positive scientific advancement.

Witnesses included Dr. Harold E. Varmus, Director, National Institutes of Health; Dr. Caird E. Rexroad, Jr., Supervisory Research Physiologist, Agriculture Research Service, United States Department of Agriculture; Dr. M. Susan Smith, Director, Oregon Regional Primate Research Center; Dr. Thomas H. Murray, Chairman, Genetics Testing Subcommittee, National Bioethics Advisory Commission, and Professor and Director, Center for Biomedical Ethics, Case Western University, School of Medicine; Mr. James Geraghty, President and CEO, Genzyme Transgenics Corporation.

*Summary of hearing*

Dr. Harold E. Varmus, testifying as Director, National Institutes of Health, addressed the scientific foundations that allowed the cloning experiment to occur and the future applications of the breakthrough. He also spoke about the steps the Administration had taken in light of the recent discovery. He stated that it is not scientifically necessary to make human clones since we already have spontaneously occurring identical twins. He applauded the President's decision to refer the issues of human cloning to the National Bioethics Advisory Commission.

Dr. Caird E. Rexroad, Jr., testifying as Supervisory Research Physiologist, Agriculture Research Service, U.S. Department of Agriculture, testified with regards to the technical and scientific aspects of cloning in farm animals, specifically at the United States Department of Agriculture. He stated that his department has been involved in biotechnology research with farm animals to improve animal health, production efficiency, food safety, human nutrition, etc. He stated that until researchers can successfully do genetic engineering in the lab, more research needs to be done. Once this ability is mastered, a very useful tool will be available to help improve animal productivity and yield significant benefits to customers.

Dr. M. Susan Smith, testifying as Director, Oregon Primate Research Center, stated that genetically identical monkeys would provide a powerful resource for biomedical research since it would eliminate genetic variation from research studies. For now the Oregon Center will focus on the use of embryonic cells to produce genetically identical offspring (known as twinning) since there is currently no rationale for cloning adult monkeys. The Center is still working on producing genetically identical monkeys since it would revolutionize the use of non-human primates in biomedical research. Not only would fewer animals be required in research studies, but these techniques could be used to preserve the gene pool of non-human primate species in danger of extinction.

Dr. Thomas H. Murray, testifying as Chairman, Genetics Testing Subcommittee, National Bioethics Advisory Commission, noted that the National Bioethics Advisory Commission (NBAC) had called upon leaders of the major religious traditions in the United States to present their views about the ethical issues raised by the prospect of cloning human beings, and they have time set aside for public discussion. He pointed out that a clone would be very different from the original. He would have different parents and friends, as

well as a lifetime of different experiences to shape his character. Our public policy response to research on cloning of animals, he said, should not be swept along by our concern to prevent what we will judge to be the ethical dangers of human cloning.

Mr. James Geraghty, President and CEO, Genzyme Transgenics Corporation, discussed the transgenic technology with regards to the potential impact the recent cloning would have on the development of therapeutic products. Transgenic technology involves the transfer of genetic material from one species to another. Currently the technology is used to develop therapeutic proteins in the milk of dairy animals. He stated that with very complex proteins, transgenic technology represents the only technically feasible way in which the product can be manufactured. He encouraged Members not to rush to judgment in such a complex area as the ethics of cloning or it may lead to bad policy.

*4.5(d)—Federal Aviation Administration Research, Engineering,  
and Development Authorization*

*March 13, 1997*

*Hearing Volume No. 105–6*

*Background*

On March 13, 1997, the Subcommittee on Technology held a hearing entitled, “Federal Aviation Administration Research, Engineering and Development Authorization” to review the President’s Federal Aviation Administration (FAA) Research, Engineering, and Development (R,E&D) budget request for Fiscal Year 1998 and beyond. The President’s fiscal year 1998 budget request for FAA R,E&D is \$200 million, \$8.4 million less than the fiscal year 1997 enacted level. According to the budget request, the funding is needed to conduct research, engineering, and development programs that improve the national air traffic control system by increasing its safety, security, capacity, and productivity to meet the unexpected air traffic demands of the future.

Witnesses included: Dr. George L. Donohue, Associate Administrator for Research and Acquisitions, Federal Aviation Administration and Mr. Ralph Eschenbach, Chair-FAA R,E&D Advisory Committee.

*Summary of hearing*

Dr. George L. Donohue, testifying as Associate Administrator for Research and Acquisitions, Federal Aviation Administration, testified that the FAA, as directed by the 1996 Reauthorization Act, has made sure that the R&D Advisory Committee is more involved in assessing FAA priorities. For FY 1999 programs, the FAA plans to increase the Advisory Committee’s role by using six standing subcommittees, and regularly scheduled meetings of those subcommittees with FAA staff. He stated that the new acquisition management system, which took effect April 1, 1996, provides a simplified and more flexible way to meet the FAA’s acquisition needs. The White House Commission on Aviation Safety and Security (also known as the Gore Commission) recently issued its final report which included several recommendations that will involve RE&D

programs. He testified that the FAA is now working to develop pertinent cost and resource information, as well as schedules and priorities, to determine how to best achieve the needed results.

Mr. Ralph Eschenbach, testifying as Chair, Federal Aviation Administration Research, Engineering and Development Advisory Committee, stated that the National Airspace System (NAS) modernization program must be sped-up. However, with the current architectural plan and the current level of funding it will be difficult to reach the year 2005 goal as established by the Gore Commission. He also emphasized that prototypes are crucial to rapid implementation. One of the critical components necessary for injecting new technology into a market is the ability to prototype and test those components. As an example, he cited the FLIGHT 2000 demonstration program in Alaska and Hawaii which effects just one percent of the airplanes in NAS, but provides much needed answers to implementation and operation questions.

*4.5(e)—Funding Needs for the Technology Administration and the National Institute of Standards and Technology (NIST), Parts I–II*

*March 19, 1997*

*Hearing Volume No. 105–12*

*Background*

On March 19, 1997, the Subcommittee on Technology held the first of two hearings entitled, “Funding Needs for the Technology Administration and the National Institute of Standards and Technology (NIST), Parts I and II,” to assess the funding requirements for the Department of Commerce Technology Administration in Fiscal Year 1998 and beyond, as well as review the effectiveness of programs under the Technology Administration. Also, an assessment on the needed legislative changes to statutes authorizing programs under the Technology Administration was completed.

Witness included: Dr. Mary L. Good, Undersecretary for Technology, Department of Commerce.

*Summary of hearing*

Dr. Mary L. Good, testifying as Undersecretary for Technology, U.S. Department of Commerce, testified that NTIS is a fee-funded agency, but that its authorizing legislative language needs to be changed so the agency may operate in a more flexible manner. She stated that the NIST laboratory budget has increased by about 40 percent in four year’s time. She stated that NIST laboratories are the “Crown Jewel” of the Technology Administration. She noted that the U.S. government does not set standards since we have voluntary, private-sector, standards setting organizations. She said that any of the NIST buildings, since they were all built about the same time, she said, are in need of major repair and refurbishing. She also addressed the need for the Advanced Technology Program, the Manufacturing Extension Partnership and the Malcom Baldrige Award program. Since the Office of Technology Assessment was closed, the Technology Administration is the only group doing domestic and international technology assessments. The

Technology Administration, she stated, has been streamlined to be more efficient.

*4.5(f)—Year 2000 Risks: What Are the Consequences Of Information Technology Failure? (Joint hearing with the Subcommittee on Government Management, Information and Technology, Committee on Government Reform and Oversight)*

*March 20, 1997*

*Hearing Volume No. 105–5*

*Background*

On March 20, 1997, the Subcommittee on Technology held a joint hearing with Committee on Government Reform and Oversight, Subcommittee on Government Management, Information and Technology entitled, “Year 2000 Risks: What Are the Consequences Of Information Technology Failure?” to explore non-software problems associated with the Year 2000 computer problem. Testimony was received regarding potential Year 2000 impacts and the legal actions that would occur after the start of the Year 2000.

Witnesses included: Mr. Bruce Hall, Research Director, Gartner Group; Ms. Ann Coffou, Managing Director—Year 2000 Relevance Service, Giga Information Group; Mr. Vito C. Peraino, Attorney, Hancock Rothert & Bunshoft; Mr. Harris Miller, President, Information Technology Association of America.

*Summary of hearing*

Mr. Bruce Hall, testifying as Research Director, Gartner Group, testified that approximately 80 percent of the computer code to be remedied for the Year 2000 problem is on large mainframe systems. There is no time to retire or replace a significant number of mainframe systems, so a massive repair effort will be consuming key information technology resources over the next three years. He stated that in 1995 more than three billion micro-controller chips were shipped and are used in telephone systems, bar cod readers, bank machines, civilian and military avionics. Many of these microchips may be subject to Year 2000 failure. Organizations cannot afford to ignore these systems whose failures may have a dire impact on society.

Ms. Anne Coffou, testifying as Managing Director, Year 2000 Relevance Service, Giga Information Group, stated that the current challenge is to deal with embedded microchips in very simple products like VCR's, fax machines, elevators as well as very complex products like devices that control traffic lights, power generation, and water and sewer systems. This chip failure will have results ranging from annoying to life threatening. The solution, she said, will be to test every device with an embedded microchip. Manufacturers, she said, will be assumed guilty until they can prove their innocence.

Mr. Vito C. Peraino, testifying as Attorney, Hancock Rothert & Bunshoft, testified the Year 2000 problem is a litigation catastrophe waiting to happen, and most companies and lawyers are currently unaware of the potential problem. He stated that at the most basic level, the Year 2000 problem threatens the integrity of

financial information because so much of that information is date-dependent. He outlined five points associated with the legal aspect of the Year 2000 bug and suggestions to help limit the potential litigation catastrophe. He also recommended that Congress mandate that all sizable companies disclose publicly their Year 2000 problem and their plan to fix it. This action will bring public pressure on companies to address the problem, and it will give Congress a tool to gain a better sense of how critical sectors of our economy are addressing the problem.

Mr. Harris Miller, testifying as President, Information Technology Association of America, stated that the Office of Management and Budget's recent estimate of \$2.3 billion for a federal-wide Year 2000 fix is a clear signal that our government has not made this a top priority issue. He insisted the figure is much higher than \$2.3 billion. He also testified about ITAA's Year 2000 certification process called ITAA 2000. The program was designed to give the marketplace a mechanism to identify the companies which are addressing the Year 2000 issues. Currently 11 organizations have received certification and 18 more are undergoing technical evaluation.

*4.5(g)—Funding Needs for the National Institute of Standards and Technology (NIST), Parts I and II*

*April 10, 1997*

*Hearing Volume No. 105–12*

*Background*

On April 10, 1997, the Subcommittee on Technology held the last of two hearings entitled, "Funding Needs for the National Institute of Standards and Technology Parts I and II," to receive testimony from outside witnesses on the funding requirements for the National Institute of Standards and Technology (NIST) and to review the Administration's fiscal year 1998 budget request and out-year budget projections through fiscal year 2002. The discussion focused on the effectiveness of NIST programs such as the Advanced Technology Program (ATP) and the Manufacturing Extension Partnership program (MEP).

Witnesses included: Mr. Allen Li, Associate Director for Energy, Resource and Science Issues, U.S. General Accounting Office; Mr. Claude Barfield, Director, Science and Technology Policy Studies, American Enterprise Institute; Mr. W.C. Dyer, Director, Michigan Manufacturing Technology Center; Professor Michael Borrus, Co-Director of BRIE, University of California at Berkeley; Dr. Michael Gough, Director of Science and Risk Studies, CATO.

*Summary of hearing*

Mr. Allen Li, Associate Director for Energy, Resources and Science Issues, U.S. General Accounting Office, stated that GAO was releasing a report entitled Performance Measurement: Strengths and Limitations of Research Indicators (GAO/RCED-97-91). This report highlights the difficulty in measuring the impact of technology programs like ATP and MEP. GAO's research shows that ATP has funded research projects that would have been fund-

ed by the private sector as well as those that would not. The report released on performance measurement shows that there is no single indicator or evaluation that adequately captures the results of R&D.

Mr. Claude Barfield, Director, Science and Technology Policy Studies, American Enterprise Institute, addressed the place of the ATP program in relation to overall U.S. technology policy, the role of government in constructing a technology policy for the United States and the wisdom of linking the ATP program with the traditional NIST laboratory role. He stated that while calling for the ATP budget to double between 1998 and 2002 the Administration will allow the budget of the labs to decline substantially in real terms over that same period. Given the more important contribution of the labs to long-term productivity and competitiveness of U.S. industry, it seems to be a mistake to give higher priority to more politically popular grant programs.

Mr. W.C. Dyer, Director, Michigan Manufacturing Technology Center, testified with regards to the Michigan Manufacturing Technology Center (MMTC) and the MEP program. He stated that without the services provided by MMTC, many small firms would find it difficult to modernize. If his center loses federal support they will have to charge higher fees for services and therefore many small businesses will not be able to afford their services. The MEP program emphasizes practical, cost-effective solutions to the needs of smaller manufactures.

Professor Michael Borrus, Co-Director, BRIE, University of California at Berkeley, stated that continued U.S. leadership in technological progress is essential for the long-term growth of the domestic economy, for rising standards of living and for continued competitive success of the U.S. industry. International developments make continued support especially urgent. Interventionist governments abroad and growing foreign public commitments to technology spending threaten to cut into the U.S.'s technology development lead and transplant long-term technical progress abroad.

Dr. Michael Gough, Director, Science and Risk Studies, CATO Institute, advocated the abolishment of the ATP program. He testified that ATP could be eliminated with no damage done to the economy of the country, with tax savings, and with the potential for more private investment in R&D.

*4.5(h)—Surface Transportation Research Needs for the Next Century, Parts I-II*

*April 23, 1997*

*Hearing Volume No. 105-9*

*Background*

On April 23, 1997, the Subcommittee on Technology held the last of two hearings entitled, "Surface Transportation Research Needs for the Next Century, Parts I-II." This was the second in a series of hearings on surface transportation research. Following the first Subcommittee on Technology transportation hearing in February, Subcommittee Chairwoman Constance Morella and Full Committee Ranking Member George E. Brown, Jr. introduced H.R. 860, the

Surface Transportation Research and Development Act of 1997. The legislation authorizes appropriations for the Department of Transportation to carry-out surface transportation R&D programs, including the Intelligent Transportation System (ITS) program, for Fiscal Years 1998–2003. This hearing reviewed the private sector views on the effectiveness of the federal government’s current role in surface transportation R&D. It also identified ways to encourage increased private sector surface transportation R&D. The hearing also determined the appropriate prioritization of funding for surface transportation R&D through fiscal year 2003.

Witnesses included: Mr. Noah Rifkin, Senior Program Manager, Transportation Group, Calspan SRL; Mr. Richard Braun, Treasurer, Board of Directors, Intelligent Transportation Society of America; Mr. Hank Dittmar, Executive Director, Surface Transportation Policy Project; Dr. C. Michael Walton, P.E., Chair—Transportation Policy Board, American Society of Civil Engineers.

#### *Summary of hearing*

Mr. Noah Rifkin, testifying as Senior Program Manager, Transportation Group, Calspan SRL discussed his support for the current version of the Intermodal Surface Transportation Efficiency Act (ISTEA) in particular the R&D segments of the bill, and provided some thoughts on how the Administration’s National Economic Crossroads Transportation Efficiency Act (NEXTEA) may be strengthened even further. Mr. Rifkin said he supports a larger percentage of investment of federal dollars for the nation’s transportation enterprise. He summarized saying he supports ISTEA and suggests that Congress reassess its priorities, tune its focus, and reaffirm its national commitment to assure the success of NEXTEA.

Mr. Richard Braun, testifying as Treasurer, Board of Directors, Intelligent Transportation Society of America stated that the ITS initiative is vital. He gave several examples where technology can meet the nation’s growing traffic needs. Mr. Braun highlighted many technologies already in place in several major cities. He also suggested several ITS components for inclusion in NEXTEA.

Mr. Hank Dittmar, testifying as Executive Director, Surface Transportation Policy Project expressed his support for surface transportation research and development. He also suggested that the R&D program be guided by an overall strategic agenda that reflects the goals contained in ISTEA and cited several elements for inclusion in the federal surface transportation research program. Mr. Dittmar recommended expanding current surface transportation R&D technology programs to include more policy research. He emphasized the important role of the Federal Government in research and technology development activities.

Dr. C. Michael Walton, testifying as Chair, Transportation Policy Board, American Society of Civil Engineers, discussed his support for ISTEA and the benefits it offers, such as increased partnership opportunities among government, the private sector and universities. He expressed continued support of NEXTEA. He stressed the importance of developing another strategic plan for NEXTEA and offered several suggestions to be included in that plan, particularly continued research and development of ITS.

*4.5(i)—Technology in the Classroom: Panacea or Pandora's**May 6, 1997**Hearing Volume No. 105-13**Background*

On May 6, 1998, the Subcommittee on Technology held a hearing entitled, "Technology in the Classroom: Panacea or Pandora's." The hearing explored the appropriate role of technology in K-12 education. The hearing addressed the role of state, local and Federal Government programs; the cost associated with the use of technology; barriers to replicate successful programs; and how the private sector can be harnessed to assist both urban and rural schools in bringing technology into the classroom.

To date, the Federal Government has played a substantial role in providing technology in the classroom. A recent RAND survey estimated that, in 1994, \$850 million in federal funding went to K-12 technologies, about 30% of the total national investment. Last year, Congress passed, and the President signed into law the Telecommunications Act of 1996. Among its provisions, the legislation requires telecommunications carriers, if requested, to provide elementary and secondary schools with telecommunications services at reduced rates.

Witnesses included, Mr. Paul Reese, Computer and Technology Coordinator, Community School District Five, New York, NY; Mr. Joseph Hofmeister, Director, Technology Integration, Cincinnati Country Day School, Cincinnati, OH; Mr. Kalani Smith, Instructional Specialist, Office of Global Access Technology, Montgomery County Public Schools, Rockville, MD; Ms. Kathleen Fulton, Associate Director, Center for Learning and Educational Technologies, College of Education, University of Maryland, College Park, MD; Mr. Tip Kilby, Executive Director, Computers for the Classrooms, Inc., Atlanta, GA.

*Summary of hearing*

Mr. Paul Reese testified on behalf of the Consortium for School Networking and Community School District Five in New York City. Mr. Reese asserted that technology has contributed immensely to the success of the students and teachers at Ralph Bunche School. This technology includes: access to both local area networks (LAN) and wide area networks (WAN) through an Internet server, e-mail accounts for students and teachers, newsgroups set up in collaboration with other schools, a web server and, an electronic portfolio whereby students can save word processing, graphic and other files. This access to information has challenged students and teachers to develop new projects and find new ways of acquiring, as well as constructing, knowledge. Mr. Reese believes that we must assure that all students have access to the Internet, and that teachers receive the necessary training in order to assure success.

Ms. Kathleen Fulton testified on behalf of the Center for Learning and Educational Technology at the University of Maryland. She believes that new understandings of educational technologies can change how we think about education. Ms. Fulton views new tech-

nologies for students as a “pencil for the mind,” and encourages Congress to continue to support the creation and availability of educational technologies for the benefit of our nation’s school-children.

Additionally, Ms Fulton testified that federal investments made in educational technology over the past decade have been substantial, but cautioned that these monies will continue to present budgetary challenges. She noted that while federal dollars provide approximately 6 percent of K–12 education expenditures, federal funding has supplied 25 percent of the share for technology. Ms. Fulton also testified that there is a steadily growing body of research that supports technology’s positive impact on student learning. However, there is no guarantee that favorable results will be achieved by just having the technology in the classroom

Mr. Joseph Hofmeister Testified on behalf of Cincinnati Country Day School (CCDS), a preK–12, private, independent, college preparatory school in Cincinnati, OH. Mr. Hofmeister believes that CCDS’s experience with computers in schools over the last 25 years has given them a distinct and unique perspective on the use of educational technology. Additionally, Mr. Hofmeister asserted that computers can be a catalyst for developing a new paradigm for learning in schools. When students become more active and constructive in dealing with information, rather than being passive recipients, many things are learned and understood better, developing independent, problem solving learners who achieve more personal satisfaction in the process. He believes that students must be encouraged, and maybe required, to use technology to enhance, expand and serve their learning experiences.

Mr. Tip Kilby, testified on behalf of Computers for the Classrooms, Inc. (CCI). CCI is dedicated to enhancing education through better use of technology. They achieve this by providing teachers with a computer for their own personal use, outfitting the computer with relevant, useful software, and training the teachers through a series of classes. Mr. Kilby believes that in order to reach our goal of fully integrated educational technologies we need to focus more on training teachers in this area. A part of this educating teachers is giving teachers access to their own computers at all times where they can spend time learning how to properly use them.

Mr. Kilby also stated that two ways to expedite our goal is to tap into the abundant technological resources of companies and individuals, and tap into their vast human resources. Utilizing volunteers who know how to use technology, and use it everyday as part of their work.

Mr. Kalani Smith testified on behalf of the Montgomery County Education Association’s Office of Global Access Technology. Mr. Smith stated that technology available to teachers is increasing at a rapid rate. He cautioned that this technology is not an end in itself, but a tool which a teacher can use to enhance their methods of instruction. The difficulty, as he sees it, is in training the teachers to utilize these available technologies. And to help them see technology as a powerful tool to deliver even better instruction of their curriculum. Additionally, Mr. Smith asserted that teacher training in the instructional use of technology is, and needs to be,

a priority so that our children can take advantage of the wealth of knowledge this period in earth's history has to provide.

*4.5(j)—Review of the President's Commission's Recommendations on Cloning*

*June 12, 1997*

*Hearing Volume No. 105-19*

*Background*

On June 12, 1997 the Subcommittee on Technology held a hearing to review and discuss the report, "Review of the President's Commission's Recommendations on Cloning," submitted to the President on June 9, 1997, by the National Bioethics Advisory Commission (NBAC). The President had requested the NBAC perform a ninety day study to examine the scientific, ethical and legal aspects of the cloning issue. The hearing, entitled "Review of the Recommendations on Cloning by the President's Commission," provided the first Congressional forum for discussion on the findings of the Commission. The hearing also considered the NBAC recommendations on the legal and ethical issues associated with the use of cloning technology.

Witnesses included: Dr. Harold Varmus, Director, National Institutes of Health, Bethesda, MD; Harold T. Shapiro, Ph.D., Chairman, National Bioethics Advisory Commission; Thomas Murray, Ph.D., Chairman, Genetics Subcommittee, National Bioethics Advisory Commission; David R. Cox, M.D., Ph.D., Professor of Genetics and Pediatrics, Department of Genetics, Stanford University School of Medicine, Stanford, CA.

*Summary of hearing*

Dr. Harold Varmus testifying as Chairman of the National Institutes of Health, briefly summarized the legislative activity (the House Committee on Science, Subcommittee on Technology legislative hearing on March 5, 1997 and the Senate Committee on Labor and Human Resources, Subcommittee on Public Health and Safety hearing on March 12, 1997) that had transpired to that date.

Dr. Harold T. Shapiro testifying as Chairman of the National Bioethics Advisory Commission, broadly summarized some of the major conclusions of the NBAC. He began by presenting some of the scientific uncertainties and impediments that exist that currently obstruct the successful cloning of a human being, and thus, the successful scripting of public policy analysis in this area. He provided that the Commission's report cited deficient technology, at present, for the safe cloning of a human, and that the current state would expose the fetus and developing child to unacceptable risks. This deficiency was coupled with far-reaching concern over societal concerns about the ethics of allowing human cloning.

Dr. Shapiro concluded by suggesting that a specific period of time be set aside, during which no attempts at human somatic cell nuclear transfer would be attempted, and that the debate be revisited after scientific, moral, and ethical data can be further collected and better evaluated.

Dr. Thomas M. Murray testifying as Chairman of the National Bioethics Advisory Commission's Genetic Testing Subcommittee, Dr. Murray testified to the religious and ethical issues analyzed by the Commission. After outlining the process taken by the NBAC, he presented the major findings in regard to ethical and religious debate. Many raised the issue of the responsible dominion over nature by humankind. From a family/religious perspective, also acceptable procreation was analyzed in an effort to better understand the differences between begetting and making. The Commission looked at human cloning from a number of perspectives. He stated that the potential cloning of humans could disrupt the relationship among generations. From a religious perspective, the Commission focused on concerns over hubris, domination and oppression of made people, and concern over objectification. The Commission also stated that extreme caution must be exhibited whenever humans are used as the subject of scientific experimentation. But most of all, at this time, there is sufficient cause to warrant legislation to bar cloning based on the fact that a developing child would be subject to undue harm as a result of the current "unscientifically plausible technology."

Dr. David R. Cox testifying as a Member of the National Bioethics Advisory Commission, spoke of the remarkable nature of the scientific discovery and the opportunity for great advancements in basic science. Dr. Cox also was careful to mention the scope of the NBAC study. He explained that the cloning technique in question, somatic cell nuclear transfer, cannot be done without the transfer of genetic information to an egg. When division of the egg takes place, by definition, an embryo is produced. He insisted that it was not in the scope of the study to revisit the embryonic debate, nor assess the current annual ban on federal funding of human embryo research. He concluded with a justification as to why the scientists on the Commission would recommend legislation aimed at controlling science, in light of the fact that above all, "scientists value scientific freedom."

*4.5(k)—Computer Security Enhancement Act of 1997: To Amend The National Institute Of Standards and Technology Act to Enhance The Ability Of The National Institute of Standards And Technology To Improve Computer Security, And For Other Purposes*

*June 19, 1997*

*Hearing Volume No. 105-20*

*Background*

On June 19, 1997, the Subcommittee on Technology held a hearing entitled, "Computer Security Enhancement Act of 1997: To Amend The National Institute Of Standards and Technology Act to Enhance The Ability Of The National Institute of Standards And Technology To Improve Computer Security, And For Other Purposes." The hearing focused on the provisions of the Computer Security Enhancement Act of 1997. The bill amends the Computer Security Act of 1987 (P.L. 100-235). P.L. 100-235 gave NIST the lead responsibility for computer security for federal civilian agen-

cies. The Act required NIST to develop standards and guidelines needed to ensure cost-effective security and privacy of sensitive information in federal computer systems. The Computer Security Enhancement Act of 1997, updates the decades-old act while giving NIST the tools it requires to ensure that appropriate attention and effort is concentrated on securing our federal information technology infrastructure.

Witnesses included: The Honorable Gary Bachula, Acting Under Secretary for Technology, Technology Administration, U.S. Department of Commerce; Dr. Whitfield Diffie, Distinguished Engineer, Sun Microsystems, Mountain View, CA; Mr. Stephen T. Walker, President and CEO, Trusted Information Systems, Inc., Glenwood, MD; Mr. D. James Bidzos, President and CEO, RSA Data Security, Redwood City, CA; Marc Rotenberg, Esq., Director, Electronic Privacy Information Center, Washington, DC.

#### *Summary of hearing*

The Honorable Gary Bachula described an electronic world of the future, whereby one keystroke, performed by a consumer, would initiate an elaborate, electronically controlled process, resulting in the delivery of a custom good to the end user. This would require a "reliable, secure and trustworthy environment. \* \* \* We need to have access to public information but also assurance that the wrong people will not have access to classified or private information." In addressing the sections of the bill, Mr. Bachula, speaking on behalf of the Administration, strongly supported portions of the bill that augment NIST's role in assisting the establishment of non-federal public key management infrastructures, as well as providing guidance and assistance to federal agencies. Support of Section 5 was also given. The intent of Section 6 and Section 8 was supported, yet Mr. Bachula suggested that the language needed to be improved. Mr. Bachula indicated that the Administration opposed Section 7, which gives NIST a role in the assessment of the strength of foreign encryption technologies thereby providing guidance to DoC in granting export licenses for domestic encryption products.

Dr. Whitfield Diffie testified on the historical development of the government's role in computer security. In tracing the development of the interaction between National Security Agency (NSA) and NIST, Mr. Diffie spoke very highly of the intent of the Computer Security Act of 1987; however, he noted that the provision which called for NIST to consult with NSA, later modified by an inter-agency Memorandum of Understanding, resulted in a separation of authority (NIST) and funding (NSA). Mr. Diffie highlighted the problems caused by the NIST/NSA interaction, and contended that NIST autonomy would eliminate this predicament. Citing its timeliness, Mr. Diffie strongly supported H.R. 1903, which he stated would bring back the spirit of the Computer Security Act of 1987.

Mr. Stephen T. Walker also testified in support of H.R. 1903. He strongly supported the provisions that strengthened and augmented the role of the Computer System Security and Privacy Advisory Board (CSSPAB), which was created by the 1987 Act. He pointed out the public good that was done by CSSPAB allowing public debate on the widely criticized Clipper initiative and de-

fended H.R. 1903's enhancement of the board's interaction with NIST. Mr. Walker, though, was opposed to the portions of the bill that direct NIST to conduct evaluations of encryption technology, both domestically (Section 4, paragraph 6) and internationally (Section 7). He questioned the ability of NIST to conduct such evaluations, not because of inadequacies of NIST, rather, the fact that "no one in government or industry has been able to perform effectively at this point" such an evaluation.

Mr. D. James Bidzos refuted Mr. Walker's contention regarding evaluation of encryption technologies. He stated that the provisions of section 7 were both doable and needed. Also, Mr. Bidzos praised the bill's provisions that increased the private sector's role in establishing computer security for civilian government agencies. While implementation of the 1987 Act missed the opportunity for NIST to work closely with industry, "we have an opportunity now to correct it. And, I think that's what [H.R.] 1903 does." Concluding, Mr. Bidzos found no shortcomings with the bill, and strongly supported its contents and timing.

Mr. Marc Rotenberg concluded oral testimony with an overall appraisal of H.R. 1903. Citing the merits of the 1987 Act, Mr. Rotenberg supported the bill as powerful and timely legislation that furthers the intent of its predecessor, while eliminating the inefficacy induced by NIST's Memorandum of Understanding with NSA for consultation on computer security matters under the Act.

*4.5(l)—The Role of Research & Development In Improving Civilian Air Traffic Management*

*June 24, 1997*

*Hearing Volume No. 105-22*

*Background*

On June 24, 1997, the Subcommittee on Technology held a hearing entitled, "The Role of Research & Development In Improving Civilian Air Traffic Management." The hearing was held to review the current state of air traffic control (ATC) modernization, identify what improvements to the system are necessary; and determine the proper role R&D should play in ATC modernization.

Currently, our nation's air traffic system is aging. Failures of critical technological components that support aviation safety are on the increase. Projections call for a 5% increase in air traffic volume for the next ten to fifteen years. Without significant modifications, the system will not be able to cope with the future demand while maintaining the current level of aviation safety.

Witnesses included: Mr. Steven B. Zaidman, Director, Office of System Architecture and Investment Analysis, Federal Aviation Administration, Washington, DC; Dr. Henry McDonald, Director, Ames Research Center, National Aeronautics and Space Administration, Moffett Field, CA; Ms. Margaret Jenny, RTCA Government/Industry Free Flight Steering Committee, Director of Operations Research, U.S. Airways, Arlington, VA; Ms. Nancy Price, Chair, Air Traffic Services Subcommittee, Research, Engineering and Development Advisory Committee, Washington, DC.

*Summary of hearing*

Mr. Steven B. Zaidman testifying on behalf of the Office of System Architecture and Investment Analysis, spoke of the Federal Aviation Administration's activities in introducing new technologies into the air traffic management system. He additionally highlighted concerns and difficulties in the present system of air traffic management. Mr. Zaidman asserted that the greatest limitation of the air traffic management technology being used today is its inability to support the continued growth of air travel in our country. Mr. Zaidman commended two allies that have helped the agency better focus R,E&D investments. First, the Congress, for their implementation of the Government Performance and Results Act. Second, Mr. Zaidman applauded the R,E&D Advisory Committee. Their collaboration has been instrumental in finalizing the Agencies budget.

Ms. Nancy Price, testifying on behalf of the National Airspace System (NAS) Air Traffic Management (ATM) Panel of the FAA R,E&D Advisory Committee, spoke to the charter that the NAS ATM Panel set for themselves in order to review the FAA R&D program. The panel made 20 recommendations on various subjects critical to the future of FAA R&D. These recommendations included: Management recommendations, Advanced ATM recommendations, Software recommendations, Weather recommendations and, leveraging recommendations. As stated by Mr. Zaidman, the FAA sees the Advisory Committee as a collaborative partner and incorporates many of their recommendations into existing FAA priorities.

Ms. Margaret Jenny, testifying as Co-Chair of the FAA's R,E&D Advisory Committee RTCA Free Flight Select Committee, spoke to the need of the entire air management system to modernize in order to meet growing consumer demand. The RTCA Free Flight Select Committee has determined that "free flight" is a bold innovation which could significantly improve air traffic management to the benefit of all involved. In the RTCA Free Flight plan, safety decisions would be made by the FAA, but economic decisions (routes, direct, indirect, etc.) would be made by the users (airlines). Additionally, Ms. Jenny highlighted the importance of the RTCA's evolution to the free flight roadmap. She also urged the Science Committee to resolve the FAA research agenda, "The aviation community looks to . . . your Committee to insure not only that appropriate research is conducted, but also that promising products of previous research will be expedited to the field . . ."

Dr. Henry McDonald, testifying as Director of the Ames Research Center, NASA, briefly spoke to the new strategic framework for the NASA Aeronautics and Space Transportation Technology Enterprise. This endeavor has three national goals which describe the vision and goals for future federal investments in aeronautics and aviation. Additionally, Dr. McDonald explained the cooperative efforts underway with the FAA and expressed his determination for NASA to continue to work closely with the FAA.

*4.5(m)—Will Federal Government Computers Be Ready For the Year 2000? (Joint Hearing with the Subcommittee on Government Management, Information and Technology, Committee on Government Reform and Oversight)*

*July 10, 1997*

*Hearing Volume No. 105–35*

*Background*

On July 10, 1997, the Subcommittee on Technology held a joint hearing with the Subcommittee on Government Management, Information and Technology, Committee on Government Reform and Oversight) entitled, “Will Federal Government Computers Be Ready For The Year 2000?” The hearing was held to review the status of current Federal Government efforts to correct the Year 2000 problem; to discuss the viability of Federal Government agency timetables and milestones in addressing the Year 2000 problem for mission-critical programs; and to assess whether there are sufficient management processes and structures in place to monitor Federal Government Year 2000 efforts.

Recognizing the need to take immediate federal action on this issue, the 104th Congress required all federal agencies to develop by February 1997, a federal strategy and a cost-estimate to correct the Year 2000 problem. This requirement was inserted into the Treasury Postal Fiscal Year 1997, Appropriations Act. The language required the Federal Government, through the Office of Management and Budget (OMB), to create: (1) a detailed plan; (2) a cost-estimate; and (3) a time table to implement the plan.

Witnesses included: The Honorable Sally Katzen, Administrator, Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC; Mr. Joel Willemsen, Director, Accounting and Information Management Division, U.S. General Accounting Office, Washington, DC; Mr. Alvin Pesachowitz, Vice Chair, Chief Information Officers Council, U.S. Environmental Protection Agency, Washington, DC; Ms. Katherine Adams, Chair, Interagency Year 2000 Subcommittee of the Chief Information Officers Council, Assistant Deputy Commissioner for Systems, Social Security Administration, Baltimore, MD; Mr. Joe Thompson, Chief Information Officer, U.S. General Services Administration, Washington, DC.

*Summary of hearing*

The Honorable Sally Katzen, testifying as Administrator, Office of Information and Regulatory Affairs, Office of Management and Budget, reported on the status of the Federal Government’s progress in assuring federal computer systems are ready for the Year 2000. In May, OMB informed agencies that they would be required to report quarterly on their Year 2000 progress. Ms. Katzen characterized the first reports (received by OMB on May 15, 1997) as showing that agencies have made a good start in addressing the year 2000 problem. She also indicated that the government-wide cost estimate had increased from \$2.3 billion to \$2.8 billion. Ms. Katzen concluded by stating that while OMB is concerned with the

amount of work that remains to be done, they are confident the Year 2000 computer problem will be a non-event with regard to the Federal Government computer systems.

Mr. Joel C. Willemsen, testifying as Director, Information Resources Management, Accounting and Information Management Division, General Accounting Office, described the Federal Government's strategy for addressing the Year 2000 problem, and agencies' reported status in resolving the issue. In addition, Mr. Willemsen provided observations on federal efforts to date based on work GAO has completed at certain agencies and on their review of OMB's implementation of the federal strategy, including year 2000 reports submitted by 24 federal agencies. Mr. Willemsen insisted that the pace of current date change work needs to be accelerated if widespread system problems are to be avoided. In conclusion, he feels that preparing for the Year 2000 is much more of a management challenge than a technical one.

Mr. Alvin Pesachowitz, testifying as Vice-Chairman, Federal Chief Information Officers Council, discussed the role of the Federal CIO Council in dealing with the Year 2000 problem. He asserted that the CIO council believes there is no higher priority for them than the proper operation of the information systems the Federal Government relies on to serve the American public. To that end, the CIO Council has worked closely with OMB and the private sector in formulating Year 2000 policies. Mr. Pesachowitz believes that the collaborative efforts by OMB and the CIO Council has had a positive impact on the pace of the Federal Government's response to the Year 2000 problem.

Ms. Kathleen Adams, testifying as Chairperson, Chief Information Officers Council Subcommittee on Year 2000, described what the Subcommittee has done and is doing to help federal agencies address the Year 2000 problem. The primary functions of the Year 2000 Subcommittee are; to raise awareness of the problem; assess facets of the issue that cut across government; seek mutual solutions; and share the best practices. To facilitate these functions the Subcommittee has sponsored two conferences to increase awareness, developed a Best Practices guide to provide a framework for each agency and department and, worked with OMB to develop the quarterly status report each agency must submit to OMB. Ms. Adams also spoke of the future activities of the Subcommittee. Specifically, they are developing a database of commercial off the shelf software and how it will function when handling dates beyond 1999; focusing on data exchanges where multiple agencies are involved to minimize the impact on state and local governments.

Mr. Joe M. Thompson, testifying as Chief Information Officer, General Accounting Office, spoke to GSA's progress and government-wide leadership in resolving the Year 2000 computer dilemma. GSA's primary approach, in resolving the issue within their agency, has been to upgrade all their systems to Year 2000 compliance in order to improve the overall function of their system's. Outside GSA, Mr. Thompson testified that GSA has notified manufacturers, service and equipment providers that all products sold to the government must be year 2000 compliant and developed an Office of Government-wide policy directory that has become a one-stop shopping source for information on Year 2000 issues. Mr.

Thompson cautioned that many state and local government's are not moving rapidly or aggressively enough to assure they will be ready on time. However, the continued attention that Congress is showing the matter will assist in both raising awareness and stimulating solutions.

*4.5(n)—Meeting The Needs Of People With Disabilities Through  
Federal Technology Transfer*

*July 15, 1997*

*Hearing Volume No. 105-26*

*Background*

On July 15, 1997, the Subcommittee on Technology held a hearing entitled, "Meeting The Needs Of People With Disabilities Through Federal Technology Transfer." This hearing was held to discuss the effectiveness of our federal technology transfer laws and methods in which they may be improved, focusing on assistive technologies for our nation's disabled citizens. Assistive technologies are being used to increase, maintain, and improve the functional capabilities of citizens with disabilities. For the 49 million people in the United States who have disabilities, our nation's federal laboratories have yielded a tremendous number of quality of life enhancements.

Witnesses included: Dr. Katherine Seelman, Director, National Institute of Rehabilitation and Research, U.S. Department of Education, Washington, DC; Mr. C. Dan Brand, Chairman, Federal Laboratory Consortium for Technology Transfer, Jefferson, AR; Dr. Bruce Webbon, Chief, Commercial Technology, NASA Ames Research Center, Moffett Field, CA; Steve Jacobs, Executive Assistant to the President, NCR Corporation, Dayton, OH; David H. Hershberger, Vice President of Product Development, Prentke Romich Company, Wooster, MA; Mr. Joe Lahoud, President, LC Technologies, Fairfax, VA.

*Summary of hearing*

Dr. Katherine Seelman, testifying as Director, National Institute on Disability and Rehabilitation Research (NIDRR), Office of Special Education and Rehabilitative Services, Department of Education. NIDRR is the lead federal agency in research, development and deployment of assistive technologies. Dr. Seelman stated that currently, an estimated 15.6 million people in the U.S. either use some type of specialized assistive technology or have reported they would benefit if they did use an assistive technology. She also asserted that there are numerous prospects for potential collaboration between NIDRR and the federal laboratories in the area of assistive technologies. A working model for future successful collaboration should include; continuing to work on information exchange; providing additional resources to seek out potential technology for transfer; conducting pilot projects or reciprocal exchange between NIDRR and the federal laboratories; and involving individuals with disabilities in technology transfer research. Dr. Seelman concluded that through continued leadership of the Congress new ways will

be found to transfer technology into the area of assistive technology.

Mr. C. Dan Brand, Testifying as Chair, Federal Laboratory Consortium, spoke to the important role played by the Federal Laboratory Consortium (FLC) in the transfer of technology from federal laboratories to the marketplace. Mr. Brand stated that the FLC is committed to enhancing the partnership opportunities between the federal laboratories and the assistive technology community. He cited four things the FLC can begin implementing to assist NIDRR in their mission; promote awareness and benefits of assistive technology; identify the technical needs of the NIDRR laboratories and match them with a federal laboratory; exploit and adapt the mechanisms provided through key legislation; and convey to the laboratory leadership the importance of considering assistive technology design and development. Mr. Brand further stated that the FLC has a clear mandate to work with the assistive technology community and they welcome the opportunities and challenges ahead.

Dr. Bruce Webbon, Testifying as Chief, Commercial Technology Office, NASA-Ames Research Center, indicated that large private companies are often reluctant to develop needed assistive technology devices due to the small return on investment. Additionally, smaller companies do not have the resources to do so. Dr. Webbon feels that the federal laboratories are uniquely able to bridge this gap since they are not in the business of selling commercial products, and they have, in collaboration with agencies, the needed technical expertise. Dr. Webbon spoke of NASA's long history of applying aerospace research, developed to accomplish its tasks in space, to help solve problems on earth. He gave specific examples of Ames research being successfully applied to the assistive technology community.

Mr. Steven I. Jacobs, Testifying as a Senior Technology Consultant, NCR Corporation, stated "Developing products that are accessible, usable and useful by people with disabilities brings more benefits to mainstream business than may be obvious to the casual observer." He gave numerous examples of technology being developed to facilitate various job performances and their rather easy application to the assistive technology community. Mr. Jacobs further asserted that strengthening the ability to meet the needs of people with disabilities through federal technology transfer will bring with it many benefits. Additionally, he believes that supporting programs which proactively encourage collaboration between rehabilitation engineering centers and federal laboratories increase the quality and speed of products currently under development.

Mr. David Hershberger, Testifying as Vice President, Product Development, Prentke Romich Company, stated that his company was founded in 1966 for the sole purpose of providing technology for people with disabilities. This has remained the company's one and only activity. Prentke Romich's primary products are speech generation devices. The computer revolution has benefited the production of these. This revolution has also had a profound impact on people with disabilities in two important ways. Firstly, many of the new products developed are much easier to use, or at least modify, for use by people with disabilities. Secondly, the accompanying advancement in components required to make computers

also can be used for assistive technologies. For example, components used to make faster computers are also used to make more sophisticated wheelchair controls.

Mr. Joseph A. Lahoud, testifying as President, LC Technologies, Inc., spoke as a representative of an emerging assistive technology industry in the United States. Mr. Lahoud asserted that LC Technologies, Inc. is a working model of a successful collaborative arrangement between a small company and the federal laboratory system. LC Technologies Eyegaze technology is a computer/communication system for people with physical disabilities who cannot use traditional technologies. This technology has the ability to improve and enhance not only present communication for those with disabilities, but also many future applications. Mr. Lahoud asserted that his company has benefited from opportunities presented by the Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) grants as well as collaborative agreements with Federal Government laboratories. However, he further stated that these funds represent only a small percentage of the funds needed to address the R&D needs of the community of people with disabilities.

*4.5(o)—The Prohibition of Federal Funding of Human Cloning Research*

*July 22, 1997*

*Hearing Volume No. 105-32*

*Background*

On July 22, 1997, the Subcommittee on Technology held a hearing entitled, "The Prohibition of Federal Funding of Human Cloning Research." The hearing discussed the parameters governing federal funding for human cloning research and, reviewed H.R. 922, "The Human Cloning Research Prohibition Act," introduced by Congressman Vern Ehlers of Michigan, which prohibits the expenditure of federal funds to conduct or support research on the cloning of humans.

Advances in cloning technology offer great potential in such areas as medical research and agriculture. Experiments involving cloned animals could greatly enhance the basic understanding of aging and may provide a window into the development of diseases, such as cancer. However, these advances also raise serious ethical questions, particularly with respect to the possible use of the technology to clone human embryos. This has opened up a world-wide debate on the legal and ethical issues associated with cloning technology.

Witnesses included: Dr. Hessel Bouma III, Professor of Biology, Calvin College Biology Department, Grand Rapids, MI; Professor Kevin Wildes, Associate Director, Kennedy Institute of Ethics, Georgetown University, Washington, DC; Arthur F. Haney, MD, President-elect, American Society for Reproductive Medicine, Director, Department of Endocrinology & Infertility, Duke University Medical Center, Durham, NC; Dr. Alison Tauton-Rigby, President & CEO, Aquila Biopharmaceuticals, Worcester, MA; Dr. Lester M. Crawford, Vice Chairman, National Association for Biomedical Re-

search, Director, Center for Food and Nutrition Policy, Georgetown University, Washington, DC.

*Summary of hearing*

Dr. Hessel Bouma III, testifying as Professor of Biology, Calvin College Biology Department, stated that ethical decision about human cloning should not be left solely to the medical community. In order to safeguard the public welfare, we need to institute government restrictions on human cloning. H.R. 922 is one effective means of restricting human cloning. Although warranted, this federal funding ban is insufficient as it provides restrictions only to federal research. If we agree that human cloning should not be done, then government restrictions are warranted on the private sector as well as the public.

Professor Kevin Wildes, testifying as Associate Director, Kennedy Institute of Ethics, Georgetown University, spoke as a philosopher with a specialty in bioethics and health policy. He felt that federal legislation to prohibit human cloning should be enacted and that any legislation must seek to be as clear and precise as possible in its language and definitions.

Arthur F. Haney, MD, testifying as President-elect, American Society for Reproductive Medicine, Director, Department of Endocrinology & Infertility, Duke University Medical Center. ASRM opposes any attempt at cloning an existing human being. Although they are generally reluctant to support any legislative efforts to curtail scientific inquiry, at this time cloning merits such a prohibition. ASRM feels that the best way to proceed is for legislation that would prohibit this practice more generally, not just for federally funded researchers. ASRM supports legislation which prohibits cloning existing human beings using somatic cell nuclear transfer. They request that any legislation include: (1) a sunset provision; (2) a preemption clause to ensure that individual state legislatures do not overrule federal law; and (3) the Committee lift the existing prohibitions on the use of federal funds for blastocyte or preembryo research (i.e., the current federal ban on embryo research).

Dr. Lester Crawford, testifying as Vice Chairman, National Association for Biomedical Research, stated that NABR, is dedicated exclusively to advocating sound public policy regarding the humane and necessary use of animals in biomedical research, education and testing. NABR represents over 360 member institutions including the nation's largest university, the majority of US medical and veterinary schools, academic and professional societies, voluntary health organizations as well as pharmaceutical and biotechnology companies. NABR agrees with and support the conclusions and recommendations made by the National Bioethics Advisory Commission, but does not support the NBAC proposed legislation or H.R. 922. NABR recommendations are: (1) science will not pursue research results which society is morally and ethically unwilling to accept; (2) safeguards are in place to protect humans and animals in experimentation; and (3) existing laws and regulations are being followed, and can be periodically reviewed to keep pace with new technologies.

Dr. Alison Taunton-Rigby, testifying as President and CEO, Aquila Biopharmaceuticals, and on behalf of the Biotechnology In-

dustry Organization, representing 730 biotechnology companies and others engaged in biotechnology research on medicines and diagnostics, agriculture, pollution control, and industrial applications. BIO agrees with the conclusions of the National Bioethics Advisory Commission, but BIO believes that legislation on the subject of cloning human beings is not needed. In lieu of legislation, BIO recommends that the current moratorium on human cloning be continued indefinitely. If legislation must be enacted, BIO recommends: (1) it should focus only on research funded by the Federal Government, (2) it should include a sunset provision, (3) a pre-emption provision, (4) a findings section, (5) a section defining protected research, (6) a prohibition on private rights of action, and (7) an effective date.

*4.5(p)—Reauthorization of the Small Business Technology Transfer Program (STTR)*

*September 4, 1997*

*Hearing Volume No. 105-39*

*Background*

On September 4, 1997, the Subcommittee on Technology held a hearing entitled, "Reauthorization of the Small Business Technology Transfer Program (STTR)." The Small Business Innovation Development Act (P.L. 97-219) created the Small Business Innovative Research (SBIR) program in 1982. In 1992 the program was reauthorized by P.L. 102-564 (15 U.S. 638). The reauthorization created a three year pilot program called the Small Business Technology Transfer (STTR) program.

STTR is intended to facilitate the commercialization of university, non-profit, and federal laboratory research and development by small businesses. STTR provides funding for research proposals which are developed and executed cooperatively between small firms and scientists/professors in research organizations. Currently, the Department of Energy (DOE), Department of Defense (DOD), Health and Human Services (HHS), National Aeronautics and Space Administration (NASA), and National Science Foundation (NSF) all contribute to the program. The STTR set-aside was last reauthorized as part of the Omnibus Consolidated Appropriations Act of 1996. That authorization expired on September 30, 1997.

Witnesses included: Mr. Daniel Hill, Assistant Administrator for Technology, U.S. Small Business Administration, Washington, DC; Ms. Susan Kladiva, Acting Associate Director, Energy, Resources and Science Issues, U.S. General Accounting Office, Dr. Wendy Baldwin, Deputy Director for Extramural Research, National Institutes of Health, Bethesda, MD; Mr. Scott Wallsten, Economist, Department of Economics, Stanford University, Stanford, CA; Ms. Ann Eskesen, President, Innovation Development Institute, Swampscott, MA.

*Summary of hearing*

Mr. Daniel Hill, testifying as Assistant Administrator for Technology, U.S. Small Business Administration, indicated the Small Business Administration's (SBA) strong support for extending the

STTR program through the year 2000 at its current level. He also stated that, while small businesses produce twice as many innovations per employee as large firms, they receive a very low percentage of federal research and development funds. He indicated that the STTR, established as a pilot program during the 1992 reauthorization of the Small Business Innovation Research Program (SBIR), has begun to bridge this gap. According to SBA, the program, in only its third year of existence, has received high praise from both the General Accounting Office (GAO), as well as the Department of Defense (DOD) for its success in bringing technology to the market quickly. Mr. Hill testified that both STTR and SBIR programs are vital to the nation's research agenda and small business community.

Ms. Susan Kladiva, testifying as Acting Associate Director, Energy, Resources and Science Issues, U.S. General Accounting Office (GAO), spoke of the agency-by-agency review conducted by GAO of the first year implementation of STTR. She stated that while agency officials offered differing views on the effect of, and the need for, the STTR program, all officials felt the program was not competing for quality proposals with the SBIR program or reducing the quality of the participating agencies' R&D programs. Additionally, some agency officials noted potentially beneficial effects, such as greater collaboration between small business and research institutions in the SBIR program. Ms. Kladiva also discussed GAO's work on small businesses which receive multiple awards. From fiscal year 1990 through fiscal year 1996, approximately 6,500 companies have received STTR and/or SBIR awards from the five agencies that participate in both programs.

Dr. Wendy Baldwin, testifying as Deputy Director for Extramural Research, National Institutes of Health, stated that the National Institute of Health (NIH) is the only principal operating component within the Department of Health and Human Services (HHS) that participates in the STTR program. She further acknowledged that HHS is very pleased with their involvement in the program. Dr. Baldwin fully expects HHS results, with regard to STTR, to mirror those of its SBIR program. A recent report from GAO and SBA indicates that HHS has experienced the highest success rate among all federal agencies in commercializing the results of research conducted under SBIR. A further benefit of the two programs at NIH has been in contributing to the development of products and methods useful in other research efforts. These products and processes have succeeded in increasing the productivity of other researchers and decreasing the cost of other areas of research.

Mr. Scott Wallsten, testifying as a Ph.D. candidate at Stanford University. Mr. Wallsten asserts that he has been studying the SBIR program for several years and feels that his conclusion that SBIR cannot meet its legislative goal of increasing innovation and commercialization is equally applicable to STTR, as it is not only similar to the SBIR in many ways, but also because many firms participate in both programs. Mr. Wallsten believes that STTR funds will go to research that is likely to lead to a commercialized product. However, this same research would proceed even in the absence of federal funds. A government grant is much cheaper than

a loan, so it stands to reason that any rational firm will look to this source of funding first.

Ms. Ann Eskesen, testifying as President, Innovation Development Institute, asserted that, as one of the original people who helped draft and implement the SBIR program in 1982, she possesses the necessary “corporate memory” of the path, intentions and future direction of the SBIR. Ms. Eskesen testified that since its inception, 40,000 projects have been selected for SBIR awards. These projects have included nearly 9,000 small businesses representing every state in the union. She noted the diversity of emphasis and breadth of talent which currently makes up the SBIR program. She stated that SBIR and STTR represents an extraordinary pool of validated competence and talent and, within the SBIR, every conceivable area of scientific and technological investigation is represented. In conclusion, Ms. Eskesen suggested perhaps including in the reauthorization a provision for program managers at each agency to designate a percentage of their awards each year toward long-term higher risk projects.

*4.5(q)—Promoting Technology Transfer by Facilitating Licenses to Federally-Owned Inventions*

*September 25, 1997*

*Hearing Volume No. 105–27*

*Background*

On September 25, 1997, the Subcommittee on Technology held a hearing entitled, “Promoting Technology Transfer by Facilitating Licenses to Federally-Owned Inventions.” The hearing was held to discuss the effectiveness of our federal technology transfer laws and methods in which they may be improved, and to review H.R. 2544, the Technology Transfer Commercialization Act of 1997, which seeks to promote technology transfer by facilitating licenses to federally-owned inventions.

Each day research and development programs at 700 United States federal Laboratories produce new knowledge, processes, and products. Often, technologies and techniques generated in these federal laboratories have commercial applications if further developed by the industrial community.

As a result, federal laboratories work closely with United States industries, universities, and state and local governments, helping them to apply these new capabilities to their own particular needs. Through this technology transfer process, the laboratories share the benefits of national investments in scientific progress with all segments of society. In this way, the results of the federal R&D enterprise are used to meet other national needs including the economic growth that flows from new commercialization in the private sector.

Witnesses included: Mr. Joe Allen, Vice President, Market and Technology Assessment, National Technology Transfer Center, Wheeling, WV; Mr. C. Dan Brand, Chair, Federal Laboratory Consortium, Jefferson, AR; Mr. Dan Passeri, Vice President, Business Development and Intellectual Property, Gene Logic, Inc., Columbia, MD; Mr. John G. Mannix, Associate General Counsel, National

Aeronautics and Space Administration, NASA Headquarters, Washington, DC.

*Summary of hearing*

Mr. Joe Allen, testifying as Vice President, Market and Technology Assessment, National Technology Transfer Center, stated that linking federal laboratories and universities with American industry holds great promise for our future economic prosperity. Mr. Allen asserted that the passage of the Bayh-Dole Act in 1980, initially considered a bold and radical idea, is now a model that our economic competitors are emulating. This legislation holds the same promise. However, Mr. Allen believes that in order to license government-owned inventions, the Congress must ease the current complex system which a company must go through. For example, a company must publish in the Federal Register their intention to pursue a federally-owned license. Companies, however, are reluctant to do this as it effectively gives away their marketing strategy. In conclusion, Mr. Allen recommended taking a well thought out incremental approach, such as H.R. 2544, that simplifies current procedures while retaining important safeguards.

Mr. Daniel R. Passeri, testifying as Vice President, Gene Logic, Inc., spoke of the importance for the Federal Government to streamline the procedures and remove the uncertainty associated with the licensing determination process. In doing so, the Federal Government will foster an attractive environment for corporate investment and partnering efforts. Mr. Passeri believes that under the current system there is a tension between the needs of industry to rapidly respond to market demands and opportunities, and the procedural requirements of federal agencies in regards to the exclusive licensing of high risk, early stage technology. He stated that these procedural barriers create increased transaction costs, delays in obtaining the license, as well as the uncertainty of actually being granted the license. The barriers, however, do not exist in university technology transfer. In conclusion, Mr. Passeri welcomed H.R. 2544's proposed improvements to the current law and indicated that in their current form they will address the frustrations of industry.

Mr. C. Dan Brand, testifying as Chair, Federal Laboratory Consortium, spoke of the Federal Laboratory Consortium's (FLC) importance as the nationwide network of federal laboratories who provide a forum to develop strategies and opportunities for linking government technology to the marketplace. Mr. Brand stated that in advance of this hearing, the FLC solicited and received comments from a number of their member departments and agencies on removing legal obstacles to effectively license federally-owned inventions. He cautioned that these are not an "official" department or agency position, but rather an initial assessment. Mr. Brand stated the FLC's belief, as well as those comments received from departments and agencies, is that the amendments to the Bayh-Dole Act will serve to speed transfer and commercialization of technologies to industry, while maintaining a fair and open competitive environment. Mr. Brand further cautioned that while the initial input from member laboratories was largely positive, the

Subcommittee should also consider the views of the FLC Legal Issues Committee and the National Institutes of Health.

Mr. John G. Mannix, testifying as Associate General Counsel, Intellectual Property, National Aeronautics and Space Administration, began by stating that neither NASA nor the Administration had an opportunity to completely review the proposed legislation so neither has had an opportunity to formulate a detailed position. However, Mr. Mannix asserted that having learned many lessons over the years in this regard, he would hope NASA's position would be considered before any changes in the law were made. Mr. Mannix highlighted the two major improvements to the licensing process that he has seen during his career. First, he cited the increased personal involvement of technical experts, and individuals with marketing, negotiation, and business experience in the licensing process. Second, he emphasized the importance of the statutory authority given to NASA negotiators to require written commercialization plans and yearly status reports describing progress toward commercialization. Additionally, Mr. Mannix emphasized the importance of providing some form of notice of the availability of federally owned licenses. Without such a notice, Mr. Mannix maintained, we will always be subject to claims of favoritism.

*4.5(r)—Technology to Reduce Aircraft Noise*

*October 21, 1997*

*Hearing Volume No. 105-38*

*Background*

On October 21, 1997, the Subcommittee on Technology held a hearing entitled, "Technology to Reduce Aircraft Noise," to review Federal research and technology development activities in the area of aviation noise reduction.

Aircraft noise continues to be a persistent concern to communities located around commercial airports. According to the Federal Aviation Administration (FAA), about 3.5 million citizens reside in areas where aircraft noise exceeds the level at which noise is defined to constitute a sustained interference with routine daily activities. As large as this number may appear, it represents a major reduction from the estimated 7 million citizens similarly impacted in 1974.

Witnesses included: Mr. James Erickson, Director, Office of Environment and Energy, Federal Aviation Administration, Washington, DC; Dr. Robert E. Whitehead, Associate Administrator for Aeronautics and Space Transportation Technology, National Aeronautics and Space Administration, Washington, DC; Dr. Wesley L. Harris, Federal Aviation Administration, Research, Engineering and Development Advisory Committee, Washington, DC; Mr. Don MacGlashan, Member, Board of Directors, Citizens for the Abatement of Airport Noise, Chevy Chase, MD; Mr. Robert Robeson, Vice President, Civil Aviation, Aerospace Industries Association of America, Inc., Washington, DC.

*Summary of hearing*

Mr. James Erickson, testifying as Director, Office of Environment and Energy, Federal Aviation Administration, spoke to the cooperative effort between the Federal Aviation Administration (FAA), and the National Aeronautics and Space Administration (NASA) on noise research and specifically, the Subsonic Noise Reduction Technology program. Mr. Erickson stated that in recent years FAA has made significant progress in reducing noise impacted areas through the elimination of Stage 2 aircraft. This progress has come amidst significant increases in passenger travel. Mr. Erickson also applauded the efforts of NASA and FAA in their current research effort, the Advanced Subsonic Technology program (AST). Their mission is to develop high-payoff technologies to enable safe, highly productive global air travel. Under this program FAA & NASA have met all mid-term objectives for each of the 5 program areas under this program and Mr. Erickson anticipates that they will ultimately meet all performance objectives. In conclusion, he stated that the cooperative research between NASA and FAA is a model for other agencies. And as a result, they will achieve significant reduction in aircraft noise.

Mr. Robert E. Whitehead, testifying as Associate Administrator for Aeronautics and Space Transportation Technology, National Aeronautics and Space Administration, spoke also of the cooperative research between NASA and FAA. He also discussed the role of NASA in civilian aviation research, and aviation noise reduction research. FAA and NASA have a long history of cooperative research to reduce aircraft noise. Having worked together through the 60's and 70's on programs like the Quiet Nacelle Program, the JT8D Refan program and the Quiet Engine program. Collectively, these programs have made significant contributions to reducing aircraft noise. The current Advanced Subsonic Technology program (AST) is yet another important effort on their parts. The 5 sub-elements of the AST program are a coordination among government, industry and academia to further resolve the "quality of life" issue of aircraft noise. Additionally, Mr. Whitehead reiterated Mr. Erickson's statement. That to date all major milestones of the AST program have been achieved and there is every reason to believe that this progress will continue. Mr. Whitehead concluded by stating that a major pillar of NASA's future vision is to reduce perceived future aircraft noise levels by a factor of four within twenty years.

Dr. Wesley Harris, testifying as Professor of Aeronautics and Astronautics, Massachusetts Institute of Technology, welcomed this opportunity to evaluate the progress of FAA and NASA programs to reduce aircraft noise. Dr. Harris commended NASA and FAA for their successful efforts thus far in this area. Specifically, he cited them for their acoustic nacelle design technology, their modified fan technology, their integrated jet engine design and their reduced noise and fuel efficient ducted and unducted propulsors. He also recognized NASA and FAA for the steady progress of the AST program. Dr. Harris also highlighted areas in which these two agencies need to improve. He stated that FAA and NASA should: greatly increase their R&D budget allocations related to aviation noise reduction; FAA should be the primary interface with end users,

and NASA should develop and validate negative environmental impact reduction technology, and; cooperatively develop an aviation driven environmental impact technology roadmap beyond the year 2001.

Mr. Donald W. MacGlashan, Member, Citizens for the Abatement of Aircraft Noise, Inc., commended the Subcommittee for holding this hearing. Mr. MacGlashan used Washington, DC as an example in highlighting the widespread problem of aircraft noise, but also stated that DC is not unique. This problem occurs in nearly every major airport around the country. Mr. MacGlashan stated that the current metric for determining aircraft noise (65 dB) is averaged over the course of a 24 hour period and therefore, does not take into account the single noise event which is what can be detrimental to the health and welfare of many living near airports. He also indicated that another source of aviation noise which is detrimental is helicopter noise. Currently, there are no noise standards for helicopters. Mr. MacGlashan's organization, he stated, has no faith that the FAA can resolve the problem as their primary mission is to promote the aviation industry. Mr. MacGlashan conclude by stating that aircraft noise is a much more serious and complex problem with far more health consequences than previously recognized. He pointed out that the health of people should always come first.

Mr. Robert E. Robeson, testifying as Vice President, Civil Aviation, Aerospace Industries Association, stated that AIA fully supports the combined efforts of NASA and the FAA in addressing this important issue. Mr. Robeson cautioned that the application of technologies is a long term process and the Congress should not jump to conclusions to establish premature or inappropriate regulations. The ultimate answers in minimizing environmental impacts of aviation will come from the governments' and the manufacturers' investments in advancing technologies. Mr. Robeson also emphasized the importance of an international standard for reducing aircraft noise and AIA supports the development of an international consensus on aircraft noise through the U.N. International Civil Aviation Organization. Mr. Robeson concluded by emphasizing a three-legged approach to aircraft noise reduction: technical goals, land use planning and operational procedures. The combination of these three will help augment the long term goals in aircraft noise reduction.

*4.5(s)—Do You Know Who You Are Doing Business With?  
Signatures in a Digital Age*

*October 28, 1997*

*Hearing Volume No. 105-25*

*Background*

On October 28, 1997, the Subcommittee on Technology held a hearing entitled, "Do You Know Who You Are Doing Business With? Signatures in a Digital Age." The hearing explored the impact of domestic and international regulations on the development of standards for digital signatures on electronic commerce; allowed Members of the Committee as well as the public to learn about the

varying concerns of those who create, those who verify, and those who use digital signatures; and allowed for a discussion of the different standards being set in the United States and abroad.

Efforts are underway both in the United States and internationally to bring interested parties to the table to discuss voluntary standards. A committee of the American Bar Association designed a comprehensive model law to deal with all the new legal issues arising from digital signatures. Simultaneously, the state of Utah enacted a variant of the ABA draft. Within the last three years, more than forty state legislatures have contemplated digital signature laws. Germany, Malaysia, and Italy already have their own laws, and many other countries are considering new regulations. Such conflicts make it difficult for Certification Authorities (CA's) to operate efficiently, which in turn will slow the development of electronic commerce.

Witnesses included: The Honorable Andrew J. Pincus, General Counsel, U.S. Department of Commerce, Washington, DC; Stewart Baker, Esq., Partner, Steptoe & Johnson, Washington, DC; Mr. D. James Bidzos, President and CEO, RSA Data Security, Redwood City, CA; Mr. Kenneth Lieberman, Senior Vice President, Corporate Risk Management, Visa U.S.A., Foster City, CA; Mr. Charles S. Walton, Jr., Chief Operations Officer, CertCo, New York, NY.

#### *Summary of hearing*

Mr. Andrew J. Pincus, testifying as General Counsel, U.S. Department of Commerce, suggested it is too early for the Federal Government to support a particular legislative approach. He encourages exploring the various approaches that others have taken so the government keeps from rushing into the issue resulting in poor and ineffective legislation. Mr. Pincus praised the possibilities of Internet/electronic commerce, but cautioned that uncertainty regarding authentication could hinder the expansion of this medium. Additionally, Mr. Pincus praised the Administration's "Framework for Global Electronic Commerce," which sets forth general principles to guide the Federal Government's relationship with electronic commerce. In conclusion, Mr. Pincus offered observations based on his initial information gathering efforts. First, it is unlikely that the market will settle on one universal authentication mechanism. Second, technologies and means for authentication are developing rapidly. To legislate unnecessarily would provide a disincentive to the continued growth of electronic commerce. Third, cross-border and multi-jurisdictional interoperability is crucial. The government must find a way to foster interoperability.

Mr. Stewart A. Baker, testifying as Partner, Steptoe & Johnson, expressed his belief that this issue will not just go away on its own. The Federal Government needs to show leadership in this area by engaging the conflicting rules and realizing that a top down policy may not be widely accepted. Mr. Baker indicated two ways digital signatures are being implemented today. First, low-grade certificates, which are liability free or offer a limited warranty are already in circulation. Second, some companies or groups of companies, have begun creating closed system certificates. These certificates are effectively a contract for their users. Additionally, he em-

phasized digital signatures need three things from the law: a keyholder who is identified and controls the key; a certifying authority, who vouches for public keys; and a relying party who decides upon certificate trust. He recommended the continued discussion of the issue to bring about solutions.

Mr. D. James Bidzos, testifying as President, RSA Data Security, expressed the misfortune that the subject of digital signature's became overshadowed by the on-going encryption debate. He stated that digital signatures have the potential for achieving very significant savings in government and corporate operations, as well as enabling the use of Internet as a trusted means of delivering goods and services. Mr. Bidzos cited six barriers to the effective use of digital signatures: Separate digital signatures policy debate from key recover debate; define the legal status of digital signatures; address the discriminatory federal standards environment; address incremental digital signature legislation at State level; address liability; the need for accreditation of certificate authorities. In conclusion, Mr. Bidzos emphasized his desire to work with the Committee in addressing the digital signatures issue.

Mr. Ken Lieberman, testifying as Senior Vice President for Corporate Risk Management, Visa USA, recommended that governments be on guard against premature or excessive regulations in the digital signature arena. Mr. Bidzos recommended the Committee play a significant role in this area by developing legislation that: allows and protects the use of digital signatures in situations where all the parties to the transaction are governed by their own agreements—so called private or closed systems; create a "safe harbor" for these private systems so that digital signature laws do not add undue burdens on these systems; and reduce the risk of inconsistent international treatment by promoting agreements with our major trading partners. Mr. Lieberman used the Secure Electronic Transaction (SET) protocol developed jointly by Visa and Mastercard as an example of a successful private system. SET has been endorsed by the financial industry and the payment card industry as the standard for payment transactions on the Internet. Mr. Lieberman concluded by emphasizing the importance of allowing existing regulatory structures to be leveraged to address the adoption of new technology by banking institutions in their private arrangements.

Mr. Charles S. Walton, Jr., testifying as Chief Operations Officer, CertCo, spoke of the many challenges that are to be faced in the transition to a virtual way of conducting business. Additionally, Mr. Walton made five recommendations for sound digital signature policy. First, let the market lead. Many entities have a vested interest in creating security infrastructure solutions. Supporting the private sectors development is an ideal way to ensure successful and secure development of this infrastructure. Second, look to existing trust institutions. The collective experience of these institutions should not be ignored. Legislative solutions should draw upon this experience and knowledge. Third, promote contractual based models by emphasizing the traditionally defined principles of contract formation. Fourth, support government pilot applications and standards. There is a clear need for the Federal Government to fi-

nance and enable, and not inhibit, pilot applications. Finally, provide forums for continued discussion.

*4.5(t)—The Global Dimensions of the Millennium Bug*

*November 4, 1997*

*Hearing Volume No. 105-34*

*Background*

On November 4, 1997, the Subcommittee on Technology held a hearing entitled, "The Global Dimensions of the Millennium Bug." The hearing was held to examine the global economic impact of the Year 2000 computer problem; the international implications of the problem on United States industry; and the steps that are being undertaken to correct the Year 2000 problem in other nations.

The Technology Subcommittee has been actively engaged in reviewing the Year 2000 computer problem. Through a series of oversight hearings and legislative initiatives, the Technology Subcommittee has raised awareness of the Year 2000 problem and pushed both the public and private sectors in the United States to act expeditiously to correct the problem in a timely manner.

There is concern, however, that in an increasingly global marketplace with a growing reliance on electronic commerce, the Federal Government and U.S. industry must play a stronger role in ensuring that their foreign counterparts are effectively addressing the Year 2000 computer problem. Unless the problem is corrected globally, international commerce could be dramatically affected. Ultimately, it may be of little consequence that Federal Government and U.S. industry are able to become fully Year 2000 computer compliant if inter-operability problems exist with their non-Year 2000 compliant global partners.

Witnesses included: His Excellency Ahmad Kamal, Chairman, United Nations Working Group on Informatics, New York, NY; Mr. Harris Miller, President, Information Technology Association of America, Arlington, VA; Mr. Richard M. Kearney, Principal, KPMG Peat Marwick, LLP, Partner-in-Charge, Global Year 2000 Practice, Boston, MA; Mr. James L. Cassell, Group Vice President, Director of Research, Gartner Group, Inc., Tampa, FL; Mr. Tony Keyes, President, The Y2K Investor, Sandy Spring, MD.

*Summary of hearing*

His Excellency Ahmad Kamal, testifying as Chairman, United Nations Working Group on Informatics, spoke to the role of the United Nations in addressing the international aspects of the Year 2000 problem. The United Nations has initiated a serious effort to remedy this problem in a satisfactory and cost effective manner. Ambassador Kamal, however, emphasized that the success of these efforts depends on the will of the Member States to focus on the ways and means to avert this crisis. Additionally, the United Nations has issued the following five point plan to address this problem: (1) Governments and international organizations should announce their commitment to solving the Year 2000 problem, thereby calling attention to its importance; (2) each government should allocate financial and human resources to fix the most essential

Year 2000 problems for their own governments; (3) each government should adjust government practices to ensure procurement of Year 2000 compliant systems; (4) each government should take appropriate action to make the non-governmental sector aware of the need to re-assess priorities to address the Year 2000 problem; and (5) each government should identify systems of national importance and ensure there are plans for them to be fixed on time. Ambassador Kamal concluded by expressing his willingness to work with others involved in remedying the Year 2000 problem.

Mr. Harris N. Miller, testifying as President, Information Technology Association of America, emphasized the importance of the U.S. Government playing a much larger international leadership role in resolving this problem. He stated that the U.S., as the world leader in information technology, appears blind to the global implications of this unprecedented situation. Mr. Miller professed concern that many leading international organizations are just starting their Year 2000 programs. The largest barrier to resolving the global aspect is that the Year 2000 problem is not viewed as a "presidential" size problem. As evidenced by the G-7 (now G-8) summit in which Ministers chose not to address the issue and have no plans to do so in the future. Mr. Miller urged the Committee and others in Congress to consider an international Year 2000 program. This program would become a top priority for compliance by major multinational organizations, beginning with the G-7 summit. He also suggested Congress undertake a study to explore the trade and trans-border implications of the present situation.

Mr. Richard M. Kearney, testifying as Partner in Charge, Global Year 2000 Consulting Practice, KPMG Peat Marwick, emphasized that the Year 2000 problem is the most pressing business issue of the day. This problem is an unprecedented challenge not only because it reaches around the globe, but more so because it affects everyone simultaneously. However, many companies and governments outside the U.S. are still unaware of the implications and immense problems that could arise if this issue is not addressed. Mr. Kearney further suggested ideas for action that could be taken by the Subcommittee on Technology to assist with resolving the international situation. First, sponsor a summit meeting of business leaders focusing on mitigating the risks surrounding cross border movement of information and money. Second, Mr. Kearney suggested opening a dialogue with other nations' Ministers of Finance and/or Treasuries to discuss Year 2000 issues. Third, encourage business regulators to communicate with their counterparts around the world to focus on Year 2000 compliance as a priority. Last, encourage Year 2000 discussions at diplomatic and economic forums throughout the world. Mr. Kearney concluded by emphasizing the importance of getting many more people involved in dealing with the issue.

Mr. James L. Cassell, testifying as Group Vice President and Director of Research, Gartner Group, focused his testimony on three areas of the Year 2000 crisis as it relates to international commerce and security. First, the state of readiness around the world. Gartner Group conducted three surveys of more than 1,100 companies worldwide. The results of these surveys, Mr. Cassell stated, were very disconcerting. According to the surveys, a significant

number of companies believe themselves to be well into their Year 2000 efforts. However, independent research by the Gartner Group indicates that this is not so. Mr. Cassell also emphasized the critical nature of many embedded non-IT systems. He stated that the Year 2000 crisis is likely to have a far greater impact on the global environment than first imagined due to the fact that many non-IT assets such as navigation equipment, cars and elevators have not been investigated as part of the Year 2000 project. In some cases failure may have far reaching business consequences. Finally, Mr. Cassell spoke of the risk to the Year 2000 projects worldwide from an inability to train and retain staff. Gartner Group research indicates that nearly 85% of the worlds enterprises will begin executing this IT project at the same time. This simultaneous work will drain an already insufficient pool of human resources. Additionally, enterprises with lower paid Year 2000 staff will see an exodus to higher paying companies. In conclusion, Mr. Cassell likened the Year 2000 crisis to a war. And noted that we have only two years to get to a point where we can sustain our security and international commerce.

Mr. Tony Keyes, President, Y2K Investor, Author, "The Year 2000 Computer Crisis, An Investors Survival Guide," stated that with less than 26 months until the beginning of the next millennium it is in the U.S.'s own best interest to demonstrate aggressive leadership on the Year 2000 problem. Mr. Keyes used as an example the recent break in the Hong Kong market, and the resulting worldwide stock drop, as an indicator of how tightly woven the fabric of our international commerce has become. The Year 2000 crisis, he implored, must be solved globally. He respectfully suggested the President of the United States appoint a U.S. Year 2000 czar, as well as forming an international panel which could: reach an agreement on interfacing standards, interoperability and schedule; work to ensure our global telecommunications network continues to operate without failure; ensure that our international maritime fleet continues to operate at full capacity; cooperate on converting international banking and finance networks; cooperate on utilization of human resources; and cooperate on implementation of Year 2000 firewalls.

*4.5(u)—The Role of Computer Security in Protecting U.S. Infrastructures*

*November 6, 1997*

*Hearing Volume No. 105-33*

*Background*

On November 6, 1997, the Subcommittee on Technology held a hearing entitled, "The Global Dimensions of the Millennium Bug." The hearing explored the appropriate role of government and of the private sector in securing the backbone of this country's information and telecommunications infrastructures.

The President's Commission on Critical Infrastructure Protection (PCCIP) was created on July 5, 1996 by Executive Order 13010. The stated reason for the order was the need to assure the uninterrupted operation of critical infrastructure. The President in that

Order stated "Certain national infrastructures are so vital that their incapacity or destruction would have a debilitating impact on the defense or economic security of the United States."

The purpose of the panel was to identify and coordinate existing expertise, inside and out of the Federal Government to look at the infrastructures of telecommunications, electrical power systems, gas and oil storage and transportation, banking and finance, transportation, water supply systems, emergency services (including medical, police, fire and rescue), and government operations. The Executive Order stated that threats to these critical infrastructures fall into two categories: physical threats or computer-based attacks on the information or communications components that control critical infrastructures ("cyber threats").

Since most of the critical infrastructures are privately owned, the Executive Order emphasized the need for close cooperation between the government and the private sector. The Commission was chaired by Robert Marsh (appointed by the President) and had representatives from both the government and the private sector.

Witnesses included: Mr. Robert T. Marsh, Chairman, President's Commission on Critical Infrastructure Protection, Washington, DC; Russell B. Stevenson, Jr., Esq., Mr. Stephen R. Katz, Chief Information Security Officer, Citibank, New York, NY; Mr. Glenn Davidson, Executive Vice President, Computer & Communication Industry Association, Washington, DC; Dr. Peter G. Neumann, Principal Scientist, Computer Science Laboratory, SRI International, Menlo Park, CA.

#### *Summary of hearing*

Mr. Robert T. Marsh, testifying as Chairman, President's Commission on Critical Infrastructure Protection (PCCIP), discussed the work, outline, principal findings and recommendations contained in their report to the President, "Critical Foundations." Mr. Marsh stated that the Commission was charged with developing a national policy and implementation strategy for protecting critical U.S. infrastructures from physical and cyber threats. The latter being of critical importance as Mr. Marsh stated, "While we have long understood the physical threat, the fast pace of technology poses us with a continually evolving cyber threat." The Commission's guiding principles recognized that most of the infrastructures operate within an existing framework of government policy and regulation, but they are also privately owned competitive enterprises. Key findings of the Commission, Mr. Marsh testified, included: the importance of information sharing, shared responsibility among owners, operators and the government, a focal point for infrastructures protection, a need to adapt to a changing culture, the important role to be played by the Federal Government, and the necessity for the legal system to better deal with technology law. Mr. Marsh concluded by emphasizing the fundamental conclusion of the Commission, "Waiting for a disaster is a dangerous strategy. Now is the time to act to protect our future."

Mr. Stephen R. Katz, testifying as Chief Information Security Officer, Citibank, welcomed this opportunity to share Citibank's views on the appropriate role of the government and the private sector in securing the country's information and telecommunications in-

frastructure. Mr. Katz's remarks focused on four principles: the framework of information security; the state of information security in the banking sector; vulnerabilities, risks and risk assessment, and; recommendations on the government and private sector's role. Mr. Katz further stated that in the coming years a virtual explosion of Internet based commerce will occur. To accommodate this mass migration security and confidentiality of information transmitted between banks and their customers must be facilitated. Furthermore, a lack of security will significantly impede this process. Mr. Katz concluded by emphasizing that another effort needs to be aimed at business and government to help them understand their information security risks and responsibilities in addressing those risks.

Mr. Glenn K. Davidson, testifying as Executive Vice President, Computer and Communications Industry Association, testified that while CCIA agrees that there is a need to guard against any attacks capable of disabling the nation's first rate infrastructure, it needs to be addressed at a slower more reasoned pace. Mr. Davidson expressed concern with the Commission's report being classified. He stated that the Commission must come forward with its threat assessment so it may be discussed, debated and understood by the public. Mr. Davidson also expressed concern with the cost burden and who will bear the cost of updating our nation's infrastructures. He believes, based on statements by the Commission, that these costs will ultimately fall to business. This would place an excessive financial burden that would blunt the competitive edge of American industry. Mr. Davidson concluded by emphasizing that it is possible to protect the complex infrastructures in the U.S. without imposing debilitating strictures on American corporations.

Dr. Peter G. Neumann, testifying as Principal Scientist, Computer Science Laboratory, SRI International, commended the Commission for their recognition that all of the critical infrastructures are closely interdependent and they all depend on an underlying computer communication information infrastructure. Dr. Neumann emphasized that his job, as well as that of others scientists' in the R&D community, is to: find ways to avoid many of the risks our current infrastructures possess; minimize the consequences of the exploitation or accidental triggering of those that cannot be avoided; and to provide well founded assurances that systems and networks are likely to be able to satisfy their critical requirements. He also commended the Commission for their massive undertaking in putting together this report. However, Dr. Neumann also states that the Commission has identified only the tip of a very large iceberg, and there is much more work to be done. He was also concerned that the Commission had largely ducked the issue of cryptography. The Commission recommended, he feels, the adoption of key recovery techniques without having analyzed the risks and other implications. Dr. Neumann concluded by stating that there is an enormous need for open discussions of these issues and commended the Subcommittee for continuing the dialogue.

Mr. Russell B. Stevenson, testifying as General Counsel, CyberCash, Inc., suggested that in considering to take on the recommendations of the Commission, Congress should limit the role of government to: research and education aimed at enabling private

actors to protect their interests more effectively; and identifying and addressing those weaknesses in the electronic infrastructure as a whole that cannot be effectively dealt with by the efforts of the private sector. He also spoke of the need for Congress to move slowly in adopting regulatory measures and stay keenly aware of the law of unintended consequences in formulating policy. He suggests allowing market forces to move first with the government limiting its actions to areas where it can clearly produce a better outcome than the private sector. Mr. Stevenson concluded by suggesting Congress should pay particular attention to the importance of encryption to security and not expose the electronic infrastructure to attacks by terrorists and criminals.

*4.5(v)—FAA at Risk: Year 2000 Impact on the Air Traffic Control System (Joint hearing with Subcommittee on Government Management, Information and Technology, Committee on Government Reform and Oversight)*

*February 4, 1998*

*Hearing Volume No. 105–49*

*Background*

On February 4, 1997, the Subcommittee on Technology held a joint hearing with the Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight entitled, “FAA at Risk: Year 2000 Impact on the Air Traffic Control System.”

The hearing examined several issues related to the risks of, and consequences for, organizations that do not effectively address the century date problem. Technology forms an amazingly intricate web not only within large organizations like the Federal Government, but between organizations and individuals around the globe. A tremendous number of our social, governmental, and commercial relationships depend on this web. The failure of any of these systems, therefore, will not be isolated. The risks and consequences are of immediate and overwhelming concern to everyone, including the Federal Government.

Witnesses included: The Honorable Jane Garvey, Administrator, Federal Aviation Administration; The Honorable Kenneth Mead, Inspector General, U.S. Department of Transportation; Mr. Stanley Graham, Senior Management Consultant, Tech-Beamers, Inc.; Mr. Joel Willemsen, Director, Civil Agencies Information Systems, U.S. General Accounting Office

*Summary of hearing*

The Honorable Jane F. Garvey, Administrator, Federal Aviation Administration testified to the status of the FAA efforts in addressing the mission-critical systems in the National Airspace System (NAS), and the agencies overall Y2K effort. Administrator Garvey stated that the FAA had set up a “war room” staffed with technical experts from across the country to tackle its Y2K problem, and that as of January 31, 1998, 125 of its 209 mission-critical systems in the NAS had been certified as Y2K compliant. She went on to discuss the Y2K effort for the rest of the FAA, where the assessments

for 216 of the 221 mission-critical systems had been completed. To head up the agency wide effort, Director Garvey stated that she had appointed Ray Long as the FAA Y2K program manager. In conclusion, she made it clear that all FAA executives understood their obligation to the flying public, and that she had the utmost confidence in the agency's ability to overcome this problem.

The Honorable Kenneth Mead, Inspector General, U.S. Department of Transportation testified that the FAA got a very late start on fixing Y2K computer problems and is behind schedule on assessing which of its systems have Y2K problems. Mr. Mead identified actions the FAA must take to effectively solve its Y2K problem. They include the need to (1) take prompt action to make necessary fixes, (2) expeditiously appoint a person with strong technical and leadership abilities to manage the Y2K effort, (3) make a prompt decision on the Host computer fixes, (4) develop a suitable contingency plan for the Host computer, (5) have an independent review of plans to fix and certify the existing Host computer, (6) develop a master schedule for fixing and testing all mission-critical systems, (7) promptly identify and secure resources needed to get the job done, and (8) report monthly to the Secretary and Congress on the progress made toward fixing the Y2K problems. In conclusion, Mr. Mead stated that funding requirements must be determined by FAA, and urged that FAA move up the implementation date to have all systems Y2K compliant, tested, and operational no later than June 1999.

Mr. Stanley Graham, Senior Management Consultant Tech-Beamers, Inc. testified that the FAA would not be able to meet its Y2K deadlines. Mr. Graham agreed with the GAO that the problem at the FAA is a project management one with technical complications. Furthermore, he stated that the FAA does not have an objective methodology for planning and tracking its Y2K project schedules. Using Beta Curves to evaluate the schedule performance of large software projects, Mr. Graham estimated that the FAA would miss their schedule by anywhere from 7 months to 9 ½ years. Furthermore, in order to reduce the risk to the integrity of the FAA flight control system Mr. Graham suggested the establishment of a pilot project on a cluster of "Year 2000 Time Machines." He believes that this proposal could be an inexpensive and practical short term fix for the FAA Y2K problem, because it would allow them to maintain their vital services.

Mr. Joel Willemsen, Director, Civil Agencies Information Systems Accounting and Information Management Division testified that FAA's progress in making its systems ready for the year 2000 has been too slow, and that its current pace, it will not make it in time. Mr. Willemsen also stated that the FAA does not know the extent of its Y2K problem because it has not yet completed its assessments. These delays leave the FAA little time for critical renovation, validation, and implementation activities. Mr. Willemsen recommends that urgent action is imperative to improve the management effectiveness of FAA's Y2K program. He suggests that the FAA Administrator should: (1) finalize an agency wide plan which provides the Y2K program manager the authority to enforce Year 2000 policies; (2) assess how its major business lines and aviation industry would be affected if the Y2K problem were not corrected

in time, and use these results to help rank the agency's Y2K activities; (3) complete inventories of all information systems by January 30, 1998; (4) finish assessments of all systems to determine each one's criticality by January 30, 1998; (5) determine priorities for system conversion and replacement; (6) establish plans for addressing identified date dependencies; (7) develop validation and test plans for all converted or replaced systems; (8) craft Y2K contingency plans; and (9) finally make a reliable cost estimate.

*4.5(w)—Review of the Fiscal Year 1999 Administration Request for the Technology Administration and the National Institute of Standards and Technology*

*February 26, 1998*

*Hearing Volume No. 105–45*

*Background*

On February 26, 1998, the Subcommittee on Technology held an oversight hearing entitled, "Review of the Fiscal Year 1999 Administration Request for the Technology Administration and the National Institute of Standards and Technology," to review the Administration's funding request for fiscal year 1999 for the Technology Administration (TA) and the National Institute of Standards and Technology (NIST).

Witnesses included: The Honorable Gary Bachula, Acting Undersecretary for Technology, U.S. Department of Commerce; The Honorable Raymond Kammer, Director, National Institute of Standards and Technology; The Honorable Johnnie E. Frazier, Acting Inspector General, U.S. Department of Commerce; The Honorable Susan Kladiva, Associate Director, Energy, Resources and Science Issues, U.S. General Accounting Office.

*Summary of hearing*

The Honorable Gary Bachula, Acting Undersecretary for Technology, Technology Administration, U.S. Department of Commerce testified that all of the policies, programs, and other activities of the Technology Administration are united under a single theme: technology is the engine of economic growth. Of the drivers of growth, technology is the single most important determinant. He recognized the pivotal role that federal investments in science and technology have played in securing global leadership in key industries, such as in agriculture, computing, communications, aerospace, pharmaceuticals, and biotechnology and, in turn, the economic growth and high wage jobs that these investments have produced for the United States. Additionally, Acting Undersecretary Bachula highlighted the Research Fund for America, the centerpiece of the Administrations research and development budget, which supports civilian research investments such as: biomedical research, space science, energy research, climate change research and technology, and university-based research.

The Honorable Raymond Kammer, Director, National Institute of Standards and Technology testified that he sees five challenges for NIST in the coming millennium: Ensuring world leadership by NIST's Measurement and Standards Laboratories; ensuring that

measurement capabilities and standards are in place to support full U.S. participation in global markets; building greater consensus on the value of the Advanced Technology Programs (ATP); expanding access to Manufacturing Extension Partnership (MEP) services for more small and medium-sized companies and continuing federal support for MEP centers after their sixth year; and promoting performance excellence in healthcare and education, particularly among non-profit organizations, through the Baldrige National Quality Program. He further testified that the Administrations' fiscal year 1999 budget request for NIST of \$715 million reflects its approach to those challenges. Each of these areas is linked closely with the Commerce Department's and NIST's strategic and performance plans, and NIST has worked hard on meaningful evaluation metrics to chart progress in meeting these challenges.

The Honorable Johnnie Frazier, Acting Inspector General, U.S. Department of Commerce testified that his appearance at the hearing was to discuss some of the Office of Inspector General's recent audit and inspection work at the National Institute of Standards and Technology (NIST) and the National Technical Information Service (NTIS), two of the agencies that constitute the Department of Commerce's Technology Administration. With regard to NIST, Acting Inspector General Frazier highlighted some areas of concern. He recommended that NIST work with the Department of Commerce, OMB, and the Congress to find a funding strategy that would allow for unified construction of the Advanced Metrology Laboratory, a primary source of concern within NIST's Capital Facilities Improvement Program (CIFP). In addition, he emphasized to NIST and the Department the importance of having the most accurate, defensible, and fiscally responsible CIFP possible. He indicated that NIST generally agreed with these conclusions and that they should reevaluate their facilities needs and revise their plan. Regarding NTIS, Acting Inspector General Frazier expressed concerns that the agency was undertaking activities based on a very broad interpretation of its mission and authority. He expressed his concern about NTIS's lack of a clearly defined mission and its ability to generate sufficient revenues to remain financially self-supporting. For these reasons, he recommended that the Department put any legislation on hold until an appropriate mission for the agency has been clearly defined.

The Honorable Susan Kladiva, Associate Director, Energy Resources and Science Issues, U.S. General Accounting Office discussed the ATP, which is administered by the NIST within the Department of Commerce. ATP is a competitive, cost-sharing program designed for the Federal Government to work in partnership with industry to foster the development and broad dissemination of challenging, high-risk technologies that offer the potential for significant, broad-based economic benefits for the nation. She indicated that ATP funding reached its highest level in 1995, but has since declined due to a more stringent application requirement process. The current Administration request of \$269 million reflects this effort. Associate Director Kladiva further indicated that program review, or peer review, would allow the program to operate in a much more efficient manner.

*4.5(x)—Review of H.R. 3007, The Advancement of Women in Science, Engineering, and Technology Development Act (Joint Hearing with the Subcommittee on Basic Research)*

*March 10, 1998*

*Hearing Volume No. 105–53*

*Background*

On March 10, 1998, The Subcommittees on the Technology and Basic Research held a joint hearing on “A Review of H.R. 3007, The Advancement of Women in Science, Engineering, and Technology Development Act.”

Witnesses included: Ms. Belkis Leong-Hong, President-elect, Women in Technology (WIT); Ms. Catherine Didion, Executive Director, Association for Women in Science; Monica Moman-Saunders, Louisville Gas and Electric Company, representing the American Society of Mechanical Engineers; and Professor Ann M. Quade, Department of Computer Science, Mankato State University.

*Summary of hearing*

Ms. Belkis Leong-Hong, testifying as President-elect, Women in Technology, Fairfax, Virginia, emphasized the need to provide young women the support necessary to pursue an education and career in science, engineering, and technology development. As an example of the lack of encouragement for young women to excel in these areas, she stated that nearly one-third of all girls in our high schools report that they were advised away from taking advanced mathematics courses. To overcome the lack of support for young women in all areas of science, the need exists for a systematic mentoring process. Women in Technology (WIT) has addressed this problem by establishing a formal mentoring program in the Washington, D.C. metropolitan area.

Ms. Catherine Didion, testifying as Executive Director, Association for Women in Science, stated that there needs to be a major change in the way society portrays women in science, engineering, and technology development. In particular, she stated that many young women have a difficult time reconciling the perceived incongruity between being a woman and being a scientist. She stated that in a recent study by the National Science Teachers Association, 99 percent of the boys and nearly 90 percent of the girls who were asked to draw a picture of a scientist drew a white male scientist. To reinforce this point, she recalled the account of one female scientist who was advised not to wear fingernail polish or makeup if she hoped to be taken seriously. After informally polling the 76 AWIS chapters and asking what was the most compelling issue facing women in science, Ms. Didion said she received numerous answers but that almost all of them contained two important recommendations. First, that there is a need to promote an effective mentoring system with adequate reward structures for women in science. In addition, flexibility in the workforce is a key contributor to whether women succeed in careers in science. She said many

women fear it is unrealistic to both pursue a career in science and also maintain a solid family structure.

Professor Ann Quade, testifying as Associate Professor, Department of Computer Science, Mankato State University, expressed her concern about the decline in the number of women pursuing degrees in computer sciences. She cited data indicating a 50% decrease in the number of women pursuing a computer science degree between the years 1986 and 1994. Professor Quade referenced other previously male dominated fields where women have made progress such as medicine, law, and business, and said that the same skills necessary to succeed in these areas are essentially the same skills necessary to succeed in computer sciences. She stated that in her experience as an educator, many young women did not have an adequate understanding of what was involved in the computer science field. She indicated that those involved in the profession had not done a very good job of explaining what they do for a living and potential job opportunities for computer science graduates. She supported the idea of a strong mentoring system to achieve this goal.

Ms. Monica Moman-Saunders, testifying on behalf of the American Society of Mechanical Engineers, cited a number of statistics which indicate that women are making progress in the areas of science, engineering, and technology development. However, she also indicated that not enough was being done to recruit, retain, and advance women in these areas. Ms. Moman-Saunders emphasized the need for the Commission established by H.R. 3007 to draw upon the resources of other groups and coordinate its efforts with those that are ongoing in order to keep duplicative research from occurring. ASME, for example, recently completed a similar study aimed at determining whether real or perceived barriers exist that inhibit the participation of women and minorities in their societies. This information should be shared and incorporated within the Commission's study. Ms. Moman-Saunders, echoed the statements of the other witnesses that mentoring programs are critically important in not only recruitment of women in science, engineering, and technology, but also their retention of women. In conclusion, Ms. Moman-Saunders stated that women constitute nearly half of the Nation's labor force; thus, it is crucial to the Nation's economy that the under-representation of women in science, engineering and technology be rectified.

*4.5(y)—Review of the Federal Aviation Administration's Fiscal Year 1999 Research and Development Budget Request, Including the Flight 2000 Program*

*March 12, 1998*

*Hearing Volume No. 105-47*

#### *Background*

On March 12, 1998, the Subcommittee on Technology held a hearing entitled, "Review of the Federal Aviation Administration's Fiscal Year 1999 Research and Development Budget Request, Including the Flight 2000 Program."

The Science Committee authorizes appropriations and provides program guidance for activities under FAA's Research, Engineering and Development account. The Science Committee's FY1999 authorization for the account was signed into law on February 11, 1998 as P.L. 105-155. The legislation authorizes \$229.6 million for the FAA to conduct RE&D projects and activities in FY1999. However, the legislation does not include authorization of the Flight 2000 demonstration program as requested in the FY1999 budget request.

The \$90 million in FY99 for the Flight 2000 demonstration program is intended for the FAA to accelerate the implementation of Free Flight concepts and harmonize the global air transportation system, providing increased safety for the flying public and efficiency benefits for system users.

Witnesses included: Mr. Dennis DeGaetano, Deputy Associate Administrator for Research and Acquisitions, Federal Aviation Administration; Dr. John Fearnside, Director, Center for Advanced Aviation System Development and Facilitator, National Airspace Modernization Task Force; Mr. Jack Ryan, Vice President, Air Traffic Management, Air Transportation Association of America; Mr. Ralph Eschenbach, Chairman, FAA RE&D Advisory Committee; and Mr. Mike McNally, President, National Air Traffic Controllers Association.

#### *Summary of hearing*

Mr. Dennis DeGaetano, Deputy Associate Administrator for Research and Acquisitions, Federal Aviation Administration (FAA) testified that the FAA has a solid research program covering a variety of critical areas—from explosive/weapons detection, to weather, aircraft structures, noise mitigation and satellite navigation. Their fiscal year 1999 RE&D budget request of \$290 million allows them to build on the previous successes of the Agency in these areas, and continue the critical research to support the national airspace system for the next century. Mr. DeGaetano testified at length about the FAA's Flight 2000 program which accounts for nearly the entire increase in their funding request. Mr. DeGaetano indicated that the modernization of the National Airspace System (NAS) will be demonstrated through the Flight 2000 program which is based on the premise that, with new technologies and innovative procedures, FAA can remove many of the restrictions of today's air traffic control system, and make the system more flexible for users. Flight 2000 will provide a limited, real-world, operational evaluation of the procedures, technologies, and human factors involved in Free Flight. Mr. DeGaetano indicated that the potential benefits of Free Flight, which include fuel and time savings and a more efficient use of airspace, are a necessary step in streamlining the efficiency of air travel through the next millennium.

Dr. John Fearnside, testifying as Facilitator, National Airspace Modernization Task Force, spoke to the challenge presented to the FAA by the White House Commission on Aviation Safety and Security that they accelerate their modernization program to achieve full operational capability by the year 2005. To address this challenge Administrator Garvey met with a group of senior representa-

tives from the FAA and the aviation community to discuss the FAA's plans for modernization of the NAS. Members of this Task Force included representatives from all sectors of the aviation community and was tasked with reviewing the current FAA draft modernization architecture plan. Dr. Fearnside indicated that a very important concern of many in the aviation community, including the Science Committee, is the problem of moving research and development from the laboratory into the field. Part of what has stymied modernization efforts thus far has been attempting to do too much at one time. The revised approach in the modernization framework will help address many of the difficulties the FAA has encountered in the past.

Mr. Jack Ryan, Vice President, Air Traffic Management, Air Transportation Association of America, testified that the Air Transportation Association of America (ATAA) is excited about Administrator Garvey's initiative to pursue a NAS modernization program that will provide the airspace users with proven technologies and systems capable of meeting immediate operational requirements without compromising safety. Further, ATAA strongly believes that several of the systems contained in the NAS modernization plan will enhance overall system safety and efficiencies. The reason these systems have matured to the point to where they are capable of enhancing overall system safety and efficiencies is because the Science Committee has wisely supported previous FAA R&D budgets. Mr. Ryan further spoke of the ATAA's member airline primary concern with the GPS and the ability of that system to provide safety critical sole-means services. ATAA feels that exclusive reliance on GPS and its augmentations, combined with other complex interdependencies raises the potential for single—point failure and cascading effects and should be addressed as part of the modernization plan.

Mr. Ralph Eschenbach, Chairman, Federal Aviation Administration, Research, Engineering and Development Advisory Committee testified that during the last several years, the RE&D Advisory Committee has been reviewing the FAA RE&D program through the work of six standing subcommittees. Mr. Eschenbach testified exclusively, due to time constraints, to the issue of the FAA's Flight 2000 program. He indicated that the FAA RE&D Advisory Committee strongly endorses the basic concept and structure of Flight 2000. However, they believe that more emphasis should be given to testing these technologies in the high-density airspace environment in which air traffic control performance is most critical and most in need of improvement. Mr. Eschenbach also noted that the FAA RE&D recommendation is consistent with subsequent recommendations regarding Flight 2000 made by the FAA Administrator's Task Force on NAS Modernization. Lastly, Mr. Eschenbach stated the 6 recommendations made by the FAA RE&D Advisory Committee to the FAA. Those recommendations are: Give greater priority to the critical issues of increasing capacity, reducing delay, and improving safety, with emphasis on total system integration; develop a Flight 2000 Baseline Plan that clearly identifies goals and objectives that are structured to support the 2005 Operational Concept and Free Flight Action Plan, in the context of the NAS Architecture; include mechanisms in the Program Plan to quantify

the anticipated benefits of Flight 2000 technologies; increase the priority for deploying ground systems which transmit weather information to the cockpit; encourage the development of affordable avionics for the display in the cockpit of traffic, weather, and hazardous terrain; and ensure that funding needed for Flight 2000 is not at the expense of the current FAA RE&D efforts.

Mr. Mike McNally, President, National Air Traffic Controllers Association testified that the National Air Traffic Controllers Association (NATCA) does support, in concept, the effort to modernize the NAS for the next millennium. However, NATCA believes it should be taken one step at a time and that all proposals for new technology, additional controllers, appropriate training and procedural changes must be fully debated by all parties before being adopted. Mr. McNally cautioned that each phase will require a transition period and hasty changes are not acceptable. Done carefully, Flight 2000—a transition to a mature air traffic system with greater flexibility—will become a reality. Mr. McNally concluded by saying that NATCA is, as has been for many years, concerned about the impact if new technology air traffic controller staffing. He believes that without careful integration of new technologies, two systems would have to be operated, calling for shadow mode operations and redundancy.

*4.5(z)—Facilitating Licenses to Federally-Owned Inventions: A Legislative Hearing on H.R. 2544, Technology Transfer Commercialization Act*

*March 17, 1998*

*Hearing Volume No. 105-42*

*Background*

On March 17, 1998, the Subcommittee on Technology held a hearing on “Facilitating Licenses to Federally-Owned Inventions: A Legislative Hearing on H.R. 2544, Technology Transfer Commercialization Act.” The hearing was held to review H.R. 2544, the Technology Transfer Commercialization Act of 1997, which seeks to promote technology transfer by facilitating licenses to Federally-owned inventions.

Witnesses included: The Honorable Ray Kammer, Director, National Institute of Standards and Technology, Gaithersburg, MD; Mr. Randolph J. Guschl, Director of Technology Acquisitions, Central Research and Development, DuPont Chemical Company, Wilmington, DE; Ms. Elizabeth Kraftician, Chief Executive Officer, Touchstone Research Laboratory, Tridelfphia, WV.

*Summary of hearing*

The Honorable Ray Kammer, testifying as Director, National Institute of Standards and Technology told of the development of a newly reconstituted Interagency Committee on Technology Transfer and the consensus support of this Committee for H.R. 2544. Specifically, Mr. Kammer emphasized paying closer attention to the output side of R&D spending. While a greater pecuniary commitment to R&D spending is laudable, the end result is equally important. Those end results making their way to the marketplace

are equally important, as they can have important societal benefits. He also spoke of the Interagency Committee's concern about specific aspects of the legislation. For example, licensing as part of a pre-existing CRADA, and eliminating current requirements for licensees to submit development or marketing plans. Mr. Kammer emphasized the importance of utilizing those plans as an objective basis for deciding whether the proposer is likely to quickly bring the innovation to market. "Bundling" innovations is also not addressed in the legislation and Mr. Kammer spoke of the improved ability to streamline and allow licensees to derive maximum commercial benefit from inventions by "bundling" similar innovations together. In conclusion, he indicated that industry and the government are still leaning how to better work together in commercializing the American people's investment in R&D.

Mr. Randolph J. Guschl, testifying as Director, Technology Acquisitions, Central Research and Development, DuPont, Wilmington, DE, expressed support for the legislation and highlighted the fact that H.R. 2544 puts the discoveries of government-owned, government-operated (GO-GO) laboratories on terms equal to those of government-owned, contractor operated (GO-CO) laboratories. However, Mr. Guschl indicated he had a couple ideas regarding the legislation. First, revise the wording regarding U.S. manufacture. Better language would require earliest possible deployment of technologies in the U.S., but not require it to be substantially manufactured in the U.S. This would allow the U.S. businesses to compete globally, thereby strengthening the U.S. portions of the companies. Second, keep the exclusivity recognition portion of the law. This provision has been used in GO-CO labs and should also be used in GO-GO labs. Third, keep the shift from 90 + 60 day notification process to a 30 day notification process. Fourth, retain requiring submission of a business and marketing plans. This allows agency to determine the commitment of prospective licensee. Lastly, consider empowering the technology transfer directors to make quick and final decisions for their labs, but also allow there to be a quick appeals process. In conclusion, Mr. Guschl suggested support for the legislation and commended its improvement of the technology transfer process.

Ms. Elizabeth Kraftician, Chief Executive Officer, Touchstone Research Laboratory, offered her strong support for H.R. 2544. Ms. Kraftician believes this legislation will have a significant impact in moving federal technologies to the marketplace. Additionally, Ms. Kraftician expressed support for this legislation as a way to benefit small businesses in this technology transfer process. Small businesses have traditionally been locked out of the technology transfer arena by the slow, cumbersome, bureaucratic and oftentimes anti-small business process by which the Federal Government has traditionally transferred technology to the marketplace. Ms. Kraftician applauded H.R. 2544's leveling of the notification playing field by allowing advertisement in an appropriate place which gives the Federal laboratory greater flexibility, so that small business need not rely exclusively on the Federal Register. In conclusion, Ms. Kraftician emphasized that in order for this legislation to work, public institutions must be held accountable for how they wield the

authorities they are given and they must be willing to make decisions and take risks.

*4.5(aa)—Year 2000 (Joint hearing with Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight)*

*March 18, 1998*

*Hearing Volume No. 105–55*

*Background*

On March 18, 1998, the Subcommittee on Technology held a joint hearing with the Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight entitled, “Year 2000,” to discuss Government Wide Year 2000 issues as well as the status of the Department of Treasury’s progress with regard to financial services.

The hearing was the first Congressional appearance by Mr. John Koskinen, who began his official duties on March 9, 1998 as the Chairman of the Presidentially-created Year 2000 Conversion Council. This was the first opportunity for Mr. Koskinen to reveal the plans and strategy of the Year 2000 Conversion Council. The recently completed GAO government-wide study of Year 2000 issues and its accompanying recommendations for government-wide solutions were also discussed at the hearing.

In addition to Mr. Koskinen’s appearance, the hearing examined the Department of Treasury. In all, Treasury has 327 mission-critical systems. As of February 15, 1998, only 22% of these mission-critical systems were finished. At its current rate of progress, Treasury will finish only 38% more of its mission-critical systems before the deadline. That will leave 130 mission-critical systems at risk of failure on January 1, 2000. This is unacceptable for any federal department and especially for Treasury, which plays such a critical role in federal finance. Within Treasury, the hearing included a detailed examination of the Internal Revenue Service (IRS) and the Financial Management Service (FMS).

Witnesses included: Mr. John Koskinen, Chairman President’s Council on the Year 2000 Conversion, Mr. Gene Dodaro, Assistant Comptroller General, U.S. General Accounting Office, Michael P. Harden Ph.D., President, Century Technology Service, Inc., Ms. Constance E. Craig, Assistant Commissioner, Information Resources, Financial Management Services, U.S. Department of the Treasury, Mr. Jim Flyzik, Acting Chief Information Officer, U.S. Department of the Treasury, Mr. Arthur A. Gross, Associate Commissioner for Modernization and Chief Information Officer, Internal Revenue Service, Dennis Schindel, Deputy Assistant Inspector General for Audit, Department of the Treasury.

*Summary of hearing*

Mr. John Koskinen, Chairman of the President’s Council on the Year 2000 Conversion, testified as to the nature of the President’s Year 2000 Council. Mr. Koskinen sees the Council on the Year 2000 conversion as a catalyst that will ensure that individuals in the public and private sectors are aware of the problem and doing

all they can to fix it. Additionally, he sees the Council as a facilitator and coordinator that will promote the fruitful exchange of ideas and ensure that resources are being used effectively.

Gene L. Dodaro, Assistant Comptroller General, U.S. General Accounting Office testified that while some progress has been made in addressing the Federal Government's Year 2000 readiness, serious vulnerabilities remain. Many agencies are behind schedule, and at the current pace it is clear that not all mission critical systems will be fixed in time. Much more action is needed to ensure that federal agencies satisfactorily mitigate Y2K risks to avoid debilitating consequences. Vital economic sectors of the nation are also vulnerable. These include state and local governments; telecommunications; banking and finance; health, safety, and emergency services; transportation; utilities; and manufacturing and small business. Mr. Dodaro stated that many organizational and managerial models exist that the Conversion Council could use to build effective partnerships to solve the nation's Y2K problem. Furthermore, due to the urgency of the situation one viable alternative would be to consider using the sector-based approach recommended by the President's Commission on Critical Infrastructure Protection. Mr. Dodaro concluded by stating that continued Congressional oversight through hearings in both the House and the Senate could help ensure that the Y2K problem is given the appropriate amount of attention.

Michael P. Harden, Ph.D., President and Chief Executive Officer of Century Technology Services, INC., testified to the possible inability of the Federal Government to provide, acquire, or maintain sufficient programming resources to tackle the Y2K Problem in the short time remaining before January 1, 2000. Dr. Harden stated that since there simply aren't enough programmers available to fix every system affected by Y2K, the law of supply and demand takes over. Programmers are now able to consistently demand salaries in the six figure range. As we get closer to the millennium demand for their services will increase even more. The result will be that by not applying sufficient resources today far more will be required later to accomplish the fix in time.

Constance Craig, Assistant Commissioner for Information Resources of the Financial Management Service, U.S. Department of the Treasury, testified in order to discuss the Financial Management Service's (FMS) progress in meeting the challenges posed by the Y2K computer problem. Ms. Craig stated that the highest priority of the FMS is to adapt its mission critical computer systems to the century date change. Additionally she stated that this is imperative, because FMS is one of the two or three Federal agencies that absolutely must meet the Y2K deadline. Ms. Craig then concluded by summarizing what FMS had done to avert catastrophe. (1) FMS has carefully identified and assessed its mission critical systems. (2) The agency is well underway making the necessary changes to its software code. (3) Implementation of Y2K compliant payment and collection systems are scheduled for completion by the end of 1998. (4) Renovation of other systems will be complete by 1998, except for a portion of the Government On-line Accounting Link System (GOALS). (5) And finally, by the summer of 1998, val-

idation testing will be well underway internally and also with FMS's customers.

James Flyzik, Acting Chief Information Officer, U.S. Department of the Treasury, testified that the Y2K computer problem is his highest priority. Mr. Flyzik stated that 97.1% of Treasury's mission critical IT systems had been assessed, and 51.4% of the mission critical systems have been renovated. Additionally, he stated that the Department has made significantly more progress than had been indicated by the figures present at the hearing. As for mission critical systems, Mr. Flyzik stated that Treasury is on schedule to meet the implementation milestone date of December 1998 with the exception of the IRS phase 5 system applications and Financial Management Services Government On Line Accounting Link System (GOALS).

Arthur A. Gross, Associate Commissioner for Modernization and Chief Information Officer, Internal Revenue Service, testified that the IRS's ability to carry out its mission could be jeopardized if the Century Date program is not completed timely. Mr. Gross discussed the uniqueness of the IRS situation in that the agency's Y2K problem is compounded by the legislatively mandated systems changes that require extensive reprogramming each filing season. Due to this incredible challenge, he stated that the IRS's potential for success is largely dependent on its ability to corporately manage, monitor and accurately evaluate adherence with the program's schedule, budget, and deliverables plans. Mr. Gross mentioned that the IRS has identified 126 mission critical applications systems. Of these, 73 have been renovated, 60 have been tested and implemented, and all are on schedule to be converted by January 1999.

Dennis Schindel, Assistant Inspector General for Audit, Office of Inspector General, Department of the Treasury, testified in order to describe the Office of Inspector General's oversight of Treasury's Y2K conversion effort. Mr. Schindel stated that the OIG has found that the Department is meeting OMB's quarterly reporting requirements and that the quarterly reports show the Department as a whole is meeting OMB's milestones. However, Mr. Schindel warned that these accomplishments must be qualified in two respects. First, the results are based primarily on the quarterly status reports provided to OMB, and have not been independently verified. Second, the milestone dates met thus far do not cover the real meat of the Y2K conversion process.

*4.5(bb)—Educating Our Children With Technology Skills To Compete In the Next Millennium (Joint hearing with Subcommittee on Early Childhood, Youth Government Management, Information and Technology, Committee on Education and The Workforce)*

*March 24, 1998*

*Hearing Volume No. 105-50*

*Background*

On March 24, 1998, the Subcommittee on Technology held a joint hearing with the Subcommittee on Early Childhood, Youth Government Management, Information and Technology, Committee on

Education and The Workforce entitled, "Educating our Children with Technology Skills to Compete in the Next Millennium."

The Department of Commerce has reported that industries using advanced technologies are more productive and profitable, pay higher wages, and increase employment more rapidly than firms that do not. In that review, the Commerce Department noted that employment at plants using eight or more advanced technologies grew 14.4 percent more than plants using no advanced technologies, and production workers' wages were more than 14 percent higher. Nevertheless, despite the attractive nature of high-technology jobs, it appears our nation is facing a technology workforce shortage.

This hearing examined the effectiveness of our current educational system in strengthening and developing the workforce necessary to maintain our nation's global competitiveness in the new millennium.

Witnesses included: Dr. Graham B. Spanier, President, The Pennsylvania State University, University Park, PA; Ms. Dyan Brasington, President, High Technology Council of Maryland, Rockville, MD; Dr. John Reinert, President, United States Activities Board, Institute of Electronics and Electrical Engineering, Washington, DC; Dr. Stuart A. Rosenfield, President, Regional Technology Strategies, Chapel Hill, NC; Dr. Robert Sweeney, Executive Director, Applied Information Management Institute, Omaha, NE.

#### *Summary of hearing*

Dr. Graham B. Spanier, President, The Pennsylvania University, University Park, PA, testified that from education's perspective, technology education is one of the highest priorities for universities and colleges nationwide and integral to their educational mission. He further stated that technology education in universities will proceed best in a technology-rich environment that capitalizes on the latest applications and tools in all areas of teaching and learning as well as simultaneously providing widespread access to the vast information resources available today. This environment is essential to support special initiatives to meet information technology workforce needs as well as to promote the technology skills of all students. Dr. Spanier feels strongly that if we expand infrastructure, advance networking capabilities, and pursue policy initiatives that enable the integration of information technologies into every aspect of work, we also are making contributions that are vital to reaping the many economic and educational benefits of these powerful tools throughout our society. Penn State, for example, is pursuing the creation of a new School of Information Science and Technology. This will allow students to merge their current disciplines with this new program, fostering a growth potential in knowledge and its distribution.

Ms. Dyan Brasington, President, High Technology Council of Maryland, testified that the High Technology Council (HTC) of Maryland is an industry consortium of approximately 600 companies, federal labs and educational institutions involved in high technology throughout the state of Maryland. HTC is the principal advocate for technology issues in Maryland, and workforce development has become the number one issue for HTC Council members.

The HTC recognizes the need to link not just with higher education, but also with the spectrum of educational institutions from K-12 education through lifelong learning. The HTC has had great results from two programs they have run in recent years to link their idea of life-long learning with workforce technological development. These programs are high school and community college students internship programs at information technology companies; and a teacher training program linking teachers with industry employees facilitating a transfer of knowledge to those who teach. She also discussed a problem that could be easily remedied by the Committee. Many information technology companies in the DC metropolitan area are contractors to the Federal Government. These Federal Government contracts stipulate certain criteria each contractor must meet, however, if a company were to take on an intern in their company the company would not be able to meet contracting criteria such as educational level. This prohibits the contractor from taking on an intern.

Dr. John Reinert, President, United States Activities Board, Institute of Electronics and Electrical Engineering testified on behalf of IEEE and its more than 300,000 members worldwide. IEEE believes that improved education, training and lifelong learning—from grade school to graduate school and beyond—is absolutely imperative if the United States is to maintain its economic and technological competitiveness in the 21st Century. To do this, Dr. Reinert stated, means investments in people—developing an educated and technologically literate workforce and encouraging workers to continually acquire additional knowledge and skills. People are at least as important as capital investments in today's increasingly competitive, information-based, global economy. Continuing advances in electronic and computer-based technologies necessitate rapid changes in the production and delivery of goods and services as well as the organization of work and the workforce. And in order for the United States to stay competitive, it is imperative we acknowledge this fundamental shift. Dr. Reinert commended the Committee for beginning to address this problem by passing H.R. 3007, the Commission on the Advancement of Women in Science, Engineering and Technology Advancement Act.

Dr. Stuart A. Rosenfeld, President, Regional Technology Strategies testified on behalf of the Consortium for Manufacturing Competitiveness (CMC) and the Trans-Atlantic Technology and Training Alliance (TATTA), groups of innovative technical colleges in the South and Europe. Dr. Rosenfeld spoke of a new computer-based approach that explicitly spurs economic development and which creates a learning community among students in rural areas and small companies. This application is called Asynchronous Learning Networks or (ALNs) and is becoming widely accepted. An ALN is not solely a means of delivering content, but an alternative for classroom and student-instructor interaction. It allows a class to learn from each other and carry out team projects using the Internet, but without being connected, or "logged on," at the same time. Dr. Rosenfeld believes ALNs will remove place and time from the learning equation. Asynchronous Learning Networks were developed to deliver technical education and upgrade the skills of part-time students and employees of small and mid-sized companies

who for various reasons are unable to attend regularly scheduled classes. Dr. Rosenfeld believes that while many claims of technologies changing the ways we educate have been made but never substantiated, this interactive form of computer-based learning may be the tool that finally works.

Dr. Robert Sweeney, Executive Director, Applied Information Management Institute testified on behalf of AIM, a membership organization supporting and promoting Omaha and Nebraska business growth related to Information Technology. AIM was created in 1992 as a 501(c)(3) non-profit corporation. Dr. Sweeney noted that, as a society we are moving into an interesting and challenging new era from an industrial economy to an information economy. The rules are changing for business, education, law, social institutions, etc. The primary worker of the information economy will be a knowledge worker—one that takes information and adds value through analysis, interpretation, summarization, coordinating, manipulating, screening, selecting, etc. New skill sets are required, different attributes will be rewarded. Old models are being replaced and this necessitates new ways to educate our workforce. AIM is attempting to participate in this transition by working with area businesses to provide student internships, mentoring, field trips, IT academies and teacher professional development. Additionally, Dr. Sweeney feels that business and educational institutions need to work more closely to address the apparent disparity between what the schools are teaching and what the businesses need. AIM seeks to facilitate this collaboration by bringing business leaders and educators together to discuss curriculum and internships.

*4.5(cc)—International Standards, Parts I and II. (International Standards: Technical Barriers to Free Trade)*

*April 28, 1998*

*Hearing Volume No. 105-58*

*Background*

On April 28, 1998, the Subcommittee on Technology held one of two oversight hearings entitled, “International Standards, Parts I and II.”

The hearing was held to explore the impact of the international standard setting process on the ability of U.S. companies to engage in free and fair trade with leading U.S. trading partners in Europe and around the world. Additionally, the hearing gave witnesses from industries who have recently participated, or are currently participating, in the international standard setting process the opportunity to voice their concerns about the current International Standards Organization (ISO) process.

Witnesses included: The Honorable Ray Kammer, Director, National Institute of Standards and Technology, Gaithersburg, MD; Mr. Samuel Tyson, Independent Consultant, Silver Spring, MD; Mr. Michael L. Turnbow, Former Chairman, American Society of Nondestructive Testing, Soddydaisy, TN; Mr. Charles Ford, Vice President, Quality, Babcock and Wilcox Power Generation Group;

and Mr. Stacy Brovitz, Chief Executive Officer, Dormnot Manufacturing, Export, PA.

*Summary of hearing*

The Honorable Raymond Kammer, Director, National Institute of Standards and Technology commended the Subcommittee on Technology for bringing attention to this issue through this hearing. Director Kammer believes that standards and the methods used to assess conformity to standards are absolutely critical for U.S. industry and our economy at large. He further expressed his eagerness for the National Institute of Standards and Technology (NIST) to help increase the visibility and level of U.S. activity in the area of standards setting to ensure U.S. industry success in the international marketplace in the years ahead. To that end, he determined the following steps need to be taken: NIST, other agencies, and the private sector must work together to remove unnecessary national, regional and international differences in testing and certification requirements which pose obstacles to U.S. industry, cooperate in the development of a sound U.S. policy for using standards to support global trade, agree on goals, work with our trading partners in advance of meetings to further our mutual technical interests; and commit to participate on a regular basis in the activities of technical committees. Additionally, Director Kammer emphasized that we need to ensure that the process serves U.S. industry's needs. To do this, we must commit to work effectively and efficiently—to match the standards development process to the cycle time of products, and to use it strategically to support our very real industrial and technical needs. In short, he feels that the entire standards community must work together more closely to develop and implement unified U.S. positions on technical and standards policy issues at the domestic and international levels.

Mr. Samuel E. Tyson, Independent Consultant testified to his experiences with the ISO standardization process in connection with steel and nickel alloy industrial products such as plate, sheet, bar and wire. In other technologies such as information, safety, environment, and especially quality systems, ISO standards have been used by all nations including USA with great success by companies, but the same cannot be said for steel product standards. The disparity between the U.S. and the international standards setting process has put the U.S. steel industry at a serious disadvantage in attempting to compete in international markets. Mr. Tyson concluded by recognizing that there is no simple path to international standardization. All the obstacles must be recognized and overcome and it is important that U.S. participation and focus be maintained in ISO to assure continued support of our domestic practices.

Mr. Michael L. Turnbow, former Chairman, American Society of Nondestructive Testing indicated that he recognizes the growing impact of standards on global commerce and the potential for standards to either facilitate or impede international trade. He has also come to realize that unless standards development activities are conducted in a manner that results in a mutual benefit to all concerned, trade will suffer. National, regional and international standards are the most potent method for imposing real trade policy. As the product of consensus organizations, they reflect the

needs and interests of the people and institutions that participated in their drafting, and by virtue of the fact that they may become convention in a country, region or around the world, they will exert more influence over trade than will a great many negotiated agreements and treaties. Additionally, Mr. Turnbow feels strongly that in order for international standards to facilitate international trade, several conditions must be satisfied: First, the scope and content of the standard must adequately address a defined need. Second, it must be based on sound science and use technology that has been tested and gained acceptance by industry. Third, the procedures used in the development of standards must foster consensus among all stakeholders. Mr. Turnbow suggested that the Congress direct the Departments of State and Commerce to begin to monitor and report on cases of U.S. industry exclusion, and working with European governments, to voice US government objections to efforts by their national standards organizations to usurp international standards development activities by working through CEN to invoke provisions of the Vienna Agreement.

Mr. Charles Ford, Vice President—Quality, Babcock & Wilcox Power Generation Group testified that industry, the American Society of Mechanical Engineers (ASME), and the Federal Government can work together to extend the use and application of American Codes (standards) such as the ASME standards and the continued acceptance of these standards by changing the fact that development and maintenance of U.S. standards are absorbed by the private sector; which is not the case in foreign Code development. In many other countries, these standards are a government function. Mr. Ford revealed that his company is trying to level the playing field in their area of trade by opening strategic joint ventures around the world to service markets and provide some immunity to the barriers they would face if trying to supply the world from the United States. The barriers that Ford sees are local content requirements on foreign contracts as well as enforcement of non-technical Code requirements, certification and accreditation. Mr. Ford cautioned that if European Union countries vote en bloc, they could dominate world standards which would cause domestic U.S. manufacturers to re-engineer and re-tool their processes in order to compete internationally. Thereby placing U.S. manufacturers at a significant financial disadvantage.

Mr. Stacy Brovitz, Chief Executive Officer, Dormont Manufacturing Company, testified about his experiences on the international market. He stated that Dormont is a small company with limited resources who makes a safe, high quality product that has 20 years of proven field experience. He stated that acquiring access to each national market through individual approvals which would include the design of individual connectors for each market, would be cost prohibitive. The Gas Appliance Directive appeared to be the proper way for them to enter the European market so they spent the money to have their products tested by a European testing agency despite full approvals from U.S. standards organizations. He stated: "We spent the money to acquire ISO 9000 certification from three separate entities, a requirement not made of local manufacturers. We hired a representative—a European with gas industry experience—to help us understand the European marketplace who

spent two years in a fruitless effort to allow our product access to the market. We attempted to do everything correctly, according to the rules they laid out . . .” and yet we still cannot sell our gas connectors in the European market. Brovitz suggested that Congress help companies like his gain approvals to sell their products in Europe by actively lobbying the European Union (EU) to accept gas connectors under the scope of the gas Appliance Directive. Additionally, Mr. Brovitz offered to assist the Congress in working to remove unfair design restrictions from the gas connector standards of the various EU member states and see that their products are granted mutual recognition in all member states.

*4.5(dd)—Aviation Manufacturing and The Fastener Quality Act*

*May 7, 1998*

*Hearing Volume No. 105–57*

*Background*

On May 7, 1998, the Subcommittee on Technology held a hearing entitled, “Aviation Manufacturing and the Fastener Quality Act.” The hearing was held to review the FQA and determine if Congress should recognize the FAA as the quality authority for proprietary fasteners of aviation manufacturers.

Witnesses included: The Honorable Don Fuqua, President, Aerospace Industries Association, Washington, DC; The Honorable Ray Kammer, Director, NIST, Gaithersburg, MD; Mr. Thomas McSweeney, Director, Aircraft Certification, Federal Aviation Administration, Washington, DC; Mr. Ed Bolen, President, General Aviation Manufacturers Association, Washington, DC.

*Summary of hearing*

The Honorable Don Fuqua, testifying as President of the Aerospace Industries Association (AIA), commented on the fact that under NIST’s FQA rule, airplane parts, including fasteners, currently regulated by the FAA still fall under the FQA. This places an onerous and perhaps dangerous burden on aircraft manufacturers but does not add any value to aviation safety. Most importantly, the testing requirements for FQA are redundant as FAA already has in place its own stringent requirements for testing of aircraft parts. These requirements equal or exceed that of the FQA. Additionally, Mr. Fuqua asserted that there are insufficient accredited laboratories to serve the needs of the aerospace industry in conforming to the FQA. Mr. Fuqua stated that AIA believes that dual regulation of the aerospace manufacturing process, which includes fasteners, is unnecessary.

The Honorable Ray Kammer, testifying as Director of NIST, explained that the intention of the FQA is to improve fastener quality and reduce the danger of fastener failure. Additionally, the Act serves to protect public safety by requiring fasteners to conform to uniform specifications and be tested by accredited laboratories. Mr. Kammer further emphasized that NIST worked closely with affected industries to develop the necessary testing procedures, while attempting to reduce the cost of compliance. He testified that the original law would have had a \$1 billion impact on industry, but

NIST has streamlined the procedures so that the impact will be minimal. Mr. Kammer stated that with regard to aircraft manufacturing, NIST agrees that civil aviation manufacturers should not be bound by FQA, since the FAA currently assures quality and suitability for proprietary aircraft fasteners. Mr. Kammer, under questioning by the Subcommittee Membership, suggested that passage of the FQA may have occurred because of emotional, but inaccurate, reports about fastener failures. He additionally suggested that the FQA may no longer be needed.

Mr. Thomas E. McSweeney, testifying as Director of the Aircraft Certification Service of the FAA, spoke to the process by which the FAA assures the quality of all aviation parts, including fasteners: First, the FAA, after approval of a design for an aircraft part, requires the manufacturer to establish and maintain a production and quality control system that ensures the production of conforming duplicates. Second, the FAA monitors manufacturers continuing production of aircraft parts through regular surveillance and periodic (every 18–24 months) formal audits. Mr. McSweeney emphasized that this process assures fastener safety at a level necessary for their use in state-of-the-art airplanes and engines. The FQA, on the other hand, is intended to apply to a much wider variety of fasteners. He stated that while different, the FAA system clearly meets or exceeds the safety standards generated by the FQA and that subjecting the aviation industry to the FQA would place significant time and financial costs on the industry without any added safety benefits.

Mr. Edward Bolen, testifying as President of the General Aviation Manufacturers Association (GAMA), stated that the General Aviation (GA) manufacturing industry is seriously threatened by NIST's implementing regulations for the FQA. Complying with FQA would force production lines to stop and safety to be compromised. Mr. Bolen emphasized that subjecting the aviation manufacturers to the requirements of the FQA is unnecessary because the fasteners are already subject to the stringent quality program of the FAA. FAA's oversight has clearly worked and should be continued. Mr. Bolen also stated that requiring GA compliance with FQA may actually undermine safety as the FQA and FAA approaches differ greatly and cannot necessarily be reconciled. A further concern with compliance, according to Mr. Bolen, is that neither FQA nor the implementing regulations define the key terms "nut", "bolt", "stud" or "screw." This forces companies to develop their own definitions causing widely disparate definitions and little conformity. In conclusion, Mr. Bolen articulated GAMA's position that proprietary fasteners of aviation manufacturers should continue to be regulated solely by the FAA.

*4.5(ee)—Y2K Effect on Energy Utilities*

*May 14, 1998*

*Hearing Volume No. 105–80*

*Background*

On May 14, 1998, the Subcommittee on Technology held an oversight hearing entitled, "The Y2K Effect on Energy Utilities."

The Year 2000 problem has the potential to severely disrupt our nation's ability to deliver energy to the American public, which is a vital industry necessary to maintaining our personal and economic quality of life. In the February 4, 1998 Executive Order issued by the President, the newly created Year 2000 Conversion Council identified the electric power generation system, as a critical national and local priority.

Witnesses included: Hugh Thompson, Jr., Deputy Executive Director for Regulatory Programs, Nuclear Regulatory Commission; Ms. Kathleen M. Hirning, Chief Information Officer, Federal Energy Regulatory Commission; John L. Laakso, Executive Director, Texas Public Utilities Commission; Kenneth P. Cohn, Manager, Computer Services, Potomac Electric Power Company; Richard Cowles, Director, Year 2000 Industry Solutions, TAVA/R.W. Beck, L.L.C.

*Summary of hearing*

Hugh Thompson, Jr., Deputy Executive Director for Regulatory Programs, Nuclear Regulatory Commission, testified that the U.S. Nuclear Regulatory Commission (NRC) is responding to the Year 2000 computer problem for operating nuclear power plants. Mr. Thompson stated that the NRC is currently upgrading its Emergency Response Data System (ERDS), which is responsible for performing the communication and data transmission functions to NRC incident response personnel during declared emergencies. Mr. Thompson also indicated that the upgrade is on schedule to be completed, tested and implemented by March 4, 1999. Mr. Thompson moved on to discuss the NRC's requirement that all operating nuclear power plants submit a written response stating how they plan to address the Y2K problem. In addition to the written responses, the NRC plans to conduct inspections, on a sampling basis, to assess licensee preparedness for the Year 2000. Mr. Thompson concluded by noting that to date the NRC had not received notification from licensees or vendors that a Year 2000 problem exists with safety-related initiation and actuation systems. Furthermore, Mr. Thompson believes that the NRC has established a framework that appropriately assures them that the Year 2000 problem will not have an adverse impact on the ability of a nuclear power plant to safely operate or shut down.

Ms. Kathleen M. Hirning, Chief Information Officer, Federal Energy Regulatory Commission, testified that the consequences of not fully understanding the seriousness of the Y2K problem as it relates to utilities is the problem. She stated that cooperative communication is necessary in order to quantify the nature of this problem, and furthermore, to ascertain the completion of development and testing of solutions, and promote operational contingency plans in a timely manner to avoid any loss in power. Ms. Hirning discussed the interconnectedness of the multiple power grids within the United States, and mentioned that problems resulting from Y2K in just a few of these could have a ripple effect throughout the network. For Ms. Hirning, this situation highlights the necessity of having a Y2K compliant energy system. Ms. Hirning sees the Federal Energy Regulatory Commission's role is to encourage regulated companies to take responsible action to ensure that their energy

systems are compliant. Ms. Hirning concluded by stating that through sharing of Y2K information within the industry, its companies, suppliers, consultants, and state and local experts, we will be able to help alleviate this potential threat to the reliability of our energy systems.

John L. Laakso, Executive Director, Texas Public Utilities Commission (PUC), testified that generally Texas' utilities seem well aware of the Y2K problem. He mentioned that the larger utilities have active programs in place to deal with potential Y2K problems, and many smaller utilities could be assisted by access to more information. Mr. Laakso, indicated that the PUC intends to continue to have a staff group monitor on Y2K issues, and will establish a site on the PUC homepage for exchanging information on Y2K solutions and issues. Mr. Laakso stated that the Commissions staff will continue to work with industry groups to reach the smaller utilities and raise awareness of Y2K issues. Mr. Laakso concluded by stating that the PUC would continue to provide information on Y2K issues affecting service to electric and telephone service consumers through the PUC web page and other valuable media.

Kenneth P. Cohn, Manager, Computer Services, Potomac Electric Power Company, testified that PEPCO began its formal Year 2000 effort in 1995. By 1996, Mr. Cohn stated that PEPCO had completed pilot projects on several of its systems, and began estimating its ability to accurately determine the scope and cost of system conversions. PEPCO's general approach to Y2K issues has been to: (1) identify all operations and systems affected; (2) inventory all affected systems and determine the appropriate response for each system; (3) implement these responses in an organized and cost-effective way; (4) test responses with sufficient lead time before January 1, 2000, so as to allow time for adjustments and fixes; and, (5) develop contingency plans for possible problems at the operational level. Moving on, Mr. Cohn estimated that conversion plans and cost estimates for embedded systems would be completed within the ensuing weeks. Finally, Mr. Cohn summarized by stating that the costs of PEPCO's Y2K problem was approximately \$10 million, and that he anticipated changes in these estimates as he went along.

Rick Cowles, Director of Year 2000 Industry Solutions, TAVA/R.W. Beck, L.L.C., testified regarding Year 2000 computer issues and their affect on the electric utility business. Mr. Cowles stated the importance of establishing a boundary around the scope of the problem. He indicated that all three sectors of the electric utility industry must work together to counter the Y2K problem. Additionally, Mr. Cowles emphasized his belief, based on surveys taken from all levels of the industry, that for the most part, the electric utility business is not fully aware of the magnitude of the Y2K issue, and hopes that there is enough time to meet the challenges of the problem.

4.5(ff)—*International Standards, Parts I and II (International Standards: Technical Barriers to Free Trade)*

June 4, 1998

Hearing Volume No. 105–58

*Background*

On June 4, 1998, the Subcommittee on Technology held the last of two oversight hearings entitled, “International Standards, Parts I and II.”

This hearing addressed electronic and digital standards which are set through the International Telecommunications Union (ITU) and the International Electrotechnical Commission (IEC).

The hearing further explored how the international standards system has been working with respect to U.S. users and manufacturers of electronics and reviewed in detail the specific case of the ongoing debate surrounding efforts to create a single global wireless telecommunications standard commonly referred to as the Third Generation Wireless Standard (3G). 3G has become one of the more interesting and important international standards currently being developed.

Witnesses included: Mr. Oliver Smoot, Executive Vice President, Information Technology Industry Council, Washington, DC; Mr. John Major, Executive Vice President, QUALCOMM, San Diego, CA; Mr. Jesse Russell, Chairman, Wireless Communication Division, Telecommunications Industry Association, Washington, DC; Mr. Bo Piekarski, Vice President, Business Development and Strategic Marketing, Ericsson, Inc., Richardson, TX.

*Summary of hearing*

Mr. Oliver Smoot, Executive Vice President, Information Technology Industry Council emphasized ITI is a national trade association whose members consist of leading producers of information technology products and services. Mr. Smoot stated that ITIC participation in the international standardization process is decentralized, private sector led, and for the most part highly successful. He indicated that succeeding at international standardization requires: Having a strategy giving the effort priority, providing the resources, sticking with it for the long term, and working at both the management and technical levels. He feels that U.S. participants, utilizing the advantages of our diversified, cooperative and competitive, market focused standards system can and have succeeded. Additionally, ITI believes that with regard to the third generation wireless standards backward compatibility and interoperability with today's wireless networks is more important for next generation systems than achieving a single global standard. If the international standardization process would embrace multiple standards, it would ensure that today's IT equipment can be used on tomorrow's networks, and would protect the investment in time, resources and money that have already been expended in the development of second generation systems, as well as, ensuring that no technology is stranded as new technologies evolve now and in the future. Most importantly, however, it ensures that the evolution of

the technology is guided by the market, not by government mandate.

Mr. John Major, Executive Vice President, QUALCOMM testified on behalf of QUALCOMM, a San Diego based developer, manufacturer, marketer and operator of advanced communications systems and products based on proprietary digital wireless technologies. One of these technologies, Code Division Multiple Access or CDMA, is now marketed around the world under the trade name cdmaOne. CdmaOne, stated Mr. Major, is an American invention, and the fastest growing digital wireless standard in the world. Less than three years after its first commercial deployment in Hong Kong, cdmaOne has become the dominant digital technology in the United States, Korea and Mexico, and has been deployed throughout Asia, Latin America, Africa, Russia and Eastern Europe, with commercial launches in Japan and Australia later this year. QUALCOMM, along with other CDMA equipment manufacturers, has worked with the CDMA Development Group, a trade industry organization representing 91 CDMA operators and manufacturers, on a third-generation version of cdmaOne that will be known as Wideband cdmaOne. Wideband cdmaOne has been submitted to various standards bodies around the world for consideration and eventual standardization. Wideband cdmaOne will allow consumers to send and receive more than 2 Mbps of data and access the Internet, while continuing to enjoy the best voice quality of any digital wireless technology. Mr. Major indicated that QUALCOMM believes in four unifying principles regarding the process of setting a third-generation standard: they believe that the world's standards bodies, under the auspices of the ITU, need to ensure backwards compatibility with existing systems, and allow for world-wide roaming; that the third-generation standards process should recognize and respect the intellectual property rights of patent holders; that markets, rather than governments, should guide the timing and deployment of third-generation services; and finally that standards and technology decisions should be made based on what is best for wireless customers and operators, not what is best for wireless manufacturers or governments. Mr. Major emphasized that QUALCOMM believe in full and fair competition among technologies and is adamantly opposed to protectionism or an industrial policy that places manufacturers ahead of consumers. Finally, Mr. Major indicated that QUALCOMM is not alone in espousing these principles.

Mr. Jesse E. Russell, Chairman, Wireless Communication Division, Telecommunications Industry Association (TIA) testified on Behalf of TIA. TIA is a full-service national trade organization with membership of 900 large and small companies that provide communications and information technology products, materials, systems, distribution services and professional services in the United States and around the world. The association's member companies manufacture or supply virtually all of the products used in global communications networks. TIA is accredited by the American National Standards Institute (ANSI) to develop American National Standards in its areas of expertise. Mr. Russell indicated that TIA supports the International Telecommunications Union's (ITU) efforts toward harmonization and will continue to work toward achieving

the global standardization of 3G wireless systems. From TIA's perspective, the goals of the 3G process are network-to-network interoperability, feature/service transparency, maximum harmonization within key technologies, global roaming among all networks, and as much backward compatibility with existing networks as possible. TIA has been working hand-in-hand to help develop what should be the final U.S. position through a consensus with all involved parties. In conclusion, Mr. Russell indicated that only IME will tell whether a single 3G standard will evolve or whether there may be several standards under the ITU's "family of systems" concept, but this process should and must evolve from the private sector.

Mr. Bo Piekarski, Vice President, Business Development and Strategic Marketing, Ericsson, Inc., addressed the role of industry standards, in particular the North American and international wireless standards process, as well as ongoing industry-led efforts to create further harmonization of various global wireless telecommunication standards. Ericsson's views on standards echo the words of Ronald Grawert, Chairman of the TIA Board. "Standards are vital to many industries, where equipment and systems must interconnect and interoperate, but in the telecommunications equipment area, we cannot exist without standards." The philosophy and practice of Ericsson has always been to respect market forces, in particular the mobile operators within a respective country and/or region, in determining which technologies will operate in their respective markets. Mr. Piekarski emphasized that Ericsson supports only those standardization processes that are: industry led; allow for licensing on reasonable terms of any company's proprietary intellectual property rights; open to all qualified participants: operators and manufacturers; fair in terms of not favoring one company, region, or technology; and customer driven in terms of serving customer needs for ease of deployment, including global compatibility with other technologies, cost efficiency, and high-quality, feature-rich services. Mr. Piekarski also cautioned that the ITU should not be in the business of selecting and imposing a single technology for worldwide deployment. Rather, the ITU should continue to function as the "international good housekeeping seal of technical approval." The rigorous scrutiny inherent in the ITU process provides member nations, private operators, government regulators, and manufacturer's confidence that they can rely on an agreed upon technology to meet or exceed ITU minimum performance capabilities.

*4.5(gg)—Community Colleges in the 21st Century: Tackling  
Technology*

*July 21, 1998*

*Hearing Volume No. 105-82*

*Background*

On July 21, 1998, the Subcommittee on Technology held a hearing entitled, "Community Colleges in the 21st Century: Tackling Technology." The hearing examined how community colleges can

overcome the technological barriers associated with maintaining a high-tech teaching environment.

There are currently approximately 1,300 community colleges nationwide serving more than 5.5 million credit-earning students. By nature of their mission, community colleges work closely with area businesses and industries and customize their academic and occupational programs to reflect local economic and workforce development needs. As U.S. businesses seek to remain competitive in the information age, many are turning to community colleges to ensure their workers have the skills necessary to keep up with the rapid pace of technological advancement.

This hearing was held to examine the use of technology in the teaching and learning process to prepare students for the rapidly changing workforce; to examine how community colleges address the challenge of investing in technology which might be rendered obsolete in a short period of time; and to determine the benefits associated with promoting partnerships between community colleges and businesses to ensure that students have the most up-to-date technology needed to effectively train them to succeed in the real world.

Witnesses included: Dr. Steven Lee Johnson, Provost, Clearwater Campus, St. Petersburg Junior College District, Dr. Mark D. Milliron, Vice President and Chief Operating Officer League for Innovation in the Community College, Dr. Allen Arnold, President, Mott Community College, Dr. Robert E. Parilla, President, Montgomery College, Dr. Diana Oblinger, Manager, Academic Programs and Strategy, IBM Global Education Industry.

#### *Summary of hearing*

Dr. Steven Lee Johnson, Provost, Clearwater Campus St. Petersburg Junior College District, testified to the nature of the changes occurring on the community college campus, especially in regard to technology. Specifically, he stated that in this new climate professors and faculty must now not only be content experts, but also must be able to respond to and connect with students who have a variety of learning needs. According to Dr. Johnson, technology will help faculty respond to the changing needs of their students and ultimately will become a very viable alternative to the basic lecture model of college instruction. In conclusion, Dr. Johnson reiterated his support for the technology assisted educational experience, and justified his claim by stating that in the future 80% of the jobs available will require fairly high levels of technical skills.

Dr. Mark Milliron, Vice President and Chief Operating Officer, League for Innovation in the Community College, testified that the key challenges for community colleges in the next century will be to develop and adopt the cutting-edge technologies, foster and assess student learning, and insure that our colleges bring communities together. Building on the previous statement, Dr. Milliron stated that the following challenge would be to better channel our collective energies, by working more closely with the federal government and corporations. As he sees it the result will be to create systems for curriculum transfer, educational and policy reform, public and private partnerships, and pilot programs. Dr. Milliron concludes by advocating the creation of a National Information

Technology Curriculum Consortium, that would allow corporations, higher education, and government to pool resources and share information with the student quickly and easily.

Dr. Allan Arnold, President, Mott Community College (MCC), testified that if MCC is to play a viable role in keeping the Flint Michigan work force strong and prosperous, it must address the needs of the areas displaced workers. Additionally, Dr. Arnold stated that MCC must also provide training for workers attempting to meet new skill requirements to maintain their existing jobs, and for citizens aspiring to join the workforce for the first time to earn a wage that will support a family. If MCC is to attain this, Dr. Arnold stated, that it must have strong computer based programs for its students. Dr. Arnold concluded by stating that a national initiative that provides incentives to encourage businesses to work with community colleges would be a tremendously important tool for them as they accept the challenges of developing the Nation's workforce.

Dr. Robert E. Parilla, President, Montgomery College, testified that Montgomery College, like many community colleges across the country, has chosen to "tackle technology" head-on. Although, Dr. Parilla did qualify by stating that the college had no intention of becoming a strictly on-line school, he did recognize the importance of utilizing technology to enhance students educational experiences. Dr. Parilla noted that it is an imperative that community colleges be responsive to private sector needs, and therefore involve themselves with a number of major business groups. Dr. Parilla stated that in order to achieve this at Montgomery College, faculty have begun meeting with employers to develop curricula and internship/co-op opportunities for qualified students. Dr. Parilla mentioned that these public-private/education-vendor partnerships are the trend for the future, and that all will benefit in the production of a well-trained technologically adept workforce.

Dr. Diana Oblinger, Manager, Academic Programs and Strategy, IBM Global Education Industry, testified that community colleges will play an increasingly important role in education. Ms. Oblinger stated that due to the speed at which technology is changing it will be necessary to get educated more than once. Therefore, it is incumbent upon community colleges to tackle technology, and help ensure that society will have a strong lifelong learning system that is capable of sustaining economic competitiveness. Additionally, Dr. Oblinger discussed the necessity of a close linkage existing between business and community colleges, that ensures up to date and relevant curricula. Through these partnerships, Dr. Oblinger testified that local businesses benefit in that they are able to retrain their work forces and hire more qualified workers. She concluded by stating that community colleges must do more than just tackle technology. Additionally, they must learn to partner creatively, and rethink how one effectively educates in this new medium.

*4.5(hh)—Developing Partnerships for Assistive and Universally  
Designed Technologies for Persons with Disabilities*

*August 4, 1998*

*Hearing Volume No. 105-68*

*Background*

On August 4, 1998, the Subcommittee on Technology held a hearing entitled, "Developing Partnerships for Assistive and Universally Designed Technologies for Persons with Disabilities," to discuss the creation, implementation, and commercialization of assistive technologies.

An assistive technology can be a device, whether acquired commercially, off-the-shelf, modified, or customized that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities. A 1993 National Council on Disability study indicated that assistive technologies had a significant impact on many aspects of the lives of people with disabilities. For example, through assistive technologies, nearly 75% of school age children with disabilities were able to remain in a regular classroom.

While assistive technology's importance spans age and disability classifications, it has been argued that assistive technologies do not gain the recognition in the Federal Government necessary to provide important assistance in research and development programs for technologies which might help the disabled. The private sector generally lacks adequate incentives to produce assistive technologies and end-users lack adequate resources to acquire assistive technology.

Witnesses included: John Lancaster, Executive Director of the President's Committee on Employment of People with Disabilities, James Fruchterman, President Arkenstone, Inc., Gary Moulton, Ph.D. and David Bolnick, Accessibility Product Managers Microsoft Corporation, Mark Lohman Ph.D., President and Co-Founder Bartimaeus Group, John Fales, Jr., President Blinded American Veterans Foundation (BAVF) and Columnist, The Washington Times.

*Summary of hearing*

John Lancaster, Executive Director of the President's Committee on Employment of People with Disabilities, testified in order to discuss a new public-private sector initiative of the President's Committee, which is convening a Technology Task Force. The Task Force is composed of companies, including AT&T, interested in working together to develop standards for digital multimedia applications to enable access to information technologies by people with disabilities. He stated that the result will be greater employment of persons with disabilities, who currently face barriers as most technologies are not designed with their needs in mind. Additionally, Mr. Lancaster stated that due to the changing nature of the economy, the high rate of unemployment in the disabled community, and the shortage of workers in the information technology sector, there is an opportunity for people with disabilities to secure and maintain employment in this field.

James R. Fruchterman, President of Arkenstone, Inc., testified before the Subcommittee in order to express the need for developing partnerships for assistive and universally designed technology for persons with disabilities. Mr. Fruchterman discussed the devices his company has invented to help disabled people, including those with learning disabilities. Mr. Fruchterman noted that the majority of disabled people are unemployed, and therefore economically disadvantaged. He asserted that he is financing adaptive technology development as a solution to help the disabled help themselves. Mr. Fruchterman stated that he encouraged the concept of universal design and his long term goal is for adaptive technology to become futile because it will no longer be necessary.

Gary M. Moulton, Ph.D., accessibility product manager of the Microsoft Corporation, testified in order to express Microsoft's commitments: being an industry model for accessibility products; helping drive the industry towards universal, accessible design; and raising awareness of the possibilities available with assistive technology. He highlighted accessibility aids that are already available on Microsoft software and their Internet browser. Dr. Moulton stated that persons with disabilities need to be aware of the existence of these features so that they may develop competitive academic and workplace skills. Dr. Moulton also stated that Microsoft Corporation will form a Disability Advisory Council composed of individuals with disabilities to keep their efforts on track in the further development of assistive technologies.

Mark Lohman, President and co-founder Bartimaeus Group, testified before the Subcommittee to state his opinion regarding a government funded research and private enterprise partnership in the field of assistive technology. Mr. Lohman is the President and co-founder of the Bartimaeus Group, which focuses on providing access solutions to individuals who are blind or visually impaired. Mr. Lohman noted the progress his company has made, specifically in regards to computer product development. However, Mr. Lohman stressed that the group is in a difficult position, because they cannot afford to develop all of their technologies. This situation would be alleviated if the government supported a program to assist companies like the Bartimaeus Group.

John Fales, Jr., President Blinded American Veterans Foundation (BAVF) and Columnist, The Washington Times, testified to the importance of integrating assistive technologies into computer systems, specifically Microsoft's suite of computer operating systems. Mr. Fales recommended that Microsoft continue to develop and upgrade assistive technologies, and that they continue to implement these technologies in the future. Mr. Fales discussed the dire situation that many disabled people face in regards to employment, and suggested that much of this could be alleviated in the future if assistive technologies continue to be developed.

*4.5(ii)—Technology Development at the Federal Aviation Administration: Computer and Information Technology Challenges of the 21st Century*

*August 6, 1998*

*Hearing Volume No. 105–70*

*Background*

On August 6, 1998, the Subcommittee on Technology held a hearing entitled, “Technology Development at the Federal Aviation Administration: Computer and Information Technology Challenges of the 21st Century,” to review the effectiveness of the FAA’s Year 2000 compliance efforts and to determine whether the FAA is implementing the appropriate and necessary security measures as it modernizes its air traffic control infrastructure.

The FAA is in the process of modernizing its air traffic control system. Since 1995, FAA has been developing a comprehensive architecture for the National Airspace System (NAS) infrastructure that will support all air operations within the U.S. and certain oceanic areas. As the FAA modernizes the aging air traffic control equipment with an open architecture complex of interconnected network systems, the NAS becomes even more vulnerable to cyber attacks. The General Accounting Office recently issued a report critical of FAA’s efforts to ensure its modernized system is secure.

Witnesses included: Mr. Dennis DeGaetano, Deputy Associate Administrator for Research and Acquisitions, U.S. Federal Aviation Administration, Washington, DC; Mr. John Meche, Deputy Assistant Inspector General for Finance, Economic and Information Technology, U.S. Department of Transportation, Washington, DC; Mr. Joel C. Willemsen, Director, Civil Agencies Information Systems, U.S. General Accounting Office, Washington, DC.

*Summary of hearing*

Mr. Dennis DeGaetano, Deputy Associate Administrator for Research and Acquisitions, U.S. Federal Aviation Administration addressed information security and Year 2000 issues in relation to the National Airspace System (NAS). Mr. DeGaetano was also accompanied by Mr. Ray Long, the Director of the Agency’s Year 2000 Program. Mr. DeGaetano testified that the FAA has had information security efforts under way for several years, and they have made significant progress in ensuring that new systems coming on-line in the NAS have the appropriate level of information security safeguarding. However, the General Accounting Office’s (GAO) recent audit has been helpful to FAA by highlighting several areas in our information security framework that can be improved. Mr. DeGaetano indicated that the FAA has already taken actions that are responsive to several of the GAO’s recommendations, and are in the process of determining a course of action with regard to the remaining issues. GAO’s most significant recommendations urges the FAA to take a more coordinated management approach to information security, a responsibility which is currently shared by several FAA lines of business, and to develop a means of ensuring that information security policy is always followed. The GAO

also reiterated a previous recommendation that the FAA should have a Chief Information Officer (CIO) that reports directly to the Administrator. Mr. DeGaetano stated that in response to these suggestions Administrator Garvey has agreed that a CIO reporting directly to her is appropriate. The Administrator is talking to candidates now, and it is clear that she wants to make a selection as soon as possible. While the details of the final management structure need to be worked out, the CIO will be responsible for information security at the FAA. Additionally, FAA recognizes the importance of ensuring that new NAS systems being brought on line are safeguarded from unauthorized access. To address this issue the FAA has vulnerability assessments, threat assessments, security plans, certifications and accreditations currently being evaluated for new systems being integrated into the NAS and administrative infrastructure of FAA. Mr. DeGaetano indicated that as assessments of new systems are completed, the civil aviation security office will certify the security of the system, or require that appropriate countermeasures, if necessary, be taken. Mr. DeGaetano concluded by emphasizing that FAA is in general agreement that information security efforts can be more efficiently managed and enforced, and that there are several finite improvements that can be made to specific procedures. They are in the process of evaluating how to accomplish several of the GAO's recommendations, and are taking steps to appoint a CIO who reports to the Administrator and will have the authority to determine how clear information security policies will be disseminated—and most importantly—enforced. Additionally, FAA continues work to ensure that new NAS systems are appropriately secure, and are prioritizing assessments and countermeasures, as necessary, for NAS legacy systems. Their work on Y2K continues to make quick and steady progress, and they will keep the Committee closely informed of their efforts.

Mr. John Meche, Deputy Assistant Inspector General for Finance, Economic and Information Technology, U.S. Department of Transportation addressed progress FAA has made on its Year-2000 efforts since his testimony before the Subcommittee on February 4, 1998; the status of the Year-2000 program and computer network security; the challenges ahead for the Year 2000 and telecommunications networks; and the actions FAA and DOT should undertake to solve their Year-2000 and computer security problems. Mr. Meche stated that FAA is reporting to him they are on schedule to achieve the next major OMB milestone—fixing all known Year-2000 problems by September 30, 1998. However, there are three areas where FAA needs more attention. First, FAA needs better documentation to support the completeness of the renovation work, especially with replacement parts and system interfaces. Second, FAA needs to determine whether six of the new systems under development are Year-2000 compliant. And third, FAA needs to begin testing the systems. In addressing the computer security challenges for FAA, Mr. Meche emphasized that FAA, as part of its NAS modernization, plans to use a common network to support both administrative and NAS operational needs, which could lead to additional exposure for the NAS. For example, during a review of FAA computer security, the DOT IG's office found that the primary and backup Host computers are located in the same room. A single

event within the computer room, such as fire, could render both computers inoperable. Mr. Meche identified actions FAA and DOT need to take to gain the confidence that there will be no significant Year 2000 and computer security issues. They include the need to: complete Year 2000 assessments of the six systems being developed, and ensure repair work is completed for all required elements including code modification, system replacement, and interfaces; re-evaluate the FAA master schedule and make a concerted effort to accelerate the implementation schedule for all systems to March 31, 1999, or as soon thereafter as possible; and enhance departmental computer security by (1) ensuring back door users are in compliance with DOT security requirements; (2) developing schedules to certify systems and install network security evaluation tools; and (3) providing for physical separation of primary and backup Host replacement computers. Taking steps to remedy these and other concerns will ensure that NAS modernization also provides a much higher level of security and stability within the FAA's electronic information system.

Mr. Joel Willemsen, Director, Civil Agencies Information Systems, U.S. General Accounting Office testified on the significant information technology challenges confronting the Federal Aviation Administration (FAA)—challenges that affect the level of risk facing the agency and the flying public. Mr. Willemsen determined that while the FAA has made progress in managing its Year 2000 problem and has completed critical steps in defining which systems need to be fixed and how to fix them, it is doubtful that FAA can adequately do all of this in the time remaining. Accordingly, they must determine how to ensure continuity of critical operations in the likely event of some systems' failures. With regard to computer security, Mr. Willemsen believes that FAA cannot provide assurances that the air traffic control systems on which it depends are sufficiently resistant to intrusion. FAA's weak computer security practices were detailed in the classified version of a report made available by GAO in May to key Congressional Committees and appropriate agency officials. In short, Mr. Willemsen is concerned that FAA faces significant challenges—both in addressing the Year 2000 problem and correcting its computer security weaknesses and that failure to address either of these issues effectively could prove devastating. FAA needs to pay careful attention to security issues, especially during the next 17 months as FAA makes a tremendous number of Year 2000-related changes to its mission-critical systems. If insufficient attention is paid to computer security during this time, existing vulnerabilities will be compounded. GAO observed that strong leadership and rigorous process discipline are needed if FAA is to successfully and safely navigate into the next century.

*4.5(jj)—Industrial Biotechnology: A Solution for the Future?**September 17, 1998**Hearing Volume No. 105–69**Background*

On September 17, 1998, the Subcommittee on Technology convened a hearing entitled, “Industrial Biotechnology: A Solution for the Future?,” to review on-going private sector research and development in the field of industrial biotechnology and the potential benefits associated with this research, and also to examine how to safeguard the United States competitive advantage in industrial biotechnology.

The hearing focused on the ongoing research and development in the industrial biotechnology field and how such research may yield significant benefits in the fields of health care, products manufacturing, food production, and environmental technology. The hearing also provided a forum to discuss the risks, both real and perceived, associated with biotechnology.

Witnesses included: Robert Dorsch, Ph.D., Director, Biotechnology Development, DuPont Life Sciences, Wilmington, DE; Karl Sanford, Ph.D., Vice President, Technology, Genecor International, Palo Alto, CA; Edward Eisenstein, Ph.D., Associate Director, Center for Advanced Research in Biotechnology, Rockville, MD.

*Summary of hearing*

Robert Dorsch, Ph.D., Director, Biotechnology Development, DuPont Life Sciences, testified that during his tenure at DuPont, he has conducted and led engineering research, biotechnology scale-up, and new business start-ups. During the last five years, he has been responsible for biotechnology strategy development and is currently working on a portfolio of industrial biotechnology development projects. Dr. Dorsch believes that the Federal Government is playing a catalytic role in many areas of technology development. Government involvement takes many different forms, ranging from practical work to demonstrate low-cost ethanol fermentations from waste biomass, to the more intricate work on the thermodynamics of enzyme systems carried out at the National Institute of Standards and Technology. He further emphasized that continued support of basic science and engineering in biotechnology fields is certain to contribute to the long-term sustainable development of the U.S. and global chemical industry. This gives the Federal Government a unique opportunity to affect the quality of life of all citizens. Dr. Dorsch related that DuPont’s reasons for beginning to study the applicability of biotechnology should apply equally to the Federal Government. Those reasons included: accelerated growth of knowledge and number of biotechnology tools suggested that new approaches to making previously unattainable molecular structures would now be possible; and a deeper understanding that biological manufacturing processes could operate under milder conditions, i.e., lower temperatures, lower pressures, and less corrosive conditions. These differences lead to both lower investment and cleaner manufacturing processes. Making these new molecules with these

new types of processes also allows for a new range of starting materials such as corn, a source of sugar to feed the fermentation processes, hence offering the opportunity to switch to a renewable resource base. Dr. Dorsch concluded by emphasizing that new knowledge has tremendous effects that are hardly ever apparent at the time the work is done, which is why the Federal Government plays, and should continue to play, such an integral role in funding.

Karl Sanford, Ph.D., Vice President, Technology, Genecor International, testified that while most of the attention on biotechnology has been focused for many years on the pharmaceutical industry, industrial biotechnology, a less well publicized aspect of biotechnology, is beginning to address significant unmet needs crucial to the sustainable development of our world. For example, Dr. Sanford, questioned the ability of U.S. industry to compete in a world where we must all do more with less. He believes that industrial biotechnology may provide a powerful new alternatives to the traditional practices. Dr. Sanford emphasizes that the goal of Genecor International is to lead the way forward in this new paradigm of industrial biotechnology research. Dr. Sanford further believes that this new examination of the role of biotechnology has often overlooked, but significant, social benefit. For example, when biotechnology is used for industrial processes, energy is saved, renewable resources replace fossil fuel, and pollution is prevented or reduced. He further emphasized that the technological advancement is progressing at an astonishing rate. Biotechnology and computer technology, two previously unpaired technologies, have crossed paths in the area of gene sequencing. This area needs to be cultivated because there are great opportunities for industrial biotechnology to improve our everyday lives.

Edward Eisenstein, Ph.D., Associate Director, Center for Advanced Research in Biotechnology, addressed the potential of industrial biotechnology to provide a safe and cost-effective alternative for the production of many profitable compounds and fine chemicals from the perspective of a basic research center (i.e., CARB). Dr. Eisenstein emphasized the importance of CARB's primary purpose of promoting advanced research and interdisciplinary training in fundamental problems at the forefront of biotechnology through the collaboration of scientists from NIST and industry. This purpose allows CARB to facilitate cross-disciplinary collaboration resulting in more sound and efficient biotechnology advancement. For example, their work in both protein and metabolic engineering, through collaboration with other scientists, has made advancement and the dissemination of such advancement much easier, thereby, creating a much more efficient use of research dollars. Dr. Eisenstein concluded by emphasizing the importance of protecting the role of basic research in the emerging field of industrial biotechnology.

*4.5(kk)—Year 2000: What Every Consumer Should Know**September 24, 1998**Hearing Volume Number 105–86**Background*

On September 24, 1998, the Subcommittee on Technology held a joint hearing with the Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight entitled, “Year 2000: What Every Consumer Should Know,” to determine the impact of the Year 2000 computer problem on American consumers.

Although the Year 2000 problem is primarily found in computer software, the problem also exists in some hardware components where integrated circuits, also called imbedded chips, store or process data. Some imbedded chips are pre-programmed by the manufacturer to store or process year data using only two digits. Embedded chips are used in all computer hardware, including PC’s and mainframes. Embedded chips are also used in many consumer electronic devices and some control different types of systems including thermostats, lighting, sprinklers, medical equipment, telephone services, and other consumer products.

The hearing discussed concerns consumers had about products in their homes, and helped to raise awareness of the Year 2000 problem.

Witnesses included: Robert Holleyman, President and Chief Executive Officer, The Business Software Alliance; Gary Shapiro, President, Consumer Electronics Manufacturers Association; Gary J. Beach, Publisher, CIO Magazine; Paloma O’Riley, Co-Founder Cassandra Project; and, Michael Hyatt, Author, The Millennium Bug.

*Summary of hearing*

Robert Holleyman, President and Chief Executive Officer, The Business Software Alliance (BSA), testified that due to certain technical conventions the two-digit date field was adopted, shared, passed on, and reused in much of the early software, firmware, and hardware development, throughout the world. Mr. Holleyman stated that the Year 2000 issue is a policy matter, that will only be effectively addressed collectively. Additionally, Mr. Holleyman testified that PC home users may face difficulty with some of their software, but mentioned that users who have recently purchased their systems may expect to face fewer problems than those with older systems. Mr. Holleyman noted that consumers must take responsibility for finding out whether their computer systems are Y2K ready, and then take proactive measures to ensure that they transition into the millennium without problems. Mr. Holleyman testified that the most troublesome effects of the Y2K issue will arise from embedded systems. Mr. Holleyman and BSA support Congressional efforts to address the disclosure liability dilemma.

Gary Shapiro, President, Consumer Electronics Manufacturers Association (CEMA), testified that most consumer electronics (CE) products will not suffer any kind of Y2K problems. Mr. Shapiro

stated that the majority of CE systems in use today have been made to accommodate the date change. Furthermore, regarding the few non-Y2K compliant CE systems in use today, most do not use or need a date to function. Mr. Shapiro testified that the Y2K impact on the small number of older CE systems will therefore be minimal, and that a simple manual resetting, or the addition of software upgrades, will easily provide a remedy in most cases. Mr. Shapiro stated that in the few cases where manual resetting would not work, he did not anticipate much impact on consumers. Mr. Shapiro testified that consumers should be able to find out whether or not they have a Y2K problem by contacting the manufacturer. Mr. Shapiro concluded by stating that Congress should move forward expeditiously with passage of legislation to provide limited liability protection for companies making Y2K disclosures.

Gary J. Beach, Publisher, CIO Magazine, testified that CIO Communications commissioned the CIO Year 2000 Consumer Study to determine consumer awareness and concerns regarding the Year 2000 problem. Mr. Beach stated that a total of 643 individuals were contacted for the study, and of those 38% were not aware of the Y2K problem and 62% were. Mr. Beach indicated that most often respondents became aware of the Y2K problem through TV/radio (48%), print publications (29%) or work (20%). Mr. Beach stated that most respondents (80%) to the survey felt fairly confident that the Y2K problem would be fixed before January 1, 2000. Mr. Beach stated that the report shows that respondents are concerned about the Y2K problem on the government level, and 34% expect that the government should be the one to monitor and report on the progress solving the Y2K problem. Mr. Beach stated that participants in the survey blame the Year 2000 problem on the technology industry (22%), government (12%), and private business (5%). Moreover, forty-six percent of the respondents mentioned that they would look into a lawsuit if they were injured as a result of a product malfunction at the turn of the century. Thirty-two percent of the study sample indicated that they would be likely to close a bank account before the turn of the century.

Paloma O'Riley, Co-Founder Cassandra Project, testified that compliance in the face of the level of our dependence on critical infrastructure is unlikely, and that we must recognize due to the interconnectedness of our society, that systems are only as compliant as the weakest link in the network. Ms. O'Riley stated that it is therefore imperative that contingency planning begin immediately. Furthermore, she stated that the public must be given enough notice and information to form their own contingency plans. Ms. O'Riley concluded by stating that in addition to providing leadership, government must take steps to protect the public from the direct, indirect, and delayed consequences of the Y2K problem.

Michael Hyatt, Author, *The Millennium Bug*, testified that some level of disruption is now inevitable, since it is impossible to get all of our systems repaired before January 1, 2000. Mr. Hyatt stated that the failure of these systems will affect government agencies, infrastructure providers, and businesses both large and small. Furthermore, he stated that it will affect each of us individually, including our associates at work, our neighbors, and our friends and family. Mr. Hyatt believes that Y2K is also a consumer issue, be-

cause ultimately it will be the consumers who will feel its impact. Mr. Hyatt testified that a three-pronged strategy is needed in order to mitigate the consumer impact of Y2K. The strategy that he proposed is as follows; (1) awareness needs to be built at every level; (2) we must continue to press for compliance; (3) and finally, most importantly, we must begin to make contingency plans. Mr. Hyatt stated that consumers must make life continuity plans, especially in regards to the possible disruption of basic services like food, water, and shelter. Mr. Hyatt concluded by discussing what Congress could do to help alleviate the upcoming problems posed by Y2K. First, Congress can help build awareness, by educating the public about the Y2K problem. Second, Congress should encourage consumers to make personal contingency plans. In order to stimulate contingency planning, he proposed that Congress commission a study on the feasibility of allowing consumers to deduct from their taxes preparedness expenses. Finally, Congress should encourage religious organizations and private charities to prepare for those who either don't have the means or the foresight to prepare for themselves.

*4.5(ll)—Aviation and the Year 2000*

*September 29, 1998*

*Hearing Volume No. 105–89*

*Background*

On September 29, 1998, the Subcommittee on Technology held a joint hearing with the Committee on Transportation and Infrastructure; and the Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight, entitled, "Aviation and the Year 2000." The hearing focused on the progress made by the aviation toward addressing the Y2K problem, to what extent contingency plans have been developed, efforts to coordinate with the FAA in its Y2K implementation plan, and examined the FAA's efforts to coordinate its efforts with the international community to ensure a seamless transition to the Year 2000.

Witnesses included: Congressman William F. Clinger, Jr., Former Chairman, House Investigations and Oversight Committee, Bruce F. Webster, Chief Technical Officer, Object System Group, Co-Chair, Washington, DC. Year 2000 Group, David E. Sullivan, President, ZONAR Corporation, The Honorable Jane F. Garvey, Federal Aviation Administrator, John Kelly, Jr., Assistant Administrator for Weather Services, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Carol B. Hallett, President and Chief Executive Officer, Air Transport Association of America, Walter S. Coleman, Regional Airline Association, Richard C. Cullerton, Assistant Vice President for Engineering, Metropolitan Washington Airports Authority, Dwight Greenlee, Director of Administration, Wichita Airport Authority.

*Summary of hearing*

Congressman William F. Clinger, Jr., Former Chairman, House Investigations and Oversight Committee, testified that the FAA

has accelerated its testing and remediation programs, and has made remarkable progress in moving hundreds of mission-critical systems toward Y2K compliance. Congressman Clinger stated that the Host computer will be fully functional on January 1, 2000, and that the agency will reach their goal of 99% compliance by September 1999. Additionally, Congressman Clinger stated that the airline industry's Y2K Program has been successful. Congressman Clinger concluded by stating that the progress of the last six months has demonstrated the aviation industry's continued commitment to safety and dedication to excellence.

Bruce F. Webster, Chief Technical Officer, Object System Group, Co-Chair, Washington, DC Year 2000 Group testified that the Y2K problem will not bring civilization to a halt, but it will not be a mere bump in the road either. Mr. Webster noted that the following economic sectors were vulnerable according to the Cutter Consortium assessment: financial services, utility and power industries, telecommunications, manufacturing, industrial and consumer services, social services, food and agribusiness, chemicals and petrochemicals, and hotels and tourism. Additionally, the Cutter Consortium indicated that transportation was particularly vulnerable. Mr. Webster concluded by stating that while the Y2K disruption will be measured in days or weeks, one needs to remember that it only took a few weeks of work stoppage at one supplier to cause General Motors to shut down its entire North American manufacturing system, lay off 200,000 workers, lose \$1 to \$2 billion, and all by itself impact the U.S. economy. Furthermore, with Y2K we may face dozens of analogous simultaneous scenarios, all interacting and intensifying one another. Because of this, the Y2K problem must be the most pressing issue for Congress and the Administration.

David E. Sullivan, President, ZONAR Corporation, testified that we are now in the midst of an effort to fix the entire world's inventory of computer programs. This current plan requires changing hundreds of billions of lines of old, reliable program code into new, improved, and untested code. Based on the computer industry statistics, hundreds of millions of errors will be made, and a large percentage of these errors will not be repaired before the year 2000 deadline. Mr. Sullivan stated that even a small number of failures, when they occur at the same time, may trigger a chain reaction. Mr. Sullivan stated that the Y2K solution needs to be looked at in a new way. The new approach that Mr. Sullivan advocated is based on the idea that we can change the years instead of the program. While this approach is unconventional and temporary, Mr. Sullivan insisted that it works. Since computers don't really know what the date is we will be able to subtract 28 from the real year, and obtain 1972's calendar which is identical to 2000's. With this new method, Mr. Sullivan stated that we would be able to postpone the Y2K problem until we are truly ready for it.

The Honorable Jane F. Garvey, Federal Aviation Administrator, testified that the FAA will not be compromised on January 1, 2000. Administrator Garvey stated that the FAA has closed a significant gap in the Office of Management and Budget's Federal Y2K compliance schedule, and continues to move steadily toward its final solution. Furthermore, Ms. Garvey stated that FAA was scheduled to

complete renovations of 99% of all required systems. With respect to the Host computer, Ms. Garvey stated that the FAA's vendors have developed a well-defined strategy for the successful transition to the Host computer of the 21st century. However, she also mentioned that as a contingency to the Host replacement, renovations to the existing Host computer had been completed as of July 31. In regards to FAA's wider repair efforts, Ms. Garvey stated the FAA was on schedule to have the majority of its systems compliant with the DOT's and OMB's deadline of March 31, 1999, and all FAA systems will be fully compliant by the end of June 1999. Ms. Garvey mentioned that the FAA had made great strides in its partnerships with the domestic and international aviation industry, and that this has raised awareness and allowed people to better work together to solve Y2K problems. Administrator Garvey concluded by stating that the FAA has worked extensively in the international arena.

John Kelly, Jr., Assistant Administrator for Weather Services, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, testified that the National Weather Service, in conjunction with other National Oceanic and Atmospheric Administration agencies and Department of Commerce Information Technology groups have been working since 1996 to ensure that all its systems are Y2K compliant. Mr. Kelly stated that all NWS computer based systems have been assessed in accordance with the U.S. Government Y2K compliance standards and requirements, and that these systems have either been certified or are in the process of being certified as Y2K compliant. Mr. Kelly stated that contingency plans will be in place to ensure that the continued flow of weather data is available after the millennium switch. Mr. Kelly concluded by stating that based upon the successful Y2K testing accomplished to date, the generally non-date centric nature of weather and satellite data products, the partnerships established for the exchange of data, and the planning being done to verify the end-to-end testing of our systems and communications, the NWS along with NESDIS has a high level of confidence in their abilities to continue operations during the Y2K date change.

Ms. Carol B. Hallett, President and Chief Executive Officer, Air Transport Association of America, testified that she is confident the aviation system will operate safely on December 31, 1999; on January 1, 2000; and beyond. Furthermore, as part of the industry's Y2K readiness efforts, Ms. Hallett stated that contingency plans are being developed for every conceivable adversity. Ms. Hallett testified that airlines individually recognized the Y2K problem several years ago, and mentioned that over 300 airlines worldwide are engaged in a cooperative effort to determine the Y2K readiness of the aviation industry. Ms. Hallett concluded that the Y2K challenge is similar in many ways to the multitude of operational challenges that the airlines face daily. She believes that the experience, coupled with the industry information survey and exchange program, the planning efforts and resources devoted to this challenge by the individual airlines, and the support of Congress and the Administration, puts them in a position to provide safe, efficient and economical air transportation on January 1, 2000.

Walter S. Coleman, Regional Airline Association, testified that the Regional Airline Association members, which include airlines and suppliers, are participating in both individual and industry initiatives to address the issues associated with ensuring that the technology dependent software and processors will function safely and efficiently in the Year 2000. Mr. Coleman stated that the RAA is also working with the FAA as necessary to assist in the mutual need for a fully implemented Y2K program by June 30, 1999. Mr. Coleman moved on to discuss RAA's Y2K "Tool Kit" to help airports in the country served by RAA member airlines. Mr. Coleman concluded by stating that the RAA will continue to work with the FAA to ensure a safe, reliable and efficient air transportation system throughout 1999 and into 2000.

Richard C. Cullerton, Assistant Vice President for Engineering, Metropolitan Washington Airports Authority, testified that the Metropolitan Washington Airports Authority operates both Ronald Reagan Washington National Airport and Washington Dulles International Airport. Together, Mr. Cullerton reports that these airports move over 30 million passengers a year. Due to the disruption the Y2K problem poses, the Authority takes it very seriously in order to ensure the safety of its future travelers. In order to combat the problem, the Authority has set up a Task Force to address potential Y2K impacts. Furthermore, the Authority has implemented a remediation approach based on the GAO format that encompasses the following five phases: Awareness, Assessment, Renovation, Validation, and Implementation. Mr. Cullerton indicated that the Awareness Phase has been completed and that the Assessment Phase is underway. Furthermore, the Authority has divided the Y2K problem into four areas: Personal Computers, software, embedded systems, and external interfaces. He stated that each area is being worked on concurrently. To date, the Authority has developed an inventory of over 500 potential non-compliant Y2K systems components. Mr. Cullerton concluded by stating that the Authority feels confident that it can resolve the critical system issues over the next 16 months, and ensure that both of its airports operate normally on Saturday, January 1, 2000.

Dwight Greenlee, Director of Administration, Wichita Airport Authority, testified that given the limited time remaining, it has become critical at all levels to prioritize resources to assure that "mission critical" systems perform as required. Mr. Greenlee stated that for this reason the Wichita Airport Authority joined with others to pool resources to solve their Y2K problem. However, Mr. Greenlee stated that legal measures discourage many others from cooperation that requires commitment of funds, people and the sharing of information, and indicated that it is necessary to pass legislation to relieve this dilemma. Mr. Greenlee moved on and discussed the situation that many smaller regional airports find themselves in, specifically in regards to the high costs associated with relieving their Y2K problems. They must either issue debt financing, apply for Airport Improvement Program (AIP) funds, include the request in a Passenger Facility Charge (PFC), or attempt all of the above. However, the application process for AIP and PFC funds is time consuming, and to be able to help smaller airports with their Y2K effort a fast track procedure must be implemented.

4.5(mm)—*Status of the District of Columbia's Year 2000  
Compliance Effort*

October 2, 1998

Hearing Volume No. 105-92

*Background*

On October 2, 1998, the Subcommittee on Technology held a joint hearing with the Subcommittee on the District of Columbia; Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight, entitled "The Status of the District of Columbia's Year 2000 Compliance Effort," to review the Year 2000 computer challenge compliance efforts by the Government of the District of Columbia.

On June 17, 1998, the General Accounting Office (GAO) submitted a report to the DC Subcommittee that the District of Columbia faces serious problems in ensuring that vital services are not disrupted by the Year 2000 problem. Due to the current financial constraints facing the District, most current systems utilized by the DC Government are not 2000 compliant. The DC Inspector General also found that there is no overall Year 2000 plan.

Witnesses included: Mr. Jack Brock, Director Information Management Issues, Accounting and Information Management Division, U.S. General Accounting Office, The Honorable Constance B. Newman, Vice Chair, District of Columbia Financial Responsibility and Management Authority, Washington, D.C., Dr. Camille C. Barnett, Chief Management Officer, Government of the District of Columbia, Washington D.C., Ms. Suzanne Peck, Chief Technology Officer, Government of the District of Columbia, Washington, D.C.

*Summary of hearing*

Mr. Jack Brock, Director, Information Management Issues, Accounting and Information Management Division, U.S. General Accounting Office, testified that until this past June, the District had only made limited progress in addressing its Y2K problem. Mr. Brock stated that since June, the pace of the District's Y2K effort has picked up considerably, and this should substantially improve its ability to complete the tasks ahead. However, Mr. Brock stated that since the District was so far behind in addressing this problem, the risk that critical processes could fail is greatly increased. Mr. Brock concluded by stating that the District needs an absolute commitment from its leadership to make the most of the short time remaining.

Constance Newman, Vice Chair of the District of Columbia Financial Responsibility and Management Assistance Authority, testified that the District started very late in addressing the Y2K problem. This has necessitated a work schedule that requires certain steps to be undertaken simultaneously rather than in the optimum situation where they would be implemented sequentially. Additionally, Ms. Newman requested that Congress give the District consideration when it debates the appropriation of \$3.25 billion in aid to government agencies in achieving Y2K compliance. Ms. Newman concluded by discussing the opportunities that arise as logical

extensions out of the currently approved management reform technology infrastructure projects. She stated that the successful completion of these projects will dramatically increase the District's ability to improve services to citizens, reduce costs, and expand revenue opportunities. Dr. Camille Cates Barnett, Chief Management Officer for the Government of the District of Columbia, testified that until June the Districts Y2K efforts had been moving slowly. However, since June the District has moved quickly to engage the problem. The first milestone was completed on August 28, 1998 when the District identified 336 mission-critical systems, 84 of which are Y2K compliant. The others require a mix of testing and remediation. Dr. Barnett stated that the District is significantly behind, and has much more work to do before it can confidently call itself Y2K compliant.

Suzanne Peck, Chief Technology Officer for the Government of the District of Columbia, testified that the total cost of the Districts Y2K problem will probably be in the range of \$80–130M. Ms. Peck stated the District's most important task over the next 15 months is to effectively manage the risk of disruption to essential city services. Expecting that some of the city's agencies will still fail after remediation and testing, Ms. Peck stressed the need for contingency planning. Additionally, for these contingency plans to be successful, a substantial commitment of resources must be made by agencies. Ms. Peck also stressed the need for agencies to develop full blown disaster recovery plans.

*4.5(nn)—Fastener Quality Act: Needed or Outdated?*

*October 8, 1998*

*Hearing Volume No. 105–94*

*Background*

On October 8, 1998, the Subcommittee on Technology held a hearing entitled, "Fastener Quality Act: Needed or Outdated?"

Despite its passage in 1990, FQA has never been implemented. Questions about the adequacy of laboratories facilities to test fasteners in a timely manner, the definition of fasteners covered by the Act, and the need for FQA have dogged the law and prevented implementation of a final NIST rule.

Witnesses included: The Honorable J. Dennis Hastert, Member of Congress, U.S. House of Representatives, Washington, DC; The Honorable Donald Manzullo, Member of Congress, U.S. House of Representatives, Washington, DC; The Honorable Raymond Kammer, Director, National Institute of Standards and Technology, Rockville, MD; Richard Klimisch, Ph.D., Vice President-Engineering Affairs Division, American Automobile Manufacturers Association, Washington, DC; Mr. Tommy Grant, President, Grant Fastener, Inc., Houston, TX; Mr. Robert Brunner, Vice President and General Manager, Shakeproof/ITW, Elgin, IL.

*Summary of hearing*

The Honorable J. Dennis Hastert, Member of Congress, U.S. House of Representatives, addressed a number of issues important in this examination. Congressman Hastert emphasized that dra-

matic changes have occurred over the last decade, since the law was passed, in the fastener manufacturing process. This fact is explicitly recognized by the National Institute of Standards and Technology in their Final Rule implementing the FQA published earlier this year. He also expressed that it is important to realize that increases in fastener quality and public safety over the last decade have occurred in the absence of the implementation of the FQA. Thus it is safe to conclude that the Act has served its purpose—without ever being implemented. Furthermore, he believes that the lack of clear evidence suggesting that fasteners pose a serious risk to public safety is one of the key problems that have plagued the FQA since its inception. In other words, anecdotal evidence alone may have replaced hard science in necessitating this Act. Congressman Hastert concluded by cautioning Congress to take a much closer look at the origination of the Act in order to determine the onerous burden that will be placed on many small businesses.

The Honorable Donald Manzullo, Member of Congress, U.S. House of Representatives, welcomed the opportunity to address the issue of the disposition of the Fastener Quality Act (FQA) as no issue has as greater an impact on the future of fastener businesses in his district and across the United States than this one. Congressman Manzullo feels that any lasting resolution to modify the FQA must address the concerns raised by the small manufacturers within the fastener industry. These problems with the FQA from the perspective of small fastener firms are numerous: ambiguity about which fasteners the Act covers; availability and proximity of accredited labs; confusion about the definition of certification; prohibitive compliance costs; over-regulation of the industry; loss of market share to foreign competitors because the FQA exempts fasteners imported as components of larger parts; and lack of information about required tests of a specialized product are all major concerns of fastener manufacturers in his district. He cautioned that resolution of these matters needs to be an important part of any final modification of the FQA. Otherwise small fastener manufacturers across the U.S. will have serious problems. Congressman Manzullo concluded by emphasizing that he believes all interested parties can and should work together to arrive at an agreeable solution.

The Honorable Raymond Kammer, Director, National Institute of Standards and Technology, addressed the specific concerns that Congress and industry appear to have regarding the ultimate resolution of the FQA. He detailed the three steps that NIST and the Department of Commerce are taking to deal effectively with this: First, the Department published a Federal Register notice on October 7, 1998, requesting information from the public about important issues related to the study including changes in fastener manufacturing technology over the past eight years and information on other regulatory programs. Second, the American Society of Mechanical Engineers (ASME) has agreed to conduct a three-day workshop in mid-November to document how fastener manufacturing technology has changed since 1990. ASME is the premier technical and educational society in mechanical engineering and have recent, and direct, experience in conducting such studies. Their goal is to quantify not only the sophistication of the technology now

being used, but also to learn the extent to which it is used across the industry. Third, staff from NIST not previously involved in fastener activities will document other fastener regulatory programs. In conclusion, Director Kammer emphasized that the Department of Commerce is working vigorously to actively solicit—and consider seriously—all suggestions for changes to the Act. In the interim they are also moving forward to the implementation of the Act as required by law.

Richard Klimisch, Ph.D., Vice President—Engineering Affairs Division, American Automobile Manufacturers Association, emphasized that since the domestic automotive industry is the single largest consumer of industrial fasteners in the U.S. economy the AAMA takes very seriously the performance of fasteners. AAMA believes the entire universe of industrial fastener users would agree that the Fastener Quality Act, in its present form, is unworkable and will cause great disruption to the U.S. economy without providing any significant public safety benefit. That the law was passed eight years ago and yet still has not been implemented calls into question the necessity of such an onerous burden being placed on so many manufacturers. AAMA and its member companies recommend very strongly that the current law as written be replaced and that Congress and the Secretary of Commerce, as directed by PL 105–234, approach the matter of whether and how industrial fasteners should be regulated with a “clean sheet of paper.”

Mr. Tommy Grant, President, Grant Fastener, Inc., believes that just as there was a need for a fastener quality law then, there is a need now. He emphasized that the FQA is a badly needed public safety legislation. Mr. Grant concedes that perhaps forty years ago the U.S. did not need such an umpire, but now our entire society lacks honesty and ethics, thereby, necessitating the FQA. Mr. Grant believes that FQA is a simple, and inexpensive law that ensures that what is being supplied matches what is ordered. He believes that if a manufacturer is capable of doing his job, then he shouldn't be objecting to the act. He also cautioned against changing the legislation due to concerns that it will adversely impact small business. The law as written, and attested to him by a number of small fastener manufacturers, will have a minuscule impact on small manufacturers.

Mr. Robert Brunner, Vice President and General Manager, Shakeproof/ITW, testified on behalf of the Industrial Fasteners Institute (IFI); a trade association representing the fastener manufacturing industry in North America, including Canada, Mexico, and the United States, and its suppliers of raw materials, machinery, tooling, installation equipment and engineering services from around the world. He emphasized that IFI strongly supported Congressional action in the form of PL 105–234, delaying implementation of the Fastener Quality Act (PL 101–592, as amended) so as to examine fully whether the Act is still needed. Mr. Brunner contends that since there have been significant changes in fastener manufacturing and purchasing practices since the FQA was first passed in 1990, an examination of the continued necessity of the law is in order. The goal of the IFI is zero defects in parts, including fasteners. In fact many are already required to institute Quality Assurance Systems(QAS) with stated goals achieving zero de-

fects. IFI also contends that the study Congress directed the Department of Commerce to perform and submit to Congress in February 1999 to identify changes that have occurred in the fastener industry is overdue and will demonstrate that the present FQA is both unworkable and unnecessary in today's private sector fastener environment. Additionally, IFI stands ready to assist the Commerce Department in assessing the changes that have occurred in the industry, and hopes that the Department will work closely with industry in conducting the study and in drafting its Report and recommendations to Congress. Mr. Brunner recommended that Congress schedule additional hearings on the FQA once it receives the Commerce Secretary's report and recommendations so that Congress can have the opportunity to explore options for amending the Act with industry and other impacted interests, both domestic and foreign, including distributors, federal agencies that procure fasteners, and federal agencies that already have prosecutorial jurisdiction before taking action.

## APPENDIX

### VIEWS AND ESTIMATES of the COMMITTEE ON SCIENCE FOR FISCAL YEAR 1998

The Committee on Science believes the future of this nation is tied to science, and that the federal government should play an important role in the promotion and support of our scientific endeavors. As we enter the next millennium, our nation faces many challenges that can be met by enhancing the country's scientific and technical base. Whether finding a cure for a deadly disease, developing technologies which minimize waste and pollution, or discovering clean and safe energy sources to sustain us well into the future, a healthy scientific research and development base is required.

The Committee on Science enthusiastically supports the efforts to balance the budget. For if Congress and the Administration fail to achieve this goal, future funding for all discretionary programs, including science and technology programs, will be jeopardized. Twenty years ago, non-defense discretionary spending accounted for almost 22.3 percent of the budget while interest on the national debt was a mere 7 percent. Today, the federal government spends 16.1 percent of the federal budget on non-defense discretionary programs and 15 percent on servicing the national debt. As interest on the public debt and the entitlement program spending continues to grow, less and less funding will be available for non-defense discretionary spending programs such as space exploration and scientific research. To prepare America for an increasingly technologically advanced competitive world and to prepare our next generation of scientists and engineers, we need to first assure our federal financial house is in order.

Therefore, it is within this framework that the Committee on Science prepared the Views and Estimates for Fiscal Year 1998. We remain convinced that within a stable discretionary budget, Research and Development can compete favorably with other funding priorities. The Administration's budget request was only 1% over the Fiscal Year 1997 level for the research and development programs under the Committee's jurisdiction. The Committee strongly feels that an investment in science is an investment in the future, therefore we are submitting a budget request that assumes a 3% increase from Fiscal Year 1997 spending levels. The Committee seeks to increase funding for basic research, scientific infrastructure, and for selected NASA and environmental programs. To partially offset these increases, funding for other programs within its jurisdiction will need to be maintained at current levels or slightly decreased. As the Committee moves through the authorization and budget process, it is our intention to provide funding for those programs that meet or exceed the following criteria:

1. Federal Research and Development should focus on essential programs that are long-term, high risk, non-commercial, cutting edge, well-managed, and have great potential for scientific discovery; funding for programs that do not meet

this standard should be eliminated or decreased to reduce budget demands and to enable new initiatives.

2. Federal R&D should be highly relevant to and tightly focused on agency missions, with accountability and procedures for evaluating quality and results.
3. Beyond the demonstration of technical feasibility, activities associated with evolutionary advances or incremental improvements to a product or process, or the marketing or commercialization of a product or process should be left to the private sector.
4. Where possible, international, industry and state science partnerships should be nurtured as a way to leverage U.S. taxpayer R&D investment.
5. Infrastructure necessary for carrying out essential federal R&D programs needs to be prioritized consistent with program requirements.

In this era of limited resources, taxpayers' dollars must be used in the most effective manner possible, and the taxpayers must be convinced they are getting value from federally-funded R&D. In this regard, the Committee will continue to examine how we can leverage the American taxpayers' R&D investment through international relationships. Further, the important role of government-university-industry relationships will need to be reviewed to ensure those partnerships reflect the challenges of the information age. The Committee recognizes the need to enhance the efforts to better educate the public about the benefits of federal government funded scientific research as well as funding those programs that satisfy the criteria.

The Fiscal Year 1998 Views and Estimates for programs within the jurisdiction of the Committee on Science are contained in the following pages.

#### SUBCOMMITTEE ON BASIC RESEARCH

The Committee continues to believe that it is the proper role of government to support fundamental research, science and engineering education, and to reduce government activity in those areas better served by the private sector.

#### **NATIONAL SCIENCE FOUNDATION (NSF)**

NSF provides funding to over 19,000 research and education projects in science and engineering. It does this through merit-reviewed grants and cooperative agreements to more than 2000 colleges, universities, K-12 schools, businesses and other research institutions in all parts of the United States. NSF accounts for about 25 percent of federal support to academic institutions for basic research.

The Administration's request of \$3.367 billion for Fiscal Year 1998 is a 3 percent increase over the Fiscal Year 1997 appropriation of \$3.27 billion. The 3 percent increase is consistent with the House-passed budget resolution in the 104<sup>th</sup> Congress for basic

research. The Committee on Science continues to support this level of growth in funding for fundamental science, and will continue to advocate policies that encourage innovation and private investment in the future.

**FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)  
FIRE PROGRAM**

The United States Fire Administration (USFA) supports activities in public education in fire safety, prevention and control; data collection, analysis and distribution; fire suppression research and development; arson prevention; and firefighter health and safety. For Fiscal Year 1998, the Committee supports a funding freeze at \$28.7 million, but is concerned that FEMA's incorporation of counter-terrorism training program into its request for USFA without a corresponding offset or request for additional funds will negatively impact other programs.

**EARTHQUAKE PROGRAM  
The National Earthquake Hazards Reduction Program (NEHRP)**

The Administration's budget request for NEHRP in Fiscal Year 1998 is \$97.6 million, approximately \$1 million less than the Fiscal Year 1997 appropriated level. As the lead agency for earthquake planning and mitigation programs, FEMA would receive \$18.7 million. The National Science Foundation (NSF) would be allocated \$28.9 million for fundamental earthquake studies, earthquake engineering research and post earthquake studies. The United States Geological Survey (USGS) which conducts research on earthquake hazards potential, earthquake effects, and post earthquake phenomena would receive \$48.1 million. NEHRP also funds research at the National Institute of Standards and Technology (NIST) in improvement of codes and standards for lifelines and structures at \$1.9 million. The Committee supports the essential freeze of funding for NEHRP, but will be reviewing the allocation priorities within the program.

**SUBCOMMITTEE ON SPACE AND AERONAUTICS**

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)**

The Committee on Science has established priorities at NASA which include: (1) Safe Operation of the Shuttle; (2) Completion of the Space Station program on time and on budget; (3) Space Science; and (4) the Reusable Launch Vehicle (RLV) program. The Congressional emphasis over the last two years has been to restore NASA's original mission of research and development. NASA's budget request for Fiscal Year 1998 is \$13.5 billion, \$200 million less than the Fiscal Year 1997 appropriated level. While we were disappointed that the President again proposed to decrease NASA's budget to \$13.5 billion, the Administration did improve their projections for the outyears in the Fiscal Year 1998 request.

The Committee remains firmly committed to building the International Space Station. This program has had to overcome many obstacles in the past and continues to be challenged by delays in Russian components. We would prefer to continue the program with the Russians, but we support the Space Station regardless of their participation.

Last year the Space Shuttle's operations were consolidated under one contract in order to provide more efficient operation leading to eventual cost savings. The Committee is supportive of these efforts to streamline, while maintaining safety as the first priority.

The Reusable Launch Vehicle programs is one of the highest priorities for the Committee. We are supportive of programs like the X-33 whose goal is to fly a demonstrator vehicle in 1999 that will lead to a low-cost, highly robust reusable launch vehicle. Greatly reduced costs of getting to space will reduce the federal government's expenditures and will open entirely new, and presently unimaginable markets. The Committee is leading the way in reducing regulatory burdens and providing incentives to commercialize space. As NASA's annual budgets continually decrease, the importance of leveraging federal resources with private sector activities grows exponentially. In addition, the Committee intends to continue its oversight of NASA procurement practices with the goal of identifying cost savings so that future reductions will have less impact on their core programs.

NASA's core science missions - Space Science as well as Life and Microgravity Sciences - continue to be very high priorities for the Committee. The Life and Microgravity Sciences program is aerospace medicine, chemical research, and research into the physical effects of space on the human body. Space Science consists of planetary exploration including the Mars Surveyor Program, as well as funding physics and astronomy missions like the Hubble Space Telescope. The Committee supports full funding for these programs.

The Mission to Planet Earth program is NASA's contribution to the U.S. Global Change Research Program. The core components are the Earth Observing System (EOS) and the Earth Observing System Data Information System (EOSDIS). EOS consists of a series of satellites to monitor the Earth and EOSDIS is supposed to manage the program's data. Mission to Planet Earth was not an original mission of NASA. The Committee continues to search for ways to streamline the program including using private sector resources to fulfill some of the technology requirements. MTPE was introduced into the NASA budget as a special initiative to be funded above and beyond NASA's base budget at a time when NASA's budget was expected to grow by 10 percent annually. Instead, NASA's budget has decreased each year while MTPE has grown each year which has been detracting from the core science missions of NASA.

#### **Office of Space Commerce**

The Office of Space Commerce is located in the Office of the Undersecretary for Technology for the Department of Commerce. The Committee supports the efforts of this small office in their promotion of commercial space activities.

**Office of Commercial Space Transportation**

This office is located in the Federal Aviation Administration at the Department of Transportation, and it is responsible for issuing licenses to commercial launch providers. The Committee on Science remains concerned about the allocation of resources within the office, and believes their focus should remain on its regulatory responsibilities.

**SUBCOMMITTEE ON TECHNOLOGY****NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)  
Scientific and Technology Research and Services (STRS)**

The Committee is committed to improving the federal infrastructure required to promote technology development within the framework of a balanced budget by 2002. The programs of the Technology Administration (TA) play a vital role in maintaining America's competitive advantage in an increasingly crowded global marketplace.

Of primary importance are the core functions of the National Institute of Standards and Technology (NIST). These functions are carried out under the Scientific and Technology Research and Services (STRS) budget account. The functions include measurement and standards research in the areas of electronics and electrical engineering, manufacturing engineering, chemical science and technology, physics, materials science and engineering, fire prevention, computer systems, applied mathematics and scientific computing.

**Industrial Technology Services**

The Committee recommends allocating sufficient funding to cover the existing mortgages for the Advanced Technology Program (ATP). To date, the Department of Commerce has shown only anecdotal evidence that ATP has yielded any benefit to U.S. competitiveness. In surveying ATP grant recipients, the General Accounting Office (GAO) found that fully half the respondents indicated that they would probably have pursued the development of the technology without grant funding. The Secretary of Commerce's recent announcement that he intends to conduct a 60-day review of the program to improve its effectiveness reinforces the point. With limited research and development resources, the federal government must concentrate on financing research and development the private sector will not fund. As a priority, ATP ranks below most other NIST programs.

The Committee supports continuation of the Manufacturing Extension Partnership (MEP) program in Fiscal Year 1998.

### **Construction**

The Committee continues to strongly support efforts to modernize NIST's aging infrastructure. The inability of the Department of Commerce to finalize a construction plan for new facilities needs in time for the FY 1998 budget cycle will delay consideration of the plan until FY 1999. The Committee recommends that the Department of Commerce devise an affordable plan, which ensures that NIST's priority facility needs are met, by no later than this spring to enable full consideration and approval during Fiscal Year 1999. In the interim, funding NIST's backlog of maintenance needs is a priority.

### **NATIONAL TECHNICAL INFORMATION SERVICE (NTIS)**

The Committee continues to support the activities of the National Technical Information Service (NTIS). Currently, NTIS is a self supporting agency. It is responsible for the collection and dissemination of scientific, technical, engineering, and other business-related information from federal and international sources. NTIS covers its operating costs through revenues earned from the sale of information products and services. The Committee supports spinning-off NTIS as a wholly-owned government corporation to enhance its ability to operate in an efficient manner and yield improved services for its clients.

### **FEDERAL AVIATION ADMINISTRATION (FAA) RESEARCH, ENGINEERING AND DEVELOPMENT (RE&D)**

The Federal Aviation Administration (FAA) Research, Engineering and Development (RE&D) account supports critical research to improve the effectiveness of air traffic control operations, mitigate aircraft noise and emissions and enhance the national air traffic control system by increasing safety, security, capacity, and productivity. The Committee supports the continued level of funding for these important research programs.

### **SURFACE TRANSPORTATION R&D**

The Committee supports investing 3 percent of the Federal Highway Administration's \$20 billion budget in research and development activities. Advanced transportation technologies developed through the Intelligent Transportation System have already proven to increase infrastructure capacity and efficiency by as much as 60 percent in some areas, lessening congestion, pollution and saving resources by reducing the need for new infrastructure. Similarly, new products and materials developed through surface transportation research and development programs have extended pavement and bridge life-cycles for the projects. Although such technologies have been used in only 25 percent of highway infrastructure projects they already account for annual savings of three-quarters of a billion dollars. Continued research and development will allow for wider

deployment of these new products and materials, saving billions of dollars in annual transportation maintenance costs.

### SUBCOMMITTEE ON ENERGY & ENVIRONMENT

#### **NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)**

The stated mission of the National Oceanic and Atmospheric Administration is to describe and predict changes in the Earth's environment, and conserve and manage the Nation's coastal and marine resources to ensure sustainable economic opportunities. NOAA conducts research to develop new technologies, improve operations, and supply the scientific basis for managing natural resources and solving environmental problems.

The NOAA programs for which the Science Committee has sole jurisdiction include: the National Weather Service (NWS); the National Environmental Satellite, Data and Information Service; the Program Support's Aircraft Services account; and the Oceanic and Atmospheric Research (OAR) office's Climate and Atmospheric programs. In addition, the Committee has jurisdiction over the appropriate line accounts under the Construction and the new Capital Assets Acquisitions accounts. And the Committee shares jurisdiction (with the Committee on Resources) over OAR's National Undersea Research Program, Sea Grant, Marine Prediction Research, Administration, and Fleet Modernization.

Of major concern to the Committee is the National Weather Service modernization program, which has been underway for 15 years at a cost of about \$4.5 billion. The U.S. General Accounting Office (GAO) has identified this program as a high-risk area, and it has been the subject of a number of critical reports by the Department of Commerce Inspector General (DOC IG). The deployment and development of the observing systems associated with the modernization are nearing completion. However, unresolved issues still remain concerning the observing systems' operational effectiveness and efficient maintenance, such as performance problems with the new radars and ground-based sensors. In addition, GAO has noted that the NWS lacks a means by which to ensure that systems provide promised returns on investment, and that the NWS has not demonstrated that all proposed capabilities will result in mission improvements.

The Committee is also concerned about other programs that have been the subject of GAO and/or DOC IG reports, including the NOAA Fleet, the NOAA Corps, Polar Orbital Environmental Satellite funding, procurement of follow-on Polar Orbital Environmental Satellites (GOES).

The Committee intends to examine carefully NOAA's FY 1998 funding proposals with the view that, within a constrained budget environment, any increases to NOAA's current level of effort should be offset by reductions to obsolete, redundant, low-risk, near-term programs.

**ENVIRONMENTAL PROTECTION AGENCY (EPA) R&D**

The Committee on Science has or shares jurisdiction over EPA R&D programs funded in five separate appropriation accounts: Environmental Programs and Management (Science Advisory Board), Science and Technology, Superfund R&D, Leaking Underground Storage Tank (LUST) R&D, and Oil Spill Research. The Committee on Science shares Superfund R&D jurisdiction with the Committee on Commerce.

The Committee's principal concern with EPA's R&D program is the lack of documentation and justification for its budget request, a concern shared by a number of independent bodies such as the National Academy of Sciences and the EPA Science Advisory Board. The Committee intends to pursue this issue vigorously with the agency. In particular, there is little or no justification provided for new initiatives such as the Americans' Right-To-Know and the Advanced Measurement Initiatives, as well as many of the substantial increases requested for a number of programs. Also of concern is the requested decrease to Drinking Water research and the impact to EPA's ability to fulfill the mandates of the Safe Drinking Water Act Amendments of 1996.

The Committee intends to provide selective increases as merited to EPA's R&D efforts where those increases are justified and warranted. However, the Committee believes that most, if not all, of these increases can be offset by corresponding decreases to current programs that do not contribute substantially to EPA's mission, or that are obsolete or redundant.

**DEPARTMENT OF ENERGY (DOE)**

The Committee on Science has jurisdiction over DOE's civilian research, development, demonstration and commercialization (RDD&C) activities. The DOE's Fiscal Year 1998 budget request proposes to fund these activities through seven appropriations accounts: Energy Supply R&D, Energy Assets Acquisition, General Science and Research, and Science Assets Acquisition, Fossil Energy, Energy Conservation R&D, the Clean Coal Technology Program.

The Committee's major concern with DOE is its contract management, particularly with respect to the DOE National Laboratories where much of the civilian R&D is performed. DOE is the largest civilian contracting agency in the federal government; it contracted out 91 percent of its \$19.2 billion in Fiscal Year 1995 obligations. Since 1990, GAO has designated DOE contracting as a high-risk area vulnerable to waste, fraud, abuse and mismanagement because DOE's missions rely heavily on contractors and DOE has a history of weak contractor oversight. In addition, DOE's conduct of its R&D programs has been criticized for excessive bureaucracy, and for its emphasis on near-term, low-risk R&D, commercialization and marketing activities that are more properly carried out by the private sector.

The Committee intends to increase support for DOE's long-term, high-risk, high-quality research and environmental cleanup programs, while simultaneously reducing funding for near-term, low-risk research and for commercialization and marketing efforts.

The Committee believes that DOE can accomplish its mission within existing or slightly reduced funding levels.

### OVERSIGHT

#### **GOVERNMENT PERFORMANCE AND RESULTS ACT (Results Act)**

Each year, American taxpayers invest billions of federal funds in civilian science agencies and programs. Rightly so, the American people are demanding that these funds be spent in a more efficient and businesslike manner. Accordingly, Congress has taken several steps to improve federal fiscal responsibility and federal management of these programs.

The Results Act provides an effective oversight tool for the Science Committee to reexamine the value and effectiveness of science programs and legislate the necessary corrective measures to these programs. By requiring agencies to adopt new planning, budgeting and reporting procedures, government agencies and programs should become more efficient, effective and accountable to the American taxpayer.

The Results Act provides a legislative vehicle for agencies to use as they seek to demonstrate and improve their effectiveness because agencies must set strategic and annual goals, measure performance, and report on the degree to which goals are met. To accomplish this, agency managers must fundamentally shift the focus from a preoccupation with staffing and activity levels to a focus on outcomes of federal programs, in other words, what is the difference their federal program makes in people's lives.

This year as the implementation of the Results Act goes government-wide, requiring agencies to formally file Strategic Plans with Congress by September 30, 1997, the Science Committee considers the full and effective implementation to be a priority for agencies under its jurisdiction and intends to use the Results Act as a key oversight tool.

#### **GENERAL ACCOUNTING OFFICE'S HIGH-RISK PROGRAMS**

In February 1997, the General Accounting Office (GAOs) issued its third series of reports since 1990 on federal program areas GAO identified as high risk because these government operations are highly vulnerable to waste, fraud, abuse and mismanagement.

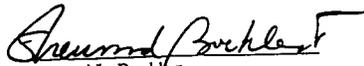
Under the purview of the Committee on Science, GAO listed four information technology initiatives: (1) the Air Traffic Control Modernization, (2) the National Weather Service Modernization, (3) Information Security and (4) the Year 2000 Problem; and three contract areas: (1) in the Department of Energy, (2) in NASA, (3) in Superfund.

Without correction, high-risk areas result in the lose of billions of taxpayer dollars and cause agencies to miss opportunities to achieve their objectives at less cost and with better service delivery. Therefore, the Committee on Science plans to assist the agencies in correcting these problems through the Committees oversight authority.

CONCLUSION

By submitting a budget request that assumes a modest increase of 3% from the Fiscal Year 1997 spending levels for its authorization responsibilities, the Committee on Science has demonstrated its commitment to balancing the budget. Further, the Committee believes that this budgetary level maintains our research and technology base for our nation's future. With this increase, the Committee intends to support funding for basic research, scientific infrastructure, and for selected NASA and environmental programs while maintaining or slightly decreasing funding for other programs within its jurisdiction.

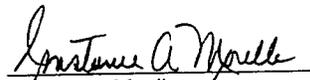
A handwritten signature in black ink, appearing to read "John Lewis". The signature is written in a cursive style with a large, prominent loop at the end.

  
Sherwood L. Boehlert

  
Vernon J. Ehlers

  
Harris W. Fawell

  
Dave Weldon

  
Constance A. Morella

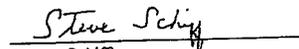
  
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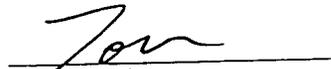
  
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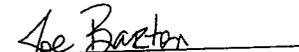
  
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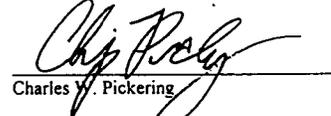
  
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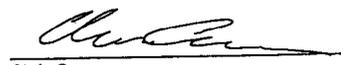
  
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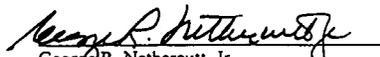
  
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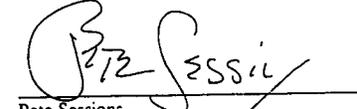
  
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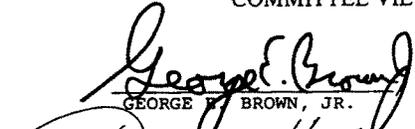
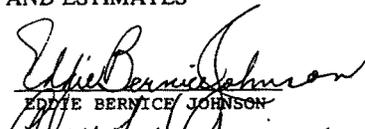
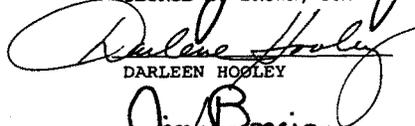
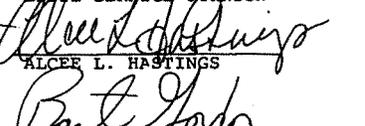
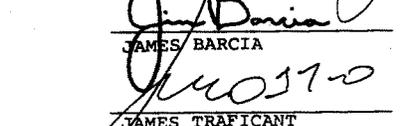
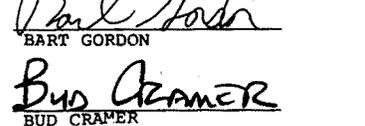
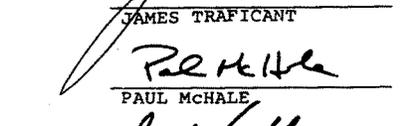
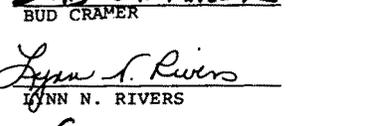
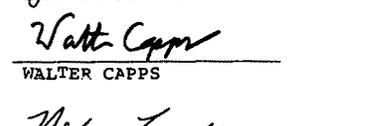
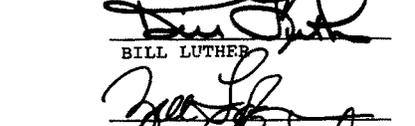
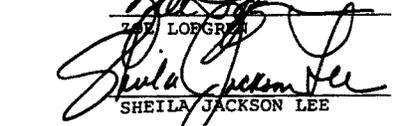
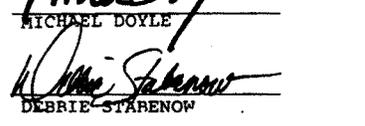
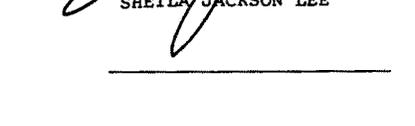
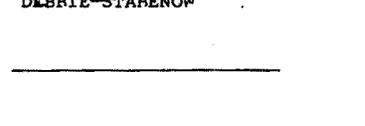
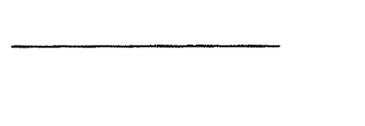
  
Phil English

  
George R. Nethercutt, Jr.

  
Pete Sessions

  
Gil Gutknecht

COMMITTEE VIEWS AND ESTIMATES

 GEORGE F. BROWN, JR.	 EDDIE BERNICE JOHNSON
 DARLEEN HOOLEY	 ALCEE L. HASTINGS
 JAMES BARCIA	 BART GORDON
 JAMES TRAFICANT	 BUD CRAMER
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**Supplemental Views by Steve Schiff**

I think it is important for this Committee and the Congress to acknowledge the increasing importance of government, university, and industry partnerships in this era of fiscal austerity. All three entities are now, and must continue to, collaborate on ventures of mutual interest and work to break down cultural barriers that prevent this type of activity. For example, partnerships such as a cooperative research and development agreement (CRADA) between a national laboratory and an industry on projects that further the missions of government agencies can be mutually advantageous to the participants and help to leverage scarce research and development dollars. In fact, as research and development budgets are tightened by both the public and private sector, it will not be possible to maintain a critical mass of researchers, educators, and technicians at our laboratories and universities without some type of collaboration which leverages resources.

Committee Views and Estimates for FY 1998  
Supplemental for Congressman Harris W. Fawell

As a strong proponent of the continued federal investment in science and technology, I applaud the Committee's emphasis on DOE's long-term, high quality research. Building on the foundation of the FY 1997 budget process, I strongly affirm the efforts of the Chairman and the Science Committee to work with the House Appropriations Committee in determining budget priorities.

I am committed to the importance of basic research. The effort to invest our nation's science dollars wisely is as important as balancing the federal budget. I am also committed to supporting efforts that encourage more partnerships between the national laboratories, universities and private industry. These combined efforts help to utilize the vast scientific resources available in many fields and leverage the federal science investment.

Most importantly, I support the recognition of the scientific excellence of our national laboratories and the effort to prioritize and utilize these outstanding facilities.



Harris W. Fawell  
Member of Congress

## ADDITIONAL MINORITY VIEWS

The Democratic Minority of the Committee on Science generally supports the Views and Estimates contained in this document. Indeed, these views may signal the re-emergence of a broader base of bipartisan agreement over the Federal role in R&D.

The expressed rationale for the Committee's support for R&D is that it constitutes an important *investment in the future*. That is, stable funding for research and development will generate both intellectual capital and direct economic activity in the future. This recognition leads directly to the need for a growth path for R&D that, as a minimum, keeps pace with inflation. This goal will help to return stability and balance to our science and technology portfolio and stem the recent decline that has already had substantial adverse effects on our Nation's R&D enterprise.

Another appropriate goal which has received ample discussion of late is a growth path for R&D that actually keeps pace with the Gross Domestic Product – that is, an annual increase of about 5% per year. This goal is relevant to a broader view of R&D as an economic input directly linked to productivity and growth. A growth of 5% per year would ensure that our investments in R&D will remain in balance with the overall economy and will maintain their positive influence on productivity.

Legislation has also been introduced in the Senate that seeks to double R&D during the next decade – a rate of growth (7%) which would both amplify the impact of R&D on economic performance and help us once again surpass our international competitors in overall R&D investments.

The 104<sup>th</sup> Congress was a crucial turning point in addressing the Federal deficit. The White House, the Republican majority, and the Democratic minority have all committed to achieving a balanced budget by the year 2002. While a balanced budget will remain a political imperative, there is not yet a coherent or unifying policy to guide the process for

achieving balance. Past proposals considered by the Congress range from artful accounting exercises to ideological and social blueprints. None have fully addressed the underlying imperative to create an economy that can sustain growth after the year 2002. R&D can play a central role in creating such a sustainable economy.

The Committee's Views and Estimates underscore the priority that should be placed on R&D within the balanced budget that Congress and the Administration will develop over the coming year. Other investments such as capital infrastructure and education and training bear similar characteristics that establish these as high priorities for a growing economy. In general, however, the present budget process does not adequately distinguish between investment and consumption. Without a fundamental restructuring of the Budget Resolution and Appropriations allocation process, such investments will continue to compete with near-term, politically popular programs that have little or no relationship to future economic growth and productivity. We recommend that the Committees of jurisdiction review ways of more clearly identifying investments in the budget and focusing the decision-making process on future economic growth.

Notwithstanding our broad support for the Committee's Views and Estimates, some differences are likely to emerge in the Committee over specific priorities. For NASA, we support a balanced program that includes the priorities identified in NASA's strategic plan. In addition to those NASA activities highlighted in the Views and Estimates, NASA's strategic plan includes a strong commitment to Mission to Planet Earth, a comprehensive environmental research and monitoring program that will significantly increase our understanding of the Earth and its climate. Since its initiation in FY 1991, Mission to Planet Earth's development cost through FY 2000 has been reduced by nearly a factor of three, with the potential for additional savings in subsequent years. We encourage NASA's continued efforts to maximize the value of the scientific return we will reap from Mission to Planet Earth, and in turn, we are confident that Congress will maintain its traditional bipartisan support for this important initiative.

For the Federal Emergency Management Agency we note the concern expressed in the "Views" for expanding the mission of FEMA to include counter-terrorism without a fully developed supporting budget. We would also note, however, that the Nation's firemen, our first responders to any disaster, must be adequately trained in the event of terrorist attack. Within the past year, the danger to firemen was clearly illustrated by the Atlanta bombings and the Japanese sarin attack, and firemen across the country have given voice to their keenly-felt need for more training. While we are concerned about the impact of anti-terrorism training on the Fire Academy's core training programs, authorization of funds for anti-terrorism training of civilians was provided in the FY 1997 Defense Authorization bill, and we recommend allocating those or other funds to FEMA to meet this urgent need.

For DOE, there was much dispute over "near-term, low-risk research" and "commercial activities" in the 104<sup>th</sup> Congress. While we agree that the Federal Government has no place in funding research that would otherwise be carried out by the private sector in a timely way, there is still a substantial question over where to draw the line between that kind of research and other research worthy of Federal support. This issue will need to be fully explored by the Committee in order to reach a consensus on priorities and goals for DOE and its laboratories.

For EPA, the Views and Estimates note the complexity of the budget request necessitated by conformance with appropriations accounts and the timing of the budget submission. Although the Committee will need to resolve this through oversight hearings, programs that may not be adequately explained in EPA's budget documents do not necessarily constitute lower priority programs.

For the Technology Administration and NIST, we recognize that the Federal role in funding technology programs such as the Advanced Technology Program and the Manufacturing Extension Program will continue to be debated. Because of their long-range relationship to competitiveness and productivity, near-term metrics for ATP and MEP that could support budgetary decision-making are difficult to develop (NIST is doing an exemplary job, in fact, in attempting to develop these very

metrics). We continue to believe that these programs are investments that directly benefit the taxpayer in future jobs and a growing economy.

We agree that there is a need to prioritize the Federal Government's investments in technology programs such as ATP, CRADAs and SBIR. A bipartisan comprehensive review would help the Committee develop a coordinated and seamless R&D investment policy. We support the Secretary's decision to conduct a 60-day review of ATP and anticipate that this may be helpful in forging a consensus within Congress over the pace and significance of this program.

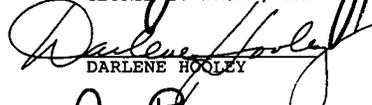
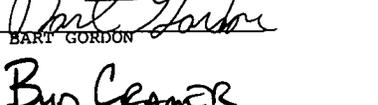
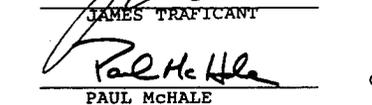
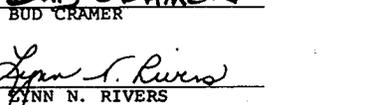
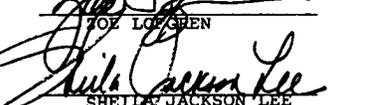
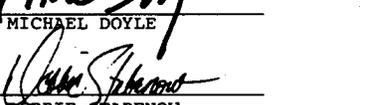
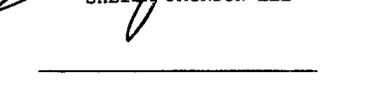
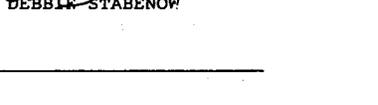
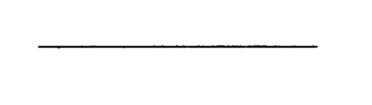
For NOAA, we have long supported reasonable cost constraints for weather modernization programs such as AWIPS. However we continue to view the modernization of the National Weather service as a high-priority activity that merits Congressional support given the long-term savings in life, property, and economic efficiency which it will achieve. In addition, we view weather service personnel as a high priority human resource. Recent reductions in National Weather Service staffing that have resulted from budgetary shortfalls may have a severe effect on the basic mission of the weather service to provide for the safety and protection of life and property. We recommend that the Budget Committee take special cognizance of the needs of NOAA and the National Weather Service.

In addition to these issues, there are certain cross-cutting programs administered by the agencies within the jurisdiction of the Science Committee that merit special attention. The Next Generation Internet program seeks to develop a national infrastructure to enable high-capacity internet transmissions that will aid the scientific community and the public in general. The Partnership for a New Generation Vehicle seeks to focus various agency capabilities on a more efficient, environmentally acceptable automobile. These programs relate to multiple agency missions but should be considered high priority as overall Federal responsibilities.

Finally, the Democratic Minority has joined the Majority in developing an agenda to oversee the implementation of the Government Performance and Results Act. We believe that the development of program metrics and agency strategic plans will have a positive impact on the ability of the agencies under our jurisdiction to carry out their

missions. This initiative will help to define more meaningful long-range agency budgets and to crystallize a coherent Congressional perspective on oversight issues. Although there may be differences in priorities among Democrats, Republicans, and the White House, all have a stake in ensuring that there is a consensus on what is to be expected from the agencies under our jurisdiction.

ADDITIONAL VIEWS

 GEORGE E. BROWN, JR.	 EDDIE BERNICE JOHNSON
 DARLENE HOOLEY	 ALCEE L. HASTINGS
 JAMES GARCIA	 BART GORDON
 JAMES TRAFICANT	 BUD CRAMER
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 TOX LOEHSSEN	 MICHAEL DOYLE
 SHEILA JACKSON LEE	 DEBBIE STABENOW
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Additional Minority Views  
Views and Estimates, Committee on Science  
Rep. Tim Roemer, March 20, 1997

While I can support many of the goals and objectives in the Committee's Views and Estimates, and certainly applaud the bipartisan spirit involved, there are elements in both the Committee views and the minority views that I can not support.

Most specifically, the space station project is as objectionable as ever. It is too expensive, scientifically fruitless, unmanageable, behind schedule, over budget, and flawed in design. The Russian partnership that was supposed to "save" the station has added significant costs, and has turned the project into a management nightmare for NASA. I do not believe that proper oversight of the program by Congress is even possible now.

It would be better for the U.S. space program, our space science infrastructure, and the American taxpayer, if we were to cancel the station now. The savings could help us to more quickly develop the next generation of reusable launch vehicle, which is to replace the aging and expensive shuttle. NASA would be able to concentrate, in the meantime, on some of its great contemporary success stories, such as the Hubble telescope mission, the other great observatories, and the "smaller, faster, cheaper" missions to Mars and other destinations that cost far less and produce usable, reliable science.

Other NASA programs will teach us much, such as the Mission to Planet Earth, which I believe the Views and Estimates document is unnecessarily harsh toward. The document also fails to address the success-driven research done in civil aviation arena, and its constant and large contribution to a positive U.S. balance of trade.

Such research should be listed as one of our priorities. NASA's mission is not solely space: it is charged with aeronautics priorities as well.

In addition, I am concerned about the negativity used in describing the National Weather Service modernization. While acknowledging the legitimate concern about development of the integration software, the modernization process itself is one we should be proud of, and certainly one that took a great deal of effort and strong management. As it nears conclusion, we should be skeptical of dubious criticism about operational effectiveness and management. To the contrary, the nation's new Doppler radar weather system is already acknowledged to have saved many, many lives and abundant amounts of property.

I support the basic thrust of the Views and Estimates, that our research infrastructure should be sound and financially responsible. The role of the government can only be enhanced by significant partnership and respect of the private sector, and a dynamic and healthy research and development infrastructure requires restraint in parceling out taxpayer dollars. But we all seem to acknowledge that there is a legitimate and proper federal role to ensure the robust and lasting contributions that the United States makes to science and technology.



**VIEWS AND ESTIMATES OF THE  
COMMITTEE ON SCIENCE FOR FISCAL YEAR 1999**

The Committee on Science is committed to ensuring America's scientific, technical and engineering base remains strong and viable, thus enabling the nation to remain the most technologically advanced in the world. As we approach the next millennium, it is imperative that we invest wisely in research and development (R&D) so America can meet the challenge of new ideas, increase productivity, and ensure a better quality of life for the next generation.

Last year, in the Views and Estimates submitted to the Committee on the Budget, the Committee on Science recommended a 3 percent increase from Fiscal Year 1997 spending levels for programs under our jurisdiction. While maintaining a strong commitment to balance the budget, and to work within the requirements of the budget agreement, members of the Science Committee passed legislation to strengthen America's science and technology agenda. The multi-year authorization bills crafted by the Committee, with broad bipartisan cooperation, reflected our recognition that new knowledge is essential to our nation's vitality and the Committee's commitment to expand the frontiers of knowledge through basic research.

Continuing our commitment to increase funding for research and development, this year, the Committee on Science is supporting the goal of substantially increasing research funding. For the Committee's support for this goal, increases must comply with the criteria outlined below, and funding must be within the discretionary spending limits. Further, the Committee believes that it is unwise and premature to commit to legislation that signals the abdication of the Committee's responsibility to review and monitor each department's annual budget submission to ensure the taxpayer's money is being spent wisely.

The Committee on Science used the following criteria in the authorization process, and the Committee reaffirms our intention to determine funding increases based upon these principles. First, federal research and development must focus on essential programs that are long-term, high-risk, non-commercial, well-managed, and have great potential for scientific discovery. Second, federal R&D should be highly relevant to and tightly focused on agency missions, with accountability and procedures for evaluating quality and results. Third, beyond the demonstration of technical feasibility, activities associated with evolutionary advances or incremental improvements to a product or process, or the marketing and commercialization of a product or process should be left to the private sector. Fourth, where possible, international, industry, and state science partnerships should be nurtured as a way to leverage the United States taxpayers' research and development investment. Finally, the infrastructure necessary for carrying out essential federal R&D programs needs to be prioritized consistent with program requirements. The Committee agreed that programs not meeting these standards should be eliminated or decreased in order to enable new initiatives in promising areas of scientific research.

This year, the Administration joined the Committee on Science in recognizing the need to invest adequately in scientific research and embraced some of the criteria

established by the Committee in its Fiscal Year 1999 budget. Specifically, as identified in a memorandum to the heads of departments and agencies, the President's outgoing science advisor and the Director of the Office of Management and Budget advocated similar guidelines. Reflecting the emphasis of the Science Committee, the Administration's budget commits the largest percentage of its non-defense R&D to long-term, high-risk basic research.

In the Fiscal Year 1999 budget request, the Administration created the Research Fund for America (Fund) that incorporates all but approximately \$6.8 billion of the total non-defense research and development. According to the Office of Management and Budget, the Fund is made up of 94 percent of all non-defense basic research; 72 percent of non-defense applied research; and 51 percent of non-defense development. For Fiscal Year 1999, actual spending for non-defense R&D increases by 6 percent, and continues to increase through Fiscal Year 2003 in actual and real (i.e. adjusted for inflation) dollars. However, the Committee's concern is that the Administration proposes to pay for the increases in non-defense R&D partially by using uncertain tax increases and uncollected money from the proposed tobacco settlement. In addition, the Administration's budget would violate the discretionary spending caps established by the Balanced Budget Act of 1997.

For programs under the Science Committee's jurisdiction, the Administration's budget increases R&D funding for Fiscal Year 1999 by 4 percent. The Committee's real concern, however, is in the outyears, where real spending on those R&D programs would be less than the Fiscal Year 1998 level. The Committee on Science is troubled about the uncertainty of funding for those programs under its jurisdiction that are included in the Research Fund for America. Funding for the National Science Foundation, the Next Generation Internet, the Intelligent Transportation System, Space Science, Earth Science, NASA Aeronautics, Space Transportation Technology, the National Institute of Standards and Technology, the Department of Energy's High Energy and Nuclear Physics, Basic Energy Sciences, Biological and Environmental Research and Fusion Energy Sciences programs, and the National Oceanic and Atmospheric Administration's Research would be in jeopardy if the tobacco settlement, or the tax increases proposed by the Administration fail to materialize.

The Committee on Science takes its authorization and oversight responsibilities seriously, therefore, the Committee has undertaken a study of our nation's science policy to develop a long-term strategy as to how federally supported research and development can best be accomplished both domestically and internationally. The results of the study will guide the Committee in its future decisions, and will provide the justification for sustainable increases in funding for research and development.

The historic balanced budget agreement passed in 1997 reflected Congressional will to put the federal financial house in order. Consequently, today the national economy is strong, and the federal government is expected to produce a small surplus for the first time in nearly three decades. It is within this framework that the Committee on Science is supporting efforts to substantially increase research and development funding, and would urge the Committee on the Budget and the Committee on Appropriations to, at a minimum, increase funding by the 4 percent level recommended by the Administration for programs under the Science Committee's jurisdiction for Fiscal Year 1999. Further,

although the Administration's budget increases for Fiscal Year 1999 represents a renewed commitment to R&D funding in the near term, the Committee on Science remains committed to the goal of stable and sustaining R&D funding in the long term. The Committee on Science recognizes the challenge is not only the recommendation that scientific research and development becomes a higher federal investment priority, the challenge is to mobilize Congressional and public support for investing in our economic futures.

The Fiscal Year 1999 Views and Estimates for programs within the jurisdiction of the Committee on Science are contained in the following pages.

#### **SUBCOMMITTEE ON BASIC RESEARCH**

It is the Committee's view that supporting basic research, including math, science, and engineering education, is a proper role of government. The Committee further believes that government activities should be reduced in areas better served by the private sector.

#### **NATIONAL SCIENCE FOUNDATION (NSF)**

NSF funds over 19,000 projects in research, engineering, and education. Most of NSF support is through competitive, peer-reviewed grants and cooperative agreements to more than 2,000 universities, colleges, K-12 schools, businesses, and other research institutions throughout the United States. About 25 percent of the federal support for academic institutions for basic research is provided through NSF. In addition, NSF provides funds for about 50 percent of non-medical research at universities. The Foundation also participates in international science projects, but does not fund overseas scientists.

The Administration's request for Fiscal Year 1999 of \$3.773 billion represents a 10 percent increase over the Fiscal Year 1998 appropriation of \$3.429 billion. The Committee on Science supports this request and is pleased the Administration has recognized the importance of basic research, including education, to U.S. economic growth and to maintaining U.S. pre-eminence in fundamental science.

#### **NEXT GENERATION INTERNET (NGI)**

The goal of the NGI program is to advance research, development, and experimentation in high-tech networking technologies. In addition to the development of alternative applications of the new technologies developed through the NGI program, the "Next Generation Internet" test bed would connect 100 sites at speeds 100 times faster than today's Internet and connect 10 sites at speeds 1,000 faster than today's Internet.

This is a joint project which includes the involvement of NSF, the Defense Advanced Research Projects Agency (DARPA), Department of Energy (DOE), National Aeronautics and Space Administration (NASA), National Institute of Standards and Technology (NIST), and the National Library of Medicine (NLM). The Committee on Science supports the Administration's funding request for \$110 million for Fiscal Year

1999. The Administration has published a detailed implementation plan for the Next Generation Internet program and has circulated the plan for comment.

The Committee continues to believe that it is the proper role of government to support fundamental research, development, and experimentation and supports the NGI program.

**FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)  
FIRE PROGRAM**

The President's Fiscal Year 1999 request for the United States Fire Administration (USFA) and the National Fire Academy (NFA) is \$28.9 million, up slightly from the Fiscal Year 1998 appropriated level and \$1.6 million below the level authorized by the Committee in Public Law 105-108. These programs support public education activities in fire safety, prevention, and control; data collection, analysis, and distribution; fire suppression research and development; arson prevention; and firefighter health and safety.

While the Committee can support the Fiscal Year 1999 funding request for these programs, it is concerned that the USFA, which is credited with helping to reduce the loss of lives (both firefighter and civilian), has had a flat budget for the past few years despite an increase in responsibilities. The Committee will closely monitor the activities of USFA to ensure crucial missions are not compromised.

**THE NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM  
(NEHRP) EARTHQUAKE PROGRAM**

The Administration's budget request for NEHRP in Fiscal Year 1999 is \$99.1 million, approximately \$1.5 million more than the Fiscal Year 1998 appropriation. The Federal Emergency Management Agency's (FEMA) funding request for "lead agency" activities as well as earthquake planning and mitigation programs is \$18.9 million. The National Science Foundation (NSF) request included \$29.4 million for fundamental earthquake studies, earthquake engineering research, and post-earthquake studies. The United States Geological Survey (USGS), which conducts research on earthquake hazards potential, earthquake effects, and post-earthquake phenomena, would receive \$48.7 million under the President's request. NEHRP also funds research at the National Institute of Standards of Technology (NIST) to improve codes and standards for lifelines and structures. NIST's portion of the Fiscal Year 1999 budget request is \$2 million.

The Committee authorized NEHRP for Fiscal Years 1998 and 1999 in Public Law 105-47. The Committee provided the NEHRP agencies with over \$108 million in authorizations in Fiscal Year 1999 to carry out important earthquake research and mitigation activities, including developing a prototype Real Time Seismic Hazards Network. In addition, the authorization sets aside over \$8 million for the external grants program at USGS, consistent with the Committee's long standing support for external, competitive, peer-reviewed research at the federal science agencies.

Compared with what the Committee has authorized for this program, the Administration's budget request falls short. Not only is the funding for NEHRP below the

authorized amount, the Administration is also below the authorized level for funding the external grants program. The Committee finds this disturbing, as NEHRP's research and mitigation activities greatly reduce the earthquake hazard risk in many parts of the country.

The Committee on Science will continue to work with the appropriators and the Administration to ensure that programs under its jurisdiction that help protect life and property such as NEHRP and the Fire Administration are adequately funded to fulfill their missions.

#### **SUBCOMMITTEE ON SPACE AND AERONAUTICS**

##### **NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)**

In 1998, the Committee applauds the 40<sup>th</sup> anniversary of the National Aeronautics and Space Administration (NASA), and extends its support for a strong NASA, notwithstanding the Administration's proposal to cut the agency's budget by \$173 million from last year's funding level. In a year when the Administration proposes to increase non-defense R&D funding, NASA's budget is reduced from the Fiscal Year 1998 level of \$13.638 billion to \$13.465 billion—a reduction of \$173 million—in Fiscal Year 1999. Since Fiscal Year 1995, the President's budget request for NASA has been continually decreased. The Fiscal Year 2000 projection is \$13.278 billion, a reduction of \$187 million from the Fiscal Year 1999 request level. Funding increases are projected for Fiscal Year 2001 and Fiscal Year 2002, although those increases still result in a NASA budget below the Fiscal Year 1999 request.

The Committee remains committed to building and operating the International Space Station, an international research laboratory enabling experiments in the unique space environment of microgravity. Unfortunately, the Space Station continues to run into schedule and cost difficulties, partly due to the inability of the Russian government to adequately fund and deliver their elements. Originally, the International Space Station was slated to begin assembly in November 1997. That date slipped to June 1998, and it is expected that the launch schedule will be further delayed because of continuing fiscal problems in Russia. The Committee's authorization bill, H.R. 1275, the Civilian Space Authorization Act, Fiscal Years 1998 and 1999, imposed accountability and stability into the program by requiring the Administration to develop a contingency plan, with definite decision points, in the event that critical elements to be provided by the Russian government are unavailable. The contingency plan must also include the costs of implementing such decisions. The bill further requires a monthly certification by the NASA Administrator as to whether the Russian government has performed the work necessary to complete the Space Station by the end of calendar year 2002. In the intervening year since H.R. 1275 was passed by the House of Representatives, the completion date has moved beyond the end of calendar year 2002. The latest estimate for completion is within the last three months of calendar year 2003. On the domestic side, the movement of Station and Shuttle program management responsibility to the Johnson Space Center has introduced turmoil and reduced accountability to Congress resulting in deferred decision making that is contributing to cost growth.

The Space Shuttle remains the cornerstone of America's human space program. It will serve as the primary transportation system for the assembly and operation of the International Space Station. The consolidation of operations under a single prime contract has been progressing since October 1997. The Committee views safe operation of the Shuttle as one of the highest priorities at NASA.

The Committee on Science continues to place a very high priority on the pursuit of basic research at NASA, in the form of Space Science and Life and Microgravity Sciences. There have been exciting developments in Space Science over the past year, including the Mars Pathfinder mission, launch of the Cassini mission to study Saturn, and new discoveries by the Hubble Space Telescope. The Science Committee is particularly pleased with the increasing outyear levels for Space Science, although the Fiscal Year 1999 request level is lower than that authorized by the Committee. The Science Committee continues to be concerned about the distribution of Life and Microgravity Sciences funding. Responsibility for managing Space Station research funding has been transferred away from the Science office to the Station office. Although this move may help improve cooperation between the engineering community and the research community, the Committee is troubled the move will facilitate shifting funds from Station science to Station construction. This situation precipitated the inclusion in H.R. 1275 of a fencing provision of the life and microgravity research funding ensuring it would be used for research purposes and not construction.

The Advanced Space Transportation Technology (ASTT) program is critically important to the Committee's goal of developing technologies to dramatically lower the cost of accessing space. Affordable access to space will open up entirely new markets and allow the United States to capture a dominant share of the international space transportation market. It is important that NASA fund multiple technology concepts to ensure redundancy and competition. Unfortunately, the Administration's budget request for ASTT is significantly less than authorized by the Committee in H.R. 1275. For Fiscal Year 1999, the Committee authorized \$818.6 million, and the Administration requested \$388.6 million; a difference of \$430 million. Specifically, the Administration requests a mere \$17 million for "Future X," a program to demonstrate flight technologies which can significantly reduce the cost and increase the reliability of reusable space transportation systems. The Committee has demonstrated its strong commitment to revolutionary advancements in space access. The Administration's \$17 million request is inadequate to test the technologies and fly the experimental vehicles needed to meet the goal of accessing space at dramatically lower costs.

The Committee will closely track the extension of the High Speed Research Program for an additional five years especially given that an operational high speed civil transport is not expected on the runways for at least 20 years. Likewise, the Committee intends to oversee the execution and coordination of the White House's initiative on aviation safety for which NASA is committed to spend \$500 million over the next 5 years.

The Earth Science program (formerly Mission to Planet Earth) is NASA's contribution to the U.S. Global Change Research Program (USGCRP), and represents the largest contributor to the program out of the eighteen agencies receiving funding. The Committee continues to be particularly concerned about the program's large level of uncosted carryover and the significant delays being experienced in the data information

system. The Committee recognizes NASA's efforts to seek alternative methods to obtain data through its commercial data purchase program. Given NASA's reduced budget, leveraging work outside of NASA is wise. In particular, buying the scientific data commercially rather than building expensive satellites and ground systems will produce enormous savings for the taxpayer. The Committee recognizes and appreciates NASA's commitment to incorporate this approach during the period of the second and third series of satellites, and will closely track its implementation to ensure that NASA follows through with this commitment.

#### **Office of Space Commerce**

The Office of Space Commerce, located in the Office of the Undersecretary for Technology at the Department of Commerce, is responsible for promoting commercial space activities. The Fiscal Year 1999 request is \$450,000, a reduction of \$30,000 from the Fiscal Year 1998 funding level of \$480,000.

#### **Office of Commercial Space Transportation**

The Office of Commercial Space Transportation, located in the Federal Aviation Administration at the Department of Transportation, issues licenses to commercial launch providers. The Fiscal Year 1999 request is \$6,275,000, an increase of \$107,000 over the Fiscal Year 1998 funding level of \$6,168,000.

### **SUBCOMMITTEE ON TECHNOLOGY**

#### **NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) Scientific and Technology Research and Services (STRS)**

The Science Committee supports improving the federal infrastructure required to promote technology development. The programs of the Technology Administration (TA) play a vital role in maintaining America's competitive advantage in an increasingly crowded global marketplace.

Of primary importance are the core functions of the National Institute of Standards and Technology (NIST). These duties are carried out under the Scientific and Technology Research and Services (STRS) budget account. The functions include measurement and standards research in the areas of electronics and electrical engineering, manufacturing engineering, chemical science and technology, physics, materials science and engineering, fire prevention, computer systems, applied mathematics, and scientific computing.

For Fiscal Year 1999, the Administration's request is \$292 million for the STRS account, an increase of \$20 million from Fiscal Year 1998 level of \$272 million, and the same amount authorized by the Committee in the House-passed authorization bill, H.R. 1274 for Fiscal Year 1999. This funding level will enable NIST laboratories to receive

\$287 million in Fiscal Year 1999 and is sufficient to allow for the expansion of the Baldrige National Quality Awards program into the fields of education and health care.

#### **Industrial Technology Services**

The Committee recommends allocating sufficient funding to cover the existing mortgages for the Advanced Technology Program (ATP). To date, the Department of Commerce has shown only anecdotal evidence that ATP has yielded benefits to U.S. competitiveness. Further, the Committee continues to be concerned that federal ATP grant money may simply be displacing private investment capital.

In their 1996 report, "Measuring Performance: The Advanced Technology Program and Private-Sector Funding," the General Accounting Office (GAO) indicated that more than half of ATP grant applicants did not look for private funding before applying for an ATP grant. More recently, at a February 25, 1998 hearing before the Science Committee, GAO testified that during the 1997 awards process, ATP grant applicants were not required to report their efforts to find private funding.

Since then, new ATP rules have been instituted by the Secretary of Commerce to address this issue. However, according to GAO's testimony, the new ATP regulations are unlikely to prevent private capital from being displaced because no supporting documentation is required from grant applicants.

While the Committee believes that the new ATP regulations are a step in the right direction, more needs to be done. The Committee continues to support the legislative revisions to the NIST Act, embodied in H.R. 1274, that will ensure that private capital is not displaced by public funding. The Administration's request for Fiscal Year 1999 of \$260 million is an increase of \$67 million over the Fiscal Year 1998 level of \$193 million. However, the majority of the Committee continues to support the \$150 million ATP authorization level for Fiscal Year 1999 included in H.R. 1274.

The Science Committee supports continuation of the Manufacturing Extension Partnership (MEP) program in Fiscal Year 1999 at a funding level of \$111 million, as included in H.R. 1274. The Administration's request for Fiscal Year 1999 is \$107 million, a reduction of \$7 million from Fiscal Year 1998.

#### **Construction**

The Committee continues to strongly support efforts to modernize NIST's aging infrastructure. The Committee is pleased that the Administration has included funding in its Fiscal Year 1999 request to address NIST's new priority construction needs. The Administration's \$57 million construction and maintenance request represents a decrease of \$38 million for the Fiscal Year 1998 appropriated level. The Committee feels the full \$67 million authorized under H.R. 1274 is needed for the account.

#### **NATIONAL TECHNICAL INFORMATION SERVICE (NTIS)**

The Committee continues to support the activities of the National Technical Information Service (NTIS). Currently, NTIS is a self supporting agency, and is

responsible for the collection and dissemination of scientific, technical, engineering, and other business-related information from federal and international sources. NTIS covers its operating costs through revenues earned from the sale of information products and services. The Committee supports spinning-off NTIS as a wholly-owned government corporation to enhance its ability to operate in an efficient manner and yield improved client services.

#### **FEDERAL AVIATION ADMINISTRATION (FAA) RESEARCH, ENGINEERING AND DEVELOPMENT (RE&D)**

The Federal Aviation Administration (FAA) Research, Engineering and Development (RE&D) account supports critical research to improve the effectiveness of air traffic control operations, mitigate aircraft noise and emissions, and enhance the national air traffic control system by increasing safety, security, capacity, and productivity. The Science Committee's Fiscal Year 1999 authorization signed into law in February 1998, as Public Law 105-155 included \$230 million for the FAA to conduct RE&D projects and activities. The Administration's budget request for Fiscal Year 1999 for these activities is \$200 million.

In addition to this request is a new research and development initiative, Flight 2000, funded separately at \$90 million for Fiscal Year 1999. The Committee reserves judgment on Flight 2000 until it has had the opportunity to review the program.

#### **SURFACE TRANSPORTATION RESEARCH AND DEVELOPMENT (R&D)**

The Committee recognizes the important role innovative transportation technologies continue to play in helping our Nation meet the transportation challenges of the new millennium. Advances developed through the Intelligent Transportation System have proven to increase infrastructure capacity and efficiency by as much as 60 percent in some areas, lessening congestion, pollution, and saving resources by reducing the need for new infrastructure. Similarly, new products and materials developed through surface transportation research and development programs have extended pavement and bridge life-cycles. Continued research and development will allow for wider deployment of these new products and materials, saving billions of dollars in annual transportation maintenance costs.

The Administration's budget request is \$497 for Fiscal Year 1999 for research and development. Because the Surface Transportation law was extended at the Fiscal Year 1997 level for one-half a year, there is no comparable number for Fiscal Year 1998. For Fiscal Year 1999, the Committee authorized \$491 million as part of H.R. 860, the Surface Transportation Research and Development Act, in the Federal Highway Administration of the Department of Transportation to conduct R&D activities designed to improve the safety, efficiency and effectiveness of the surface transportation system. The Committee continues to support this funding level for surface transportation R&D.

**SUBCOMMITTEE ON ENERGY & ENVIRONMENT****DEPARTMENT OF ENERGY (DOE)**

The Committee on Science has jurisdiction over DOE's civilian research, development, demonstration and commercialization application of energy technology activities.

The DOE's Fiscal Year 1998 budget request proposes to fund these activities through six appropriations accounts: Science, Energy Supply, Non-Defense Environmental Management, Fossil Energy R&D, Energy Conservation R&D, and the Clean Coal Technology.

The Department's Fiscal Year 1999 budget request for programs under the Committee's jurisdiction is \$4.942.9 million, an increase of \$526 million—or 11.9 percent—above the Fiscal Year 1998 comparable appropriation of \$4.416.9 million. DOE's request includes a deferral of \$40 million of prior year appropriations for Clean Coal Technology, as compared with a Fiscal Year 1998 rescission of \$101 million. When made comparable to the Fiscal Year 1999 Science Committee authorization contained in H.R. 1277, the Civilian Energy Research and Development Act of 1997—which does not include Clean Coal Technology—DOE's request of \$4.982.9 million is \$465 million, or 10.3 percent, above the Fiscal Year 1998 comparable appropriation of \$4.4517.9 million, and \$334.4 million, or 7.2 percent, above the Fiscal Year 1999 authorization of \$4.648.5 million.

Major increases over the Fiscal Year 1998 appropriation include: (1) \$331 million—or 45.4 percent—for the Administration's Climate Change Technology Initiative (CCTI); (2) \$133 million for the Spallation Neutron Source (SNS)—of which \$128.4 million is to initiate the SNS's construction; and (3) \$30 million (from \$35 million to \$65 million) for DOE's share of U.S. participation in the Large Hadron Collider at the European Laboratory for Particle Physics (CERN). The SNS is estimated to cost total of about \$1.3 billion to be a world-class state-of-the-art facility for neutron scattering and related research.

The major decrease to the Fiscal Year 1999 authorization is \$220.4 million for Non-Defense Environmental Management, primarily the result of the transfer of the Formerly Utilized Sites Remedial Action Program (FUSRAP) from the DOE to the U.S. Army Corps of Engineers, as required by the 1998 Energy and Water Development Appropriations Act (Public Law 105-62).

The Committee supports the provision of funds for the Large Hadron Collider, consistent with the DOE-NSF-CERN agreement signed in December 1977. The Committee's major concern with the Energy Department's Fiscal Year 1999 request is the inclusion of the Science appropriation account, the Fusion Energy Sciences Program, the SNS, and the CCTI in the Administration's proposed Research for America Fund, given the major uncertainties about the Fund's funding sources. The Committee also notes its disappointment that the Administration has only requested \$228 million for the Fusion Energy Sciences Program, a reduction of \$12 million below the Fiscal Year 1999

authorized level of \$240 million, and \$22 million below the President's Committee of Advisors on Science and Technology (PCAST) endorsed amount of \$250 million. Finally the Committee notes that many of the programs included in DOE's CCTI request are identical to those about which objections were raised in the past because they did not address R&D activities, but rather focused on near-term commercialization and market promotion efforts that are best left to the private sector.

The Committee continues to have major concerns with the Department's contract management, particularly with respect to the DOE National Laboratories where much of the civilian R&D is performed. The Energy Department is the largest civilian contracting agency in the federal government; it contracted out 91 percent of its \$19.2 billion in Fiscal Year 1995 obligations. Since 1990, the General Accounting Office (GAO) has designated DOE contracting as a high-risk area vulnerable to waste, fraud, abuse and mismanagement because of the Department's heavy reliance on contractors and its history of weak contractor oversight. In addition, DOE's conduct of its R&D programs continues to be criticized for excessive bureaucracy, and for its emphasis on near-term, low-risk R&D, commercialization and marketing activities more properly performed by the private sector.

The Committee intends to increase support for DOE's long-term, high-risk, high-quality research and development activities, while simultaneously reducing funding for near-term, low-risk research, and for its commercialization and marketing efforts. The Committee believes that the Department can accomplish its mission within or near the existing Fiscal Year 1999 authorization level contained in H.R. 1277.

#### **ENVIRONMENTAL PROTECTION AGENCY (EPA) R&D**

The Committee on Science has or shares jurisdiction over EPA research and development programs which are funded in five separate appropriation accounts: Environmental Programs and Management (Science Advisory Board), Science and Technology, Superfund R&D, Leaking Underground Storage Tank (LUST) R&D, and Oil Spill Research. The Committee on Science shares Superfund R&D jurisdiction with the Committee on Commerce.

The Agency's overall request of \$677.9 million for R&D represents an increase of \$7.7 million—or 1.15 percent—over the Fiscal Year 1998 appropriation of \$670.1 million, and an increase of \$19.8 million (3 percent) above the Fiscal Year 1999 Science Committee authorization of \$658.1 in H.R. 1276, the Environmental Research, Development, and Demonstration Authorization Act of 1997. The Office of Research and Development (ORD) budget drops from \$573.5 in the Fiscal Year 1998 appropriation to \$527.3 in the Fiscal Year 1999 request.

Major increases over the Fiscal Year 1998 appropriation include: (1) \$35.8 million for global climate change (from \$31.6 to \$67.4 million); (2) \$19.7 million to attain National Ambient Air Quality Standards (NAAQS) for ozone and particulate matter (from \$51.9 to \$71.6 million); and (3) \$5.2 million for Superfund R&D (from \$35.0 to \$40.2 million).

Major decreases from the Fiscal Year 1998 appropriation include: (1) \$4.3 million for safe drinking water (from \$42.0 to \$37.7 million); (2) \$26.2 for criteria air pollution

research (from \$76.0 to \$49.8 million); and, (3) \$15.9 for ecosystem protection (from \$117.6 to \$101.7 million).

The Committee views with concern the continued erosion of EPA's R&D budget relative to the overall EPA budget request. For example, the Research Strategies Advisory Committee of EPA's Science Advisory Board noted recently that ORD funding has decreased dramatically in the last ten years as a fraction of the overall EPA budget—from over 15 percent in Fiscal Year 1989 to 12.6 percent in Fiscal Year 1995 to 6.6 percent in the Fiscal Year 1999 request. The Committee is particularly concerned about the decrease to drinking water research and subsequent impact to EPA's ability to fulfill the mandates of the Safe Drinking Water Act Amendments of 1996; and about the large decrease for criteria air pollution research.

In addition, the Committee continues to be frustrated by EPA's continual lack of documentation and justification for its budget request, a concern shared by a number of independent bodies such as the National Academy of Sciences and the EPA Science Advisory Board. In particular, there is little justification provided for new initiatives such as the Climate Change Technology Initiative, and many of the substantial increases requested for a number of programs.

The Committee is also concerned about the shift in research and development resources away from Office of Research and Development (ORD) to Office of Air and Radiation (OAR) and other EPA program offices. These reallocations may affect the Agency's ability to perform thorough scientific research prior to implementing wide-ranging and expensive new regulations.

Finally, the Committee wants to state its unease about the potential conflict that arises by having a regulatory agency, such as EPA, also performing the R&D that provides the scientific bases for that agency's regulations. The Committee notes that important environmental R&D performed by other agencies, such as the National Oceanic and Atmospheric Administration (NOAA), could be expanded to include most, if not all, of the current environmental R&D activities currently carried out by EPA, and that the results of such R&D could also provide the scientific bases for EPA's regulatory functions. The Committee intends to explore the feasibility of this option.

The Committee intends to support increases to environmental R&D where those increases are justified. However, the Committee believes that most increases can be offset by reductions in current programs, so that Fiscal Year 1999 funding levels can be maintained near the levels authorized in H.R. 1276, the Environmental Research, Development, and Demonstration Authorization Act of 1997.

#### **National Oceanic and Atmospheric Administration (NOAA)**

The stated mission of the National Oceanic and Atmospheric Administration (NOAA) is to describe and predict changes in the Earth's environment, and to conserve and manage the Nation's coastal and marine resources to ensure sustainable economic opportunities. NOAA conducts research to develop new technologies, improve operations, and supply the scientific basis for managing natural resources and solving environmental problems.

The NOAA programs for which the Science Committee has sole jurisdiction include: the National Weather Service (NWS); the National Environmental Satellite, Data and Information Service (NESDIS); the Program Support's Aircraft Services account; and the Office of Oceanic and Atmospheric Research (OAR) Climate and Atmospheric programs. In addition, the Committee has jurisdiction over the appropriate line accounts under the Procurement, Acquisition and Construction account. The Committee shares jurisdiction (with the Committee on Resources) over OAR's National Undersea Research Program, Sea Grant, Marine Prediction Research, Administration and Fleet Modernization.

The NOAA Fiscal Year 1999 budget request over which the Committee has either shared or sole jurisdiction totals \$1.768.3 million--\$168.6 million, or 10.5 percent, above the Fiscal Year 1998 appropriation of \$1.599.6 million. When made comparable to the Fiscal Year 1999 Science Committee authorization contained in H.R. 1278, the National Oceanic and Atmospheric Administration Authorization Act of 1997—which does not include funding for GOES I-M Procurement, Acquisition and Construction appropriation account authorized under Public Law 102-567, and the National Sea Grant College Program authorized under P. L. 105-160), the President's request of \$1.618.9 million is \$175.3 million, or 12.1 percent, above the appropriated level of \$1.443.7 million, and \$50.7 million, or 3.2 percent, above the Fiscal Year 1999 authorization of \$1.568.2 million.

Major increases over the Fiscal Year 1998 appropriation include: (1) \$182.4 million—or 57.7 percent—for NESDIS, and \$34.8 million—or 7.5 percent—for NWS operations and research. The Committee notes with disappointment the decrease requested for the Office of Oceanic and Atmospheric Research (-\$14.7 million—or 6.8 percent).

Of continuing concern to the Committee is the National Weather Service modernization program, which has been underway for over 15 years at a cost of about \$4.5 billion. The U.S. General Accounting Office (GAO) has identified this program as a high-risk area, and it has been the subject of a number of critical reports by the Department of Commerce Inspector General (DOC IG). The deployment and development of the observing systems associated with the NWS modernization are nearing completion. However, unresolved issues still remain concerning the observing systems' operational effectiveness and efficient maintenance, such as performance problems with the new radars and ground-based sensors. In addition, GAO has noted that the NWS lacks a means to ensure that the modernized NWS systems provide promised returns on investment. GAO also found that NWS has not demonstrated that all proposed capabilities will result in mission improvements.

The Committee is also concerned about other programs that have been the subject of GAO and/or DOC IG reports, including the NOAA Fleet, the NOAA Corps, Polar Orbital Environmental Satellite funding, and procurement of follow-on Polar Orbital Environmental Satellites (GOES).

The Committee intends to carefully examine NOAA's Fiscal Year 1999 funding proposals with the view that increases to NOAA's current Fiscal Year 1999 authorization should be offset largely by reductions to obsolete, redundant, low-risk, near-term programs.

**OVERSIGHT****GOVERNMENT PERFORMANCE AND RESULTS ACT (Results Act)**

In 1993, President Clinton signed into law the bipartisan bill known as the Government Performance and Results Act. For too long, federal agencies have based their budget requests on good intentions rather than results. The Results Act was created to change this and make agencies accountable for results. The Act went into full effect last September with the agencies' submissions of their strategic plans. The Act required agencies to identify their long-term goals, develop strategies for achieving those goals, and explain how they were using their resources. This year, each agency submits its first performance plan, which is basically an action plan on how it will use its budget to meet its goals. Thus, each budget request should be tied to annual performance goals and measures. The Science Committee will continue its oversight of the implementation of the Results Act. The strategic plans need improvement as do the submitted performance plans. The Science Committee is committed to working with the agencies to assist them with compliance of the Results Act that will improve management and oversight of agencies.

**CONCLUSION**

The Committee on Science supports substantial increases in federal support for scientific research and development. The Committee is also committed to developing a coherent, long-term science policy that justifies long-term, stable and sustainable increases. The Committee intends to work with the Committee on the Budget and the Committee on Appropriations to increase funding for basic research, scientific infrastructure, and for selected NASA and environmental programs while maintaining our commitment to the balanced budget agreement and the limitations imposed on discretionary spending.



COMMITTEE ON SCIENCE VIEWS AND ESTIMATES

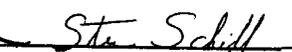
  
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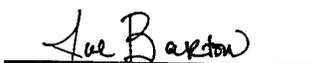
  
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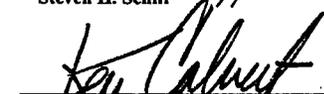
  
Constance A. Morella

  
Curt Weldon

  
Dana Rohrabacher

  
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Joe L. Barton

  
Ken Calvert

  
Roscoe G. Bartlett

  
Vernon Ehlers

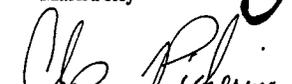
  
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Matt Salmon

  
Thomas M. Davis, III

  
Mark Foley

  
Thomas W. Ewing

  
Charles W. Pickering

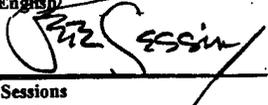
  
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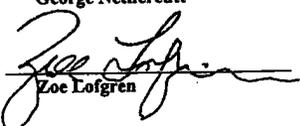
  
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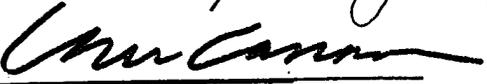
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Phil English

  
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**ADDITIONAL VIEWS  
OF REPRESENTATIVE CHRIS CANNON  
ON THE COMMITTEE ON SCIENCE  
VIEWS AND ESTIMATES FOR FISCAL YEAR 1999**

I firmly support the position of the Committee with regard to the Space Shuttle program: The Space Shuttle is the crown jewel of the American space program, and it must remain so.

Still, the Space Shuttle is a program that relies on very complex science. And, in light of the testimony heard before the Subcommittee on Space and Aeronautics of March 19, 1998, I am concerned with the intention of NASA to pursue potential modifications to this complex science, in particular with regard to the Liquid Fly Back Booster proposal.

While shuttle safety is of utmost importance, I would expect that any significant upgrade(s) to the shuttle system would be subjected to careful, independent review to ensure that cost and reliability considerations are accurately portrayed.

Risking the established integrity of the crown jewel of our space program, without such a review, could only prove to jeopardize this successful and invaluable program.

**House Science Committee Views and Estimates for Fiscal Year 1999  
Supplemental Views Of Congressman Harris W. Fawell  
March 19, 1998**

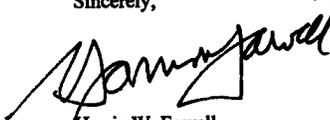
As a strong advocate of the federal investment in science and technology, I affirm the Science Committee's commitment to increased funding for research and development. I commend the Chairman and the Science Committee in their efforts to work with the House Appropriations Committee and the Committee on the Budget in determining budget priorities.

I applaud the Science Committee's efforts to ensure that America's scientific, technical and engineering base remains strong and viable. With this in mind, I support more partnerships between national laboratories, universities, and private industries. These partnerships will enable the United States to utilize the vast scientific resources available in many fields and as well as leverage the federal scientific investment.

Research in the area of nuclear energy is another area of great importance to me. Continuing research to treat and reduce the volume of nuclear waste will enable the United States to meet its obligation to the taxpayers.

Most importantly, I support the recognition of scientific excellence at our national laboratories and the effort to prioritize and utilize these outstanding facilities.

Sincerely,



Harris W. Fawell  
Member of Congress

### **FY1999 Science Committee Minority Views and Estimates**

What a difference three years can make. In the Spring of 1995, a new majority in Congress was pushing a budget that would have led to a five year, one-third reduction in civilian science and technology (S&T) accounts. We condemned that proposal as a disaster for the nation. Now, just over half-way through that projected time frame, we seem to have forged a bipartisan consensus that S&T programs must be nurtured and expanded.

As Democratic Members of the House Science Committee, we have made ongoing efforts to convince our colleagues on the other side of the aisle, as well as our Party's leader at the other end of Pennsylvania Avenue, that investing in research and development (R&D) accounts is a generational obligation every bit as important as balancing the budget. Of course, the Democratic Members of the Science Committee were not alone in that effort. The budget proposal of three years ago served as a wake-up call to researchers, students, teachers, scientific societies, corporate executives, university officers, governors—virtually anyone who cares about investing in our Nation's future—to get involved in bringing the message to Washington that Americans care about these programs. Our very future depends upon them.

Those efforts have made a terrific contribution to the broad recognition that R&D accounts provide the cornerstone for keeping the American economy vital, productive and innovative. There is a broad, clear consensus about the importance of R&D to our Nation's economic future. This consensus is leading to recommendations, across party lines, from both ends of Pennsylvania Avenue and from either side of the Capitol, that we provide additional funding to these important programs. Without the work of all these people, that consensus would not be so deep or so wide.

Therefore, it should come as no surprise that we agree with the central thrust of the Majority's Views and Estimate's: that increases in civilian R&D programs are a necessary condition for continuing to enjoy economic prosperity well into the next century. Last year the vast majority of the Democratic Members of this panel signed on to the Majority views as well as providing some additional guidance of our own. However, this year we regret that we cannot sign on to the Majority's views because of their unwillingness to embrace the President's budget request. The Majority's Views and Estimates demonstrate that despite the consensus on R&D, some differences remain over the details of how to proceed.

The President's plan would see civilian science and technology accounts grow by almost 9% in real dollars by FY2003 (21.1% in current dollars).<sup>1</sup> The Administration's plan provides strong but responsible growth in these important programs, with special emphasis on the National Institutes of Health and the National Science Foundation.

The Majority's criticism of the President's plan focuses on the revenue assumptions that underlie it. They argue that the Administration's budget is not based on "real" revenues, but on "uncertain tax increases and uncollected money from the proposed tax settlement."<sup>2</sup> Further they argue that if we did have the money and spent it as the President suggests, we would break the budget caps. Finally, they conclude by recommending that "the Committee on the Budget...at a minimum, increase funding by the 4 percent recommended by the Administration for programs under the Science Committee's jurisdiction for Fiscal Year 1999."<sup>3</sup>

We would respectfully suggest that they seem to want it both ways. Acknowledging the importance of R&D to economic performance, they want to see these accounts strengthened, perhaps even beyond the President's numbers. However, they are concerned about the President breaking the discretionary accounts in his budget while not giving any attention to offsets when it comes to their own budget advice. They want to see revenues go to these accounts, but not the revenues the President identifies nor the revenues that the booming American economy is producing, leaving the observer to wonder what revenues they would draw on to do what they claim we need to do. Unfortunately, the Majority's Views and Estimates do not provide the kind of guidance necessary to responsibly assess the effects of their budget advice.

On the question of "uncertain" revenues in the President's budget, the fact is that it is entirely within the Congress's power to approve the tobacco settlement—a major source of funding for many of the President's initiatives. The President has a budget plan that reflects anticipated revenue streams that Congress can produce or block by its action. But even if a tobacco settlement were to be put off for a year, there are more than adequate revenues—and they grow with each new Treasury or CBO projection—from current revenue sources and closing tax loopholes to cover increases in civilian R&D for FY1999.<sup>4</sup>

<sup>1</sup> . AAAS Analysis, Projected Effects of President's FY1999 Budget on Nondefense R&D, preliminary analysis released March 5, 1998. Available at web site address, <http://www.aaas.org/spp/dspp/rd/rdwwwpg.htm>.

<sup>2</sup> Proposed Views and Estimates of the Committee on Science for Fiscal Year 1999, Majority draft, March 16, 1998, p. 2.

<sup>3</sup> Ibid., p. 3.

<sup>4</sup> . The House Budget Committee Democratic Caucus has produced a document, "A Summary of President Clinton's Fiscal Year 1999 Budget", which clearly articulates that the President's budget is fully in line with the PAYGO scorecard. It is this principle that underlies both the budget agreement and the effort to balance the budget. The caps are artificial constructs of

Knowing that the revenues are there now and that a tobacco settlement that will be no worse than the current one will be there this year or in the not too distant future, we are willing to support the President's broad outline for Science and Technology accounts.

We endorse the overall plan of the President, but we do have some reservations about the distribution of funds among civilian research agencies in the out years. While NIH, NSF, Energy and EPA all enjoy real increases in funding in the Administration's five year projections, Commerce, Interior, Agriculture, Transportation and NASA are all slated to suffer declines in funding (see Table One).

Table One, President's FY1999 Budget for Federal R&D

Agency	FY1998 Estimate	FY1999 Budget	FY2000 Projected	FY2001 Projected	FY2002 Projected	FY2003 Projected	%Change FY98-03 Current \$	%Change FY98-03 Constant\$
NIH	13097	14163	14989	15918	17225	19332	47.5%	32.7%
NASA	9616	9504	9397	9389	9493	9513	-3.1%	-12.8%
Energy Non-defense	3334	3781	3691	3815	3842	3806	14.2%	2.7%
NSF	2568	2857	2946	3038	3131	3229	25.8%	13.1%
Agriculture	1559	1552	1564	1555	1558	1559	.0%	-10.1%
Commerce	1081	1084	1096	1096	1106	1077	-.4%	-10.4%
Interior	609	629	632	624	623	623	2.5%	-7.8%
Transportation	676	775	816	774	727	700	3.6%	-6.8%
EPA	637	631	641	696	725	746	17.1%	5.3%
Other Agencies	1535	1776	1727	1742	1754	1771	15.3%	3.7%
Non-defense R&D	35624	37697	38505	39708	40944	43124	21.1%	8.9%

Source: AAAS, "President's Budget Projects Increases for Nondefense R&D to FY 2003,"

We believe that some small proportion of the increase scheduled for NIH should be redistributed among the agencies slated for decreases to keep a little more

projected spending levels designed to get the budget into balance; to the degree the budget is in surplus over the caps, the caps themselves are no longer meaningful guides to balance. In other words, we don't need the caps to get there because we have already arrived. Those who claim that the President would break through those caps have to concede, as the Budget Committee points out, "that the tax and entitlement compartment of the budget will be running surpluses, or credits, large enough to fully offset the apparent breach in discretionary spending," (p. 40). The Budget Committee goes on to offer three methods by which the President's discretionary increases can be offset. To those who would now claim that discretionary caps are sacrosanct numbers carved in stone, brought down from the Mountain, we would point out that the 1997 Budget Agreement which delivered those tablets, completely ignored and violated the discretionary caps we established in the 1995 Budget Agreement. When fiscal conditions change, it is only prudent to change our revenue and spending behavior in appropriate ways. To behave as if the economy and the Government's position was other than it is could have dangerous macroeconomic consequences for the Nation.

balance in our research portfolio. We are concerned that the aggressive funding ramp for NIH will lead to inefficiencies in the management of those funds. We also note that the imbalance of funding for NIH as against other fields of science and technology may be a long-term drag on developments in the biomedical and biotechnology fields due to the interdependence of physics, chemistry, broad technology innovation and medical research.

We are also pleased with the strong programs in our science agencies to expand science and technology opportunities for women and minorities. However, we would encourage the Administration to look for more ways to create a more inclusive culture in these fields.

Finally, we have some specific programmatic guidance that we would offer.

#### **Department of Energy**

In recent years, a consensus has formed among participants in the climate change debate that investing in technology development to reduce the potential threat of climate change is a prudent and wise course. In addition to reducing the threat of climate change, such technology development would also benefit other key areas, such as decreasing the Nation's dependence on foreign oil, increasing air quality, and reducing the price of energy. We note that the President's Committee of Advisors on Science and Technology also lauds this program in their November, 1997 report on "Federal Energy Research and Development for the Challenges of the Twenty-First Century."

Faced with such a consensus, it is puzzling that the Majority's views seem to oppose the Climate Change Technology Initiative (CCTI). While the Minority agrees that some portions of the CCTI program could be reworked, we strongly support the thrust and goals of the program. We would also point out that the Majority urged the Budget and Appropriations Committees to adhere to the authorization levels set in H.R. 1277, the DOE civilian research authorization passed by this Committee last year. This would require reducing the President's request for DOE by \$330 million. The Majority neglects to mention that the authorization passed by the Committee did not deal with either CCTI or the Spallation Neutron Source and we suggest that the result was an authorization level well below what the Committee would approve today. H.R. 1277, which has not been passed by the House, provides an imperfect and misleading indication of the views of the Committee on the appropriate level of support for DOE research programs.

#### **National Institutes of Standards and Technology**

We recommend full funding at the requested level for the Advanced Technology Program. NIST and the Technology Administration are leading the way towards

providing objective evaluations of the returns on Federal investments in technology development and their steady and improving management of this program justifies their budget request. We support the Majority's request that the Manufacturing Extension Program be increased to \$111 million. However, we are concerned that many areas of the country are still not effectively covered by this creative program.

The one note of caution we would add regarding the NIST budget is that the request for construction funding seems to be only loosely justified. We would recommend that the Committee consult with the Department of Commerce's Inspector General regarding the lack of a clear construction plan relating to this request.

#### **National Aeronautics and Space Administration**

Our primary concern regarding NASA is that the President's request, especially in out years, may be inadequate to fully support their important research and exploration missions. We strongly support the basic sciences programs at NASA: Space Science, Life and Microgravity Science and Earth Science. While the Majority's views on NASA are generally sound, we would note that the allegations regarding the Johnson Space Center's managerial performance are unwarranted and unsubstantiated.

#### **Environmental Protection Agency**

We share the majority's concern about the overall level of funding requested for EPA's Office of Research and Development's (ORD) programs, but we fail to see how exploring the elimination of EPA's research program, as suggested by the Majority, would alleviate this problem. We feel the Agency should maintain a balanced research portfolio. Research programs should focus not only on immediate needs dictated by statutory responsibilities and deadlines of the program offices, but should also develop a broad knowledge base for the evaluation of the health of environmental systems.

The majority also indicates a concern about the "potential conflict" that arises by having science conducted in a regulatory agency, and expresses the Committee's intent to explore the feasibility of having other agencies conduct the research to support EPA's regulations. Democratic Members share the majority's view that regulations should be based on sound science. For that very reason, we are skeptical about the Majority's proposed solution. Removing science from EPA may simply ensure that science plays even less of a role in future regulations. While we support suggestions to improve the quality, integrity, and independence of environmental science, such a radical change should follow only from a careful, thorough, and deliberate study of any perceived problems and proposed solutions.

The Majority's suggestion that the science needs of EPA can be met through unspecified increases in the budgets of the National Oceanic and Atmospheric Administration's (NOAA) and possibly other agencies appears to directly contradict the Majority's second stated criteria for the authorization of R&D programs in our jurisdiction: "that federal R&D should be highly relevant to and tightly focused on agency missions."

#### **National Earthquake Hazards Reduction Program**

We strongly support full funding, at the authorized level, for this critical and innovative multi-agency effort. We are disappointed that the Administration's request is some \$9 million below that level and encourage the Budget and Appropriations Committee to fully fund this program.

#### **Conclusion**

The President's budget request provides a solid basis for investing in our Nation's future by providing adequate resources to our civilian science and technology accounts. While we would recommend some slight reshuffling of funding among agencies, the overall goals are the right ones. These reservations aside, the President's budget represents an important step towards building the base of a productive, booming 21<sup>st</sup> century economy.

**MEMBERS SIGNING ON TO  
MINORITY VIEWS AND ESTIMATES**

**The Honorable George E. Brown, Jr.**

**The Honorable Bart Gordon**

**The Honorable James A. Traficant**

**The Honorable James A. Barcia**

**The Honorable Paul McHale**

**The Honorable Eddie Bernice Johnson**

**The Honorable Alcee Hastings**

**The Honorable Lynn Rivers**

**The Honorable Zoe Lofgren**

**The Honorable Mike Doyle**

**The Honorable Sheila Jackson Lee**

**The Honorable Debbie Stabenow**

**The Honorable Nick Lampson**

**The Honorable Darlene Hooley**

**The Honorable Ellen Tauscher**



Fiscal Year 1999 Views and Estimates, Committee on Science, Additional Views Submitted by Rep. Tim Roemer.

Again this year I find substantial agreement with the majority views, but because of just a few major elements, I cannot sign on to the majority views and estimates document. In particular, continued support for the space station project is both troubling and unwarranted.

NASA has not only consumed reserve funding for the duration of the project, but also has announced an additional cost overrun for the station of \$3.6 billion taxpayer dollars. The schedule for the initial launch is months overdue, and counting. The final completion date is now extended two years. If NASA were to be completely honest, the figure is likely four years overdue. NASA has reprogrammed other projects to the point where they may be in danger, and is still \$200 million short this year.

The Russian government continues to neglect its space program and ignore its promises to the U.S. The first Russian module is months overdue, with no funding in sight. Russia will continue to wreak havoc with the space station construction schedule.

The space station project has been grossly mismanaged, to the detriment of the space program, to the detriment of NASA's once stellar reputation, and to the ongoing detriment of the U.S. taxpayer. Termination of this program is long, long overdue.

There are other issues of concern, as well. The majority concern that increased funding for research programs should not be entirely dependent on a "tobacco deal" are legitimate. Increases in federal research and development are necessary for the long-term economic health of this country. Our technology base is an important driver of a positive trade balance, and needs to remain healthy and vital. It has been under strain.

Other projects deserve our support: new programs like the Spallation Neutron Source and the Climate Change Technology Initiative will provide valuable research and data to our science community. These programs provide important new scientific knowledge and are done within the confines of a balanced budget.

There is an alarming trend by the Department of Energy that deserves mention. DOE continues to employ the talents of our best scientists in gaining advice for the future of our nation's energy needs, such as the Galvin Commission, the Fusion Energy Advisory Commission (FEAC) and the resources of the President's Council of Advisors on Science and Technology (PCAST). DOE continues to waste taxpayer dollars and the time and effort of top-notch scientists, researchers, and engineers by ignoring the recommendations of these Blue-Ribbon panels.

The Galvin recommendations have been warmly received and then studiously avoided. Both PCAST and FEAC have recommended increases in the fusion budget: both panels were soundly rejected. What is the point of seeking expert advice and then flatly refusing their findings?

The Minority Views make a number of valid points. The Advanced Technology Program should be fully funded. The DOE request should reflect funding for new priorities. Agricultural research is critical at this juncture, and a ten percent decline in funding over the next five years is questionable.

Both the majority and minority have given a great deal of time and consideration to these important issues, and for that I regret not being able to sign their respective documents.

I would like to join them in saluting NASA's 40th Anniversary, and am pleased to submit these additional views to the Budget Committee for the record.

**Additional Views of Mr. Lampson (D-TX)**

I strongly disagree with the proposed language in the Majority's Views and Estimates regarding Johnson Space Center. In noting increased Space Station costs, the language proposed by the Majority suggests that placing program management responsibility at Johnson Space Center has produced a lack of accountability and slow decision-making contributing to station cost growth. There is no evidence or even allegation—other than the words in the Majority's report—that any reduced accountability has come from this decision. Nor is there any evidence that management responsibility at Johnson Space Center has contributed to cost growth in this program. I am surprised at the allegation made by the Majority because there is absolutely no evidence to support it.

Moreover, the decision to place the Program Management Responsibility and the Program Management Office at Johnson Space Center was made as a result of recommendations made by the Vest Committee, which reviewed the space station redesign in 1993. The establishment of a leaner, more responsive and accountable management structure was one of the significant findings of the Vest Committee. The House Science Committee applauded the Vest Committee recommendations in 1993 and in subsequent years held NASA accountable for implementing those recommendations, including the management recommendations. To now suggest that this decision is wrong would be a reversal of the committee's historical position without any factual demonstration of the need to make such a change.

I also want to record my support for the Minority Views submitted by Mr. Brown.

**Additional Views by the Honorable Darlene Hooley (D-OR)**

I support the Minority Views and Estimates. However, I have some reservations about any reduction in the proposed increases to NIH's budget. Research directed by NIH has a dramatic impact on our Nation's quality of life and has immediate and direct applications in people's lives. Consequently, I cannot agree that we should look to reductions at NIH to fund increases at other science agencies. Rather, I would encourage the President and the Budget Committee to find alternative sources of funding to keep other agency's budgets strong, rather than looking to weaken NIH's budget.



**COMMITTEE on SCIENCE  
MAJORITY CAUCUS  
U.S. House of Representatives  
105th Congress - 2nd Session  
Washington, DC**



***COMMITTEE ON SCIENCE: ANALYSIS AND REVIEW***

**THE CLINTON SCIENCE AND TECHNOLOGY\*  
BUDGET FOR FISCAL YEAR 1999**

26 February 1998

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\*Only programs under the Committee on Science's jurisdiction are included in this analysis. The majority staff of the House Committee on Science prepared this document. It has not been approved by the full committee and therefore may not reflect the views of all of the committee's members. For more information, contact the Committee at 2320 Rayburn House Office Building, Washington, DC, 20515; (202) 225-6371;  
<http://www.house.gov/science/welcome.htm>

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**COMMITTEE on SCIENCE  
MAJORITY CAUCUS  
Chairman F. James Sensenbrenner, Jr.**



**COMMITTEE ON SCIENCE: ANALYSIS AND REVIEW  
THE CLINTON SCIENCE AND TECHNOLOGY  
BUDGET FOR FISCAL YEAR 1999**

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**II. Appendix**

**Appendix A--Data Tables**

*All tables correspond to charts in R&D Summary*

**Appendix B--Subcommittee Tables**

*Basic Research  
Energy and Environment  
Space and Aeronautics  
Technology*

**Appendix C--Agency Tables**

*Department of Energy  
Department of Transportation  
EPA  
NASA  
NIST  
NOAA  
NSF*

**I. OVERVIEW OF THE PRESIDENT'S FY1999 BUDGET**

**A. President Clinton's Budget Increases Spending, the Size of Government, and Taxes.**

On February 3, 1998, President Clinton proposed a budget that would increase federal spending to \$1.668 trillion for FY1999 and to more than \$1.945 trillion in FY2003. In his budget, the President would create 85 new spending programs, 39 of which are new entitlements costing about \$150 billion over 5 years.

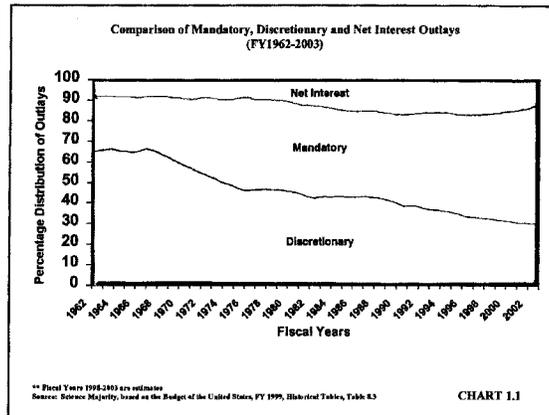
**B. The President Increases Taxes to Pay for More Spending.**

While increasing spending, the President proposes to maintain a balanced budget through a significant increase in taxes and fees by at least \$105 billion over 5 years. The assumed revenue is based primarily on the assumption that \$65.5 billion in tobacco revenues will be collected and that Congress will support extending Superfund taxes by nearly \$7.5 billion and support increasing taxes by \$24 billion on businesses through new and modified tax provisions.

**C. The President's Increased Spending Would Violate the Discretionary Spending Caps.**

This increase in spending would violate the discretionary spending limits set in the Balanced Budget Act (BBA) of 1997, which revised and extended the limits first set in the Budget Enforcement Act (BEA of 1990). In fact, the Administration's FY 1999 Budget exceeds the budget cap by \$8 billion. Under the BBA of 1997, if discretionary spending caps for any category (defense, non-defense and violent crime reduction) are exceeded, then the amount of the breach within that category must be offset by an equal amount within the category.

**D. Under the President's Budget, Discretionary Funds Continue to be Squeezed by Increased Mandatory Spending, as Chart 1.1 Illustrates.**



## II. R&D FUNDING UNDER THE PRESIDENT'S FY1999 BUDGET

•The Clinton Budget proposes to increase total R&D funding (defense and non-defense) in actual dollars for FY1999 by 3 percent over FY1998 levels. In real terms the increase is only 1.4 percent and for all other years, (FY2000-2003) real spending would be less than FY1998 levels.\*

•The President's budget makes a significant investment in non-defense R&D. Actual spending increases by 6 percent in FY1999. Non-defense R&D fares better than defense R&D. In fact, non-defense R&D will surpass defense R&D by FY2001. Non-Defense R&D experiences an increase through FY2003 in actual and real dollars.

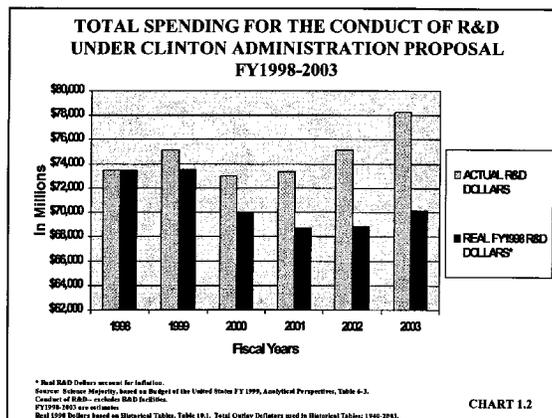
•Nevertheless, non-defense R&D under the Science Committee would be reduced. When you subtract health (including NIH, which receives the largest R&D increase) and other agencies with programs outside the Science Committee's jurisdiction, scientific research experiences an overall decline through FY2003.

•The President's proposal supports funding of "key" research programs. Other R&D programs fair less well. Research at NIH, NSF, and NIST is strongly supported in the President's budget through 2003. Other R&D agencies, including NASA, experience decreases in real funding.

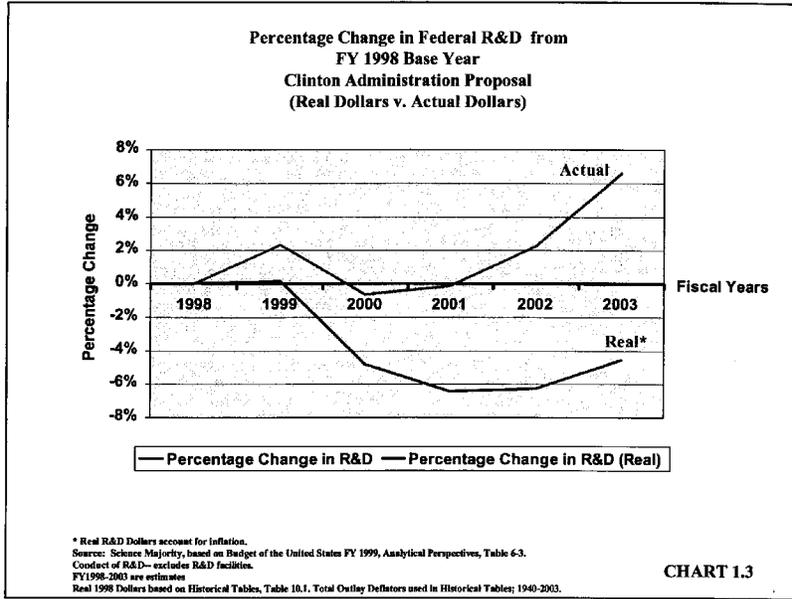
•To demonstrate his research priorities, the President's budget creates a \$31 billion Research Fund for America which combines existing and new programs, the majority of which are existing. This fund remains within the discretionary spending budget category. The problem is that funding for the Research Fund for America is based on uncertain tax increases and uncollected money from the proposed tobacco settlement.

### A. Except for FY1999, Real Spending for the "Conduct of R&D" Is Less Than FY1998 Levels in all other Years.

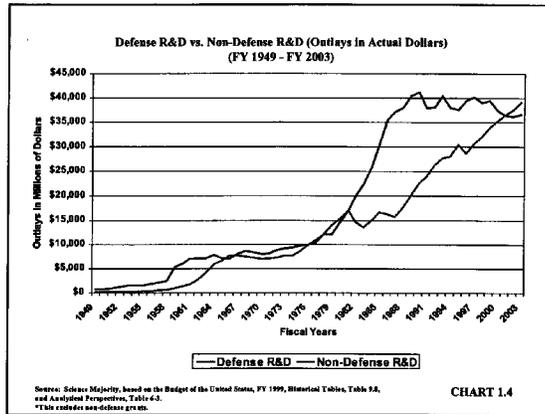
Actual spending increases dramatically in FY1999, and then dips before recovering in FY2002. In real terms, the conduct of R&D receives a smaller increase in FY1999. In all other years through FY2003, the total spending for R&D in real dollars will be less than it was in FY1998. (Please note that the conduct of R&D is a term used in the President's Budget that accounts for R&D spending excluding facilities.)



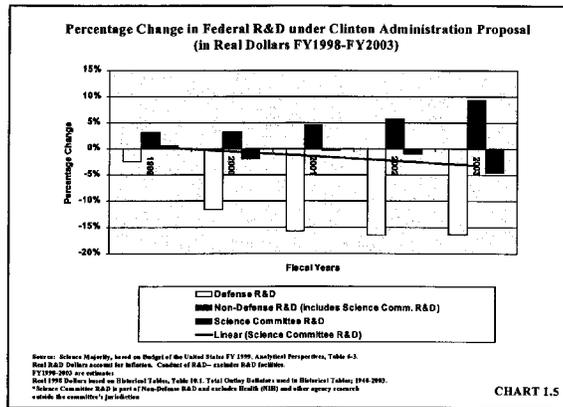
**B. Under the FY1999 Clinton Budget,  
Actual Spending Increases for R&D,  
But Real Dollar Spending Drops after FY1999.**



**C. President Clinton's Budget would Increase Non-Defense R&D above Defense R&D for the first time in 20 years.**



**D. The Clinton Budget Increases Non-Defense R&D in Real Dollars. However, Defense R&D and those Agencies under the Science Committee's Jurisdiction Experience Decreased Funding through the Outyears.**  
(Please note, Science Committee R&D excludes health and other agency research programs outside its jurisdiction.)



**E. Coinciding With the Science Committee's Position that the Proper Role of Government is to Support Basic Research, the Clinton Administration Would Spend the Largest Percentage of Non-Defense R&D on Basic Research in FY1999.**

The President's budget divides R&D spending into five categories: Basic Research; Applied Research; Development; Equipment; and Facilities. Chart 1.6 provides the funding percentage for these five categories within non-defense R&D.

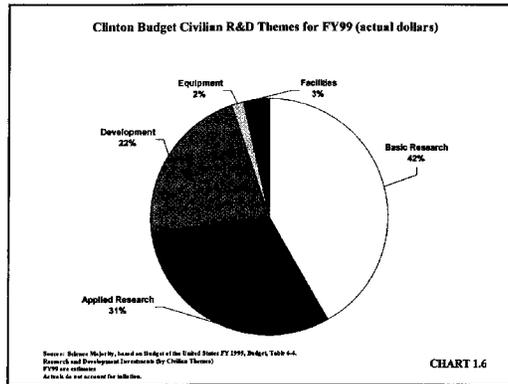
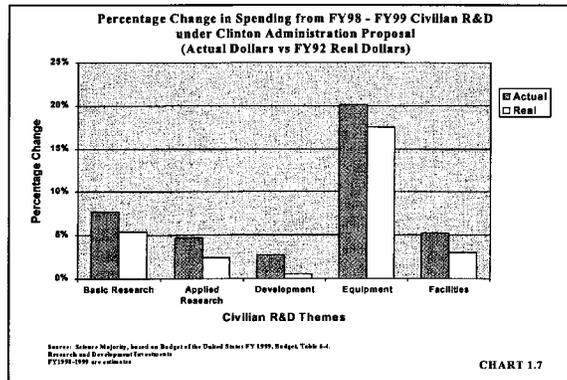
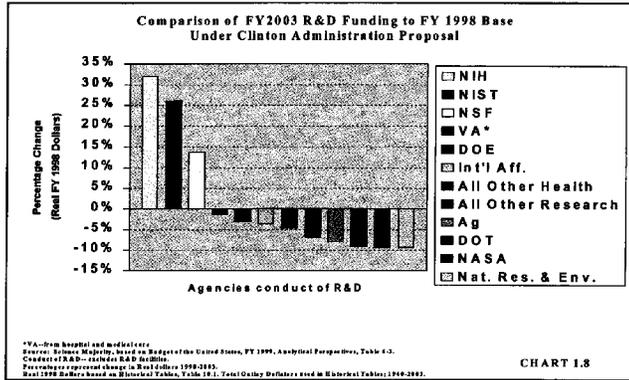


Chart 1.7 illustrates the percentage change for funding for each category within non-defense R&D. Basic research increases faster than applied research. The equipment account increases the fastest, but still accounts for only 2% of the non-defense R&D budget.

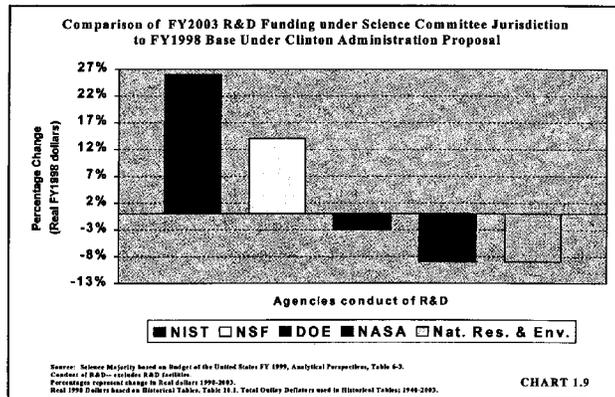


**F. After FY1999, the Majority of R&D Programs Lose Real Dollars through FY2003 under the Clinton Administration Proposals.**

Speaking at a White House press briefing, Vice President Gore claimed that the FY1999 budget “makes the largest commitment to key civilian research in the history of the United States of America[.]” (See *Daily Report for Executives*, BNA No. 22, 2-3-98 p. B-25). It appears that key research includes NIH, NSF, and NIST. Other programs would receive decreases in real dollars. For instance, research for all other health programs, veterans’ health care and hospitals, the environment, agriculture and space research receive reduced funding in real dollars through FY2003 below FY1998 levels.



Focusing on Science Committee programs Chart. 1.9, below, demonstrates the same point. NSF and NIST are the only research programs to receive increased funding in real dollars through FY2003.



**G. Except for NASA, Science Committee Agencies Receive Increases in FY1999.**

For FY1999, programs under the Science Committee's jurisdiction would receive more funding, but this is a temporary increase for many of these programs. Chart 1.10 demonstrates the FY1999 increases. Within the Science Committee's jurisdiction, the President's budget would increase budget authority in FY1999 over FY1998 levels for NSF by \$344 million; for the NOAA research program by \$168.6 million; for NIST/Technology Administration by \$43.4 million; for the Department of Energy by \$525.1 million; for EPA by \$7.7 million; and for the Department of Transportation, FAA RE&D by \$90.8 million. NASA's budget, however, would be reduced under the President's proposal by \$173 million in FY1999.

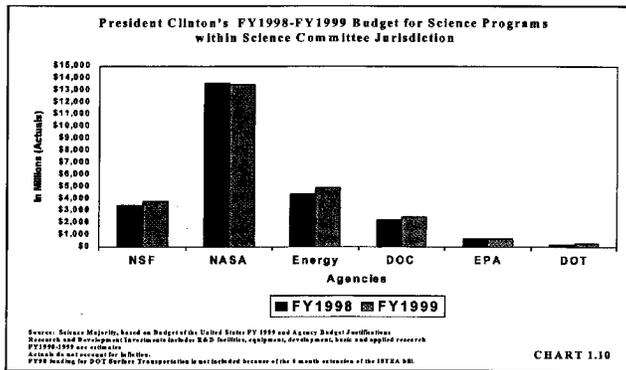
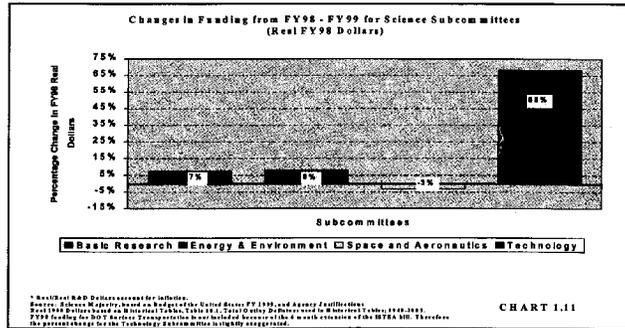


Chart 1.11 demonstrates percentage changes in funding from FY1998 to FY1999 for agencies by subcommittee in real dollars. The big winner appears to be the Technology Subcommittee because of the 35% proposed increase in ATP funding. (Please note that FY1998 funding for DOT Surface Transportation is not included because of the six month extension of the ISTEA bill. Therefore, the percent change for the Technology Subcommittee is slightly exaggerated.)

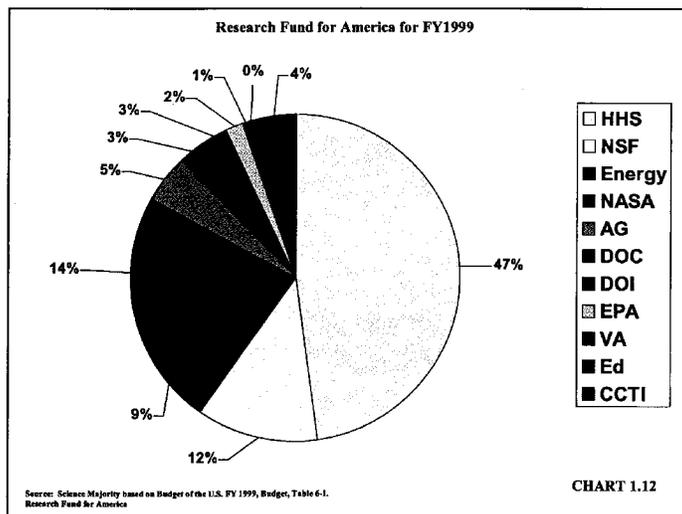


### III. THE RESEARCH FUND FOR AMERICA

Each year, federal agencies calculate the amount of their funding spent on R&D. The Clinton Administration describes this information in the Research and Development Investments Tables. This year the Administration proposes creating a "Research Fund for America," along with two other funds (the Environmental Resources Fund and the Transportation Fund). Please note that the three Funds for America are not trust funds and the Transportation Fund should not be confused with the Transportation Trust Funds. Thus, the Funds for America should be thought of as reclassifications in the President's budget and not new trust funds.

#### A. The Research Fund Components.

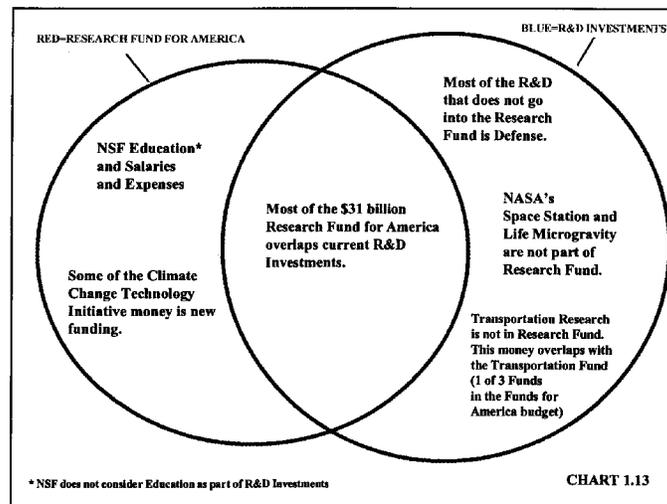
The Administration would classify \$31 billion of the \$37.8 billion proposed spending on non-defense civilian R&D as a priority under its Research Fund. NIH accounts for the bulk of the \$31 billion. The remaining money goes to the Departments of Agriculture, Commerce, Education, Energy, Interior and Veterans, and EPA, NASA and the Climate Change Technology Initiative (CCTI). Chart 1.12 illustrates the percentage of funding for each of these agencies under the Research Fund.



**B. Most of the Money to Pay for the \$31 Billion Research Fund is from Existing R&D Programs.**

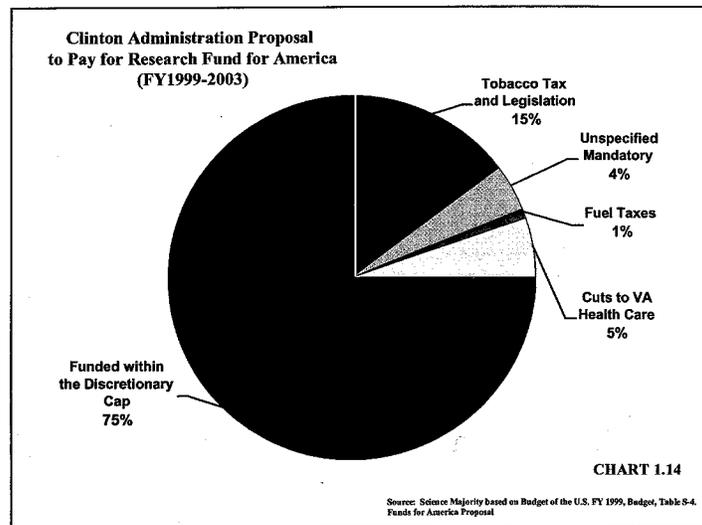
Most of the \$31 billion in funding for the Research Fund overlaps with the R&D investment money for current discretionary programs. The remaining amount of the Research Fund goes to new programs and initiatives. NSF Education, salaries and expenses are not included in the R&D investments, but are included in the Research Fund. Transportation research is not included in the Research Fund because it is in the Transportation Fund.

Please note that the Research Fund for America is not a trust fund.



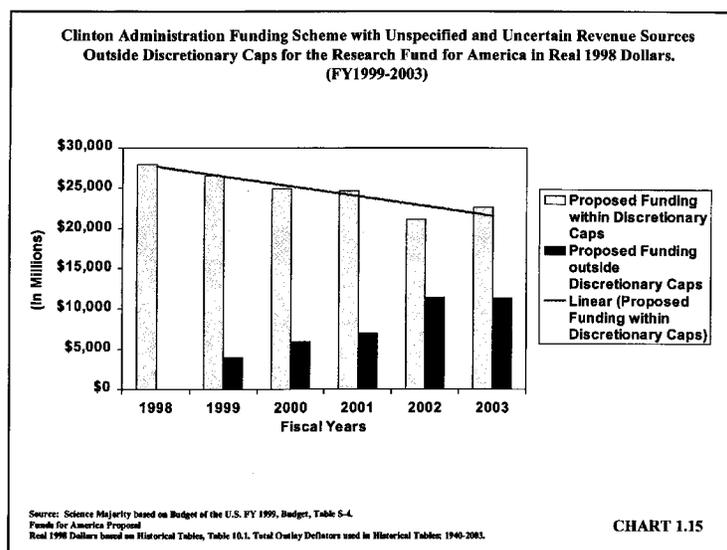
**C. The Clinton Administration Pays for the Research Fund for America  
With Unspecified Reductions in Other Discretionary Spending,  
With Uncertain Tax Increases and  
Uncollected Money From the proposed Tobacco Settlement.**

The President's budget assumes that a certain amount of future revenues will result from tobacco legislation. The President's budget fails to indicate whether the revenue calculation assumes the normal 25 percent income tax offset that is afforded to companies paying excise taxes or similar payments. If the President's budget does not account for the 25 percent deduction, then the \$65.5 billion revenues will be reduced by 25 percent. Thus, the uncollected revenues from the proposed tobacco settlement would not produce as much revenue as the President assumes, even if a tobacco settlement is reached. If no tobacco settlement is reached, R&D will be reduced substantially.



**D. The Clinton Administration Uses a Funding Scheme to Pay for the Research Fund for America.**

The Clinton budget proposes to pay for the increased spending with funds outside the discretionary caps. Chart 1.15, below, illustrates that the Clinton Administration each year will pay for its Research Fund with more and more federal money outside the discretionary caps.





**COMMITTEE on SCIENCE  
MAJORITY CAUCUS  
Chairman F. James Sensenbrenner, Jr.**

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***COMMITTEE ON SCIENCE: ANALYSIS AND REVIEW***

**THE CLINTON SCIENCE AND TECHNOLOGY  
BUDGET FOR FISCAL YEAR 1999**

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**APPENDIX**

DATA TABLES FOR CHARTS PRESENTED IN COMMITTEE ON SCIENCE: ANALYSIS AND  
REVIEW OF PRESIDENT CLINTON'S FY1999 BUDGET

<b>CHART 1.1—Comparison of Mandatory, Discretionary, and Net Interest Outlays (FY1962-2003)</b>							
<b>(Source: Science Majority, based on the Budget of the U.S, FY 1999, Historical Tables, Table 8.3)</b>							
	1962	1963	1964	1965	1966	1967	1968
Discretionary	67.5	67.6	66.8	65.8	67	67.6	66.2
Mandatory	26.1	25.4	26.3	26.9	26	25.9	27.6
Net Interest	6.4	7	6.9	7.3	7	6.5	6.2
	1969	1970	1971	1972	1973	1974	1975
Discretionary	63.9	61.4	58.3	55.7	53	51.3	47.5
Mandatory	29.2	31.2	34.7	37.6	39.9	40.8	45.5
Net Interest	6.9	7.4	7.1	6.7	7.1	8	7
	1976	1977	1978	1979	1980	1981	1982
Discretionary	47.1	48.1	47.6	47.6	46.7	45.4	43.7
Mandatory	45.7	44.6	44.7	44	44.4	44.5	44.9
Net Interest	7.2	7.3	7.7	8.5	8.9	10.1	11.4
	1983	1984	1985	1986	1987	1988	1989
Discretionary	43.7	44.5	43.9	44.3	44.2	43.6	42.7
Mandatory	45.2	42.4	42.4	42	42	42.1	42.5
Net Interest	11.1	13	13.7	13.7	13.8	14.3	14.8
	1990	1991	1992	1993	1994	1995	1996
Discretionary	39.9	40.2	38.7	38.3	37.2	36	34.2
Mandatory	45.4	45.1	46.9	47.5	48.9	48.7	50.3
Net Interest	14.7	14.7	14.4	14.1	13.9	15.3	15.4
	1997	1998	1999	2000	2001	2002	2003
Discretionary	34.2	33.1	32.7	32.1	31.4	31	30.6
Mandatory	50.5	52.3	53.4	54.6	55.9	56.8	58.1
Net Interest	15.2	14.6	13.9	13.2	12.7	12.2	11.3

<b>CHART 1.2—Total Spending for the Conduct of R&amp;D Under Clinton Administration Proposal FY1999-2003</b>						
<b>(Source: Science Majority, based on the Budget of the U.S, FY 1999, Analytical Perspectives, Table 6-3)</b>						
	1998	1999	2000	2001	2002	2003
ACTUAL R&D DOLLARS	\$73,464	\$75,145	\$72,997	\$73,351	\$75,137	\$78,293
REAL FY1998 R&D DOLLARS	\$73,464	\$73,569	\$69,945	\$68,731	\$68,838	\$70,109

<b>CHART 1.3—Percentage Change in Federal R&amp;D from FY 1998 Base Year Clinton Administration Proposal (Real Dollars v. Actual Dollars)</b>						
<b>(Source: Science Majority, based on the Budget of the U.S, FY 1999, Analytical Perspectives, Table 6-3)</b>						
	1998	1999	2000	2001	2002	2003
Percentage Change in R&D	0%	2%	-1%	0%	2%	7%
Percentage Change in R&D (Real)	0%	0%	-5%	-6%	-6%	-5%

DATA TABLES FOR CHARTS PRESENTED IN COMMITTEE ON SCIENCE: ANALYSIS AND REVIEW OF PRESIDENT CLINTON'S FY1999 BUDGET

**CHART 1.4—Defense R&D vs. Non-Defense R&D (Outlays in Actual Dollars)(FY 1949 - FY 1999)**

(Source: Science Majority, based on the Budget of the U.S., FY 1999, Historical Tables, Table 9.8 [In Millions])

	1949	1950	1951	1952	1953	1954	1955	1956
Defense R&D	\$ 762	\$ 772	\$ 846	\$ 1,204	\$ 1,553	\$ 1,551	\$ 1,550	\$ 1,898
Non-Defense R&D	\$ 178	\$ 282	\$ 279	\$ 291	\$ 295	\$ 297	\$ 345	\$ 428
	1957	1958	1959	1960	1961	1962	1963	1964
Defense R&D	\$2,134	\$2,459	\$5,364	\$5,937	\$6,922	\$7,090	\$7,144	\$7,865
Non-Defense R&D	\$577	\$729	\$1,020	\$1,385	\$1,864	\$2,747	\$4,221	\$5,931
	1965	1966	1967	1968	1969	1970	1971	1972
Defense R&D	\$7,077	\$7,097	\$8,068	\$8,544	\$8,314	\$8,021	\$8,108	\$8,837
Non-Defense R&D	\$8,763	\$7,821	\$7,894	\$7,628	\$7,346	\$7,132	\$7,301	\$7,466
	1973	1974	1975	1976	1977	1978	1979	1980
Defense R&D	\$9,139	\$9,406	\$9,715	\$9,819	\$10,874	\$12,077	\$12,129	\$14,643
Non-Defense R&D	\$7,896	\$8,028	\$8,821	\$10,169	\$10,569	\$12,455	\$14,196	\$15,592
	1981	1982	1983	1984	1985	1986	1987	1988
Defense R&D	\$16,937	\$19,809	\$22,298	\$25,765	\$30,360	\$35,565	\$37,097	\$38,032
Non-Defense R&D	\$17,231	\$14,850	\$13,602	\$15,221	\$16,856	\$16,465	\$16,159	\$18,068
	1989	1990	1991	1992	1993	1994	1995	1996
Defense R&D	\$40,366	\$41,078	\$37,887	\$38,170	\$40,396	\$38,055	\$37,699	\$39,428
Non-Defense R&D	\$20,394	\$22,732	\$24,296	\$26,558	\$27,982	\$28,397	\$30,733	\$29,011
	1997							
Defense R&D	\$40,177							
Non-Defense R&D	\$30,896							

**CHART 1.5—Percentage Change in Federal R&D under Clinton Administration Proposal  
(in Real Dollars FY1998-FY2003)**

	1998	1999	2000	2001	2002	2003	
Defense R&D		\$39,873.00	\$38,882.84	\$35,232.72	\$33,581.65	\$33,311.10	\$33,369.09
Non-Defense R&D		\$33,763.00	\$34,858.08	\$34,878.19	\$35,314.19	\$35,692.23	\$36,915.91
Science Committee R&D		\$18,088.00	\$18,201.98	\$17,735.17	\$18,036.11	\$17,915.28	\$17,277.27

**CHART 1.6—Clinton Budget Civilian R&D Themes for FY99 (actual dollars)**

	Basic Research	Applied Research	Development	Equipment	Facilities
FY1999	\$ 15,811	\$ 11,772	\$ 8,229	\$ 693	\$ 1,318
FY1999 as %s	42%	31%	22%	2%	3%

**DATA TABLES FOR CHARTS PRESENTED IN COMMITTEE ON SCIENCE: ANALYSIS AND REVIEW OF PRESIDENT CLINTON'S FY1999 BUDGET**

**CHART 1.7—Percentage Change in Spending for FY98 - FY99 Civilian R&D under Clinton Administration Proposal (Actual Dollars vs FY92 Real Dollars)**

(Source: Science Majority, based on the Budget of the U.S, FY 1999, Budget, Table 6-4)

	Basic Research	Applied Research	Development	Equipment	Facilities
Actual	8%	5%	3%	20%	5%
Real	5%	2%	1%	18%	3%

**CHART 1.8—Comparison of FY2003 R&D Funding to FY1998 Base under Clinton Administration Proposal**

(Source: Science Majority, based on the Budget of the U.S, FY 1999, Analytical Perspectives, Table 6-3)

NIH	32%
NIST	26%
NSF	14%
VA	-1%
DOE	-3%
Int'l Aff.	-4%
All Other Health	-5%
All Other Research	-7%
Ag	-8%
DOT	-9%

**CHART 1.9—Comparison of FY2003 R&D Funding under Science Committee Jurisdiction to FY98 Base Under Clinton Administration Proposal**

(Source: Science Majority, based on the Budget of the U.S, FY 1999, Analytical Perspectives, Table 6-3)

NIST	26%
NSF	14%
DOE	-3%
NASA	-9%
Nat. Res. & Env.	-9%

**CHART 1.10—President Clinton's FY1998-FY1999 R&D Budget for Science Programs within Science Committee Jurisdiction**

(Source: Science Majority, based on the Budget of the U.S, FY 1999, Budget, Table 6-4)

	NSF	NASA	Energy	DOC	EPA	DOT
FY1998	\$ 3,429	\$ 13,638	\$ 4,418	\$ 2,281	\$ 670	\$ 205
FY1999	\$ 3,773	\$ 13,465	\$ 4,943	\$ 2,493	\$ 678	\$ 296

**CHART 1.11—Changes in Funding from FY89-FY99 for Science Subcommittees (Real FY98 Dollars)**

(Source: Science Majority, based on the Budget of the U.S, FY 1999, and Agency Justifications)

Basic Research	7%
Energy & Environment	8%
Space and Aeronautics	-3%
Technology	68%

**DATA TABLES FOR CHARTS PRESENTED IN COMMITTEE ON SCIENCE: ANALYSIS AND REVIEW OF PRESIDENT CLINTON'S FY1999 BUDGET**

**CHART 1.12—Research Fund for America for FY1999**

(Source: Science Majority, based on the Budget of the U.S, FY 1999, Budget, Table 6-1)

	Dollars	Percentage
HHS	\$14,869	47%
NSF	\$3,710	12%
Energy	\$2,681	9%
NASA	\$4,605	14%
AG	\$1,444	5%
DOC	\$851	3%
DOI	\$807	3%
EPA	\$487	2%
VA	\$300	1%
Ed	\$50	>1%
CCTI	\$1,292	4%
Total RFF	\$31,096	100%

**CHART 1.13—Venn Diagram of Research Fund for America and Relationship to Research Fund for America**

Based on discussions with OMB

**CHART 1.14—Clinton Administration Proposal to Pay for Research Fund for America (FY1999-2003)**

(Source: Science Majority, based on the Budget of the U.S, FY 1999, Budget, Table S-4)

Tobacco Tax and Legislation	\$25,313	15%
Unspecified Mandatory	\$6,852	4%
Fuel Taxes	\$1,547	1%
Cuts to VA Health Care	\$9,066	5%
Transfers from other Discretionary Spending	\$127,818	75%

**CHART 1.15—Clinton Administration Funding Scheme with Unspecified and Uncertain Revenue**

Sources Outside Discretionary Caps for the Research Fund for America in Real 1998 Dollars (FY 1999-2003)

(Source: Science Majority, based on the Budget of the U.S, FY 1999, Budget, Table S-4)

	1998	1999	2000	2001	2002	2003
Proposed Funding w/ Disc. Caps	\$27,907	\$26,486	\$24,938	\$24,676	\$21,145	\$22,676
Proposed Funding outside Disc. Caps	\$0	\$3,963	\$5,937	\$6,915	\$11,400	\$11,382

Trend line related to Funding within Discretionary Caps is automatically inputted by software



**COMMITTEE on SCIENCE  
MAJORITY CAUCUS  
Chairman F. James Sensenbrenner, Jr.**

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***COMMITTEE ON SCIENCE: ANALYSIS AND REVIEW***

**THE CLINTON SCIENCE AND TECHNOLOGY  
BUDGET FOR FISCAL YEAR 1999**

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**SUBCOMMITTEE  
TABLES**

**Basic Research Subcommittee**

(In millions)

Agency	Account	Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
	DOUSGS						
	NEHRP						
		NEHRP, USGS	48.8	48.8	48.8	-0.00	-0.01%
Summary for Account = NEHRP (1 total record)							
		Sum	48.8	48.8	48.8	-0.00	
Summary for Agency = DOUSGS (1 total record)							
		Sum	48.8	48.8	48.8	-0.00	
		Agency					
		FEMA					
		Account					
		NEHRP					

Agency	Account	Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
	FEMA						
	USFA						
		NEHRP, FEMA	18.7	18.7	18.9	0.20	1.07%
Summary for Account = NEHRP (1 total record)							
		Sum	18.7	18.7	18.9	0.20	
Summary for Agency = FEMA (1 total record)							
		Sum	18.7	18.7	18.9	0.20	
		Agency					
		FEMA/USFA					

Account	USFA	FT97 Enacted	FT98 Enacted	FT99 Admin	3 DME 98 to 99	% DME 98 to 99
<b>Program</b>						
United States Fire Administration (USFA)						
Summary for Account = USFA (1 detail record)						
		30.1	28.7	28.9	0.20	0.70%
Sum		30.1	28.7	28.9	0.20	
Summary for Agency = FEMA/USFA (1 detail record)						
Sum		30.1	28.7	28.9	0.20	
Agency	NSF					
Account	eRRA					
<b>Program</b>						
		FT97 Enacted	FT98 Enacted	FT99 Admin	3 DME 98 to 99	% DME 98 to 99
Biological Sciences		320.2	370.8	417.8	47.00	12.80%
Computer & Info Science & Engineering		273.4	264.2	331.1	48.00	14.00%
Engineering		347.9	308.0	400.8	42.00	11.80%
Geosciences		448.1	405.1	507.3	62.20	11.47%
Health & Physical Sciences		885.9	718.7	762.0	78.20	10.80%
Social, Behavioral & Economic Sciences		121.8	130.7	160.3	18.00	18.00%
Special Research Programs		181.4	168.9	182.4	18.00	8.00%
Materials Logistics		62.6	62.6	62.6	0.00	0.00%
Critical Technologies Institute		2.7	2.7	2.7	0.00	0.00%
Unspecified account						

Summary for Account = e894 (10 total records)					
Account	Sum	FY97 Enacted	FY98 Enacted	FY99 Admin	% DMC 98 to 99
<b>Account</b> <b>BEHR</b>					
Program					
Education and Human Resources		619.0	632.5	633.0	7.80%
Summary for Account = BEHR (1 total record)					
Sum		619.0	632.5	633.0	86.89
<b>Account</b> <b>CMRE</b>					
Program					
Major Research Equipment		80.0	109.0	94.0	-13.76%
Summary for Account = CMRE (1 total record)					
Sum		80.0	109.0	94.0	-15.69
<b>Account</b> <b>dS&amp;E</b>					
Program					
Salaries and Expenses		134.3	137.0	144.0	8.11%
Summary for Account = dS&E (1 total record)					
Sum		134.3	137.0	144.0	7.09
<b>Account</b> <b>eIGANSF</b>					
Program					
Inspector GeneralNSF		4.7	4.8	5.2	8.39%

Summary for Account = 41G/NSF (7 detail records)	4.7	4.8	5.2	0.40
Sum				
Summary for Agency = NSF (14 detail records)				
Sum	3270.0	3429.0	3773.0	343.89
Grand Total	3368.4	3578.0	3869.0	343.39

DOJUSGS = the Department of Interior United States Geological Survey  
 FEMA = the Federal Emergency Management Agency  
 FEMA/USFA = the United States Fire Administration within FEMA  
 Accounts: NEHRP = the National Earthquake Hazard Reduction Program; R and RA = Research and Related Activities; EHR = Education and Human Resources; MRE = major research equipment; S and E = salaries and expenses; and IG/NSF = Inspector General.  
 \$23M for Next Generation Internet is provided by the Internet Infrastructure Fund. This funding is not reflected in the R and RA account.

The FY97 Enacted total on this table does not reflect the FY97 Enacted total in the NSF justification book as a result of carryover funds used by NSF during FY97 which they added to their bottom line. The difference is \$29M

**Energy and Environment Subcommittee**

(in millions)

Agency	DOC/NOAA				
Account	Construction				
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Construction	14.0	18.7	18.0	-0.70	-4.18%
Summary for Account = Construction (1 detail row)					
Sum	14.0	18.7	18.0	-0.70	
Account	Fleet Maintenance & Planning				
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Fleet Maintenance and Planning	0.0	13.5	9.6	-3.90	-28.89%
Summary for Account = Fleet Maintenance & Planning (1 detail row)					
Sum	0.0	13.5	9.6	-3.90	
Account	Fleet Modernization				
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Fleet Modernization	0.0	0.0	0.0	0.00	0.00%
Summary for Account = Fleet Modernization (1 detail row)					
Sum	0.0	0.0	0.0	0.00	
Account	NEXRAD WFO				
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
NEXRAD Weather Forecast Office, Maintenance	1.0	1.0	5.4	4.40	440.00%

Summary for Account = NERVOUS WFO (1 detail record)						
Account	1.0	1.0	1.0	5.4	4.40	
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99	
<b>ORF&amp;PAC</b>						
National Ocean Service (NOS)	142.7	163.2	151.3	-11.90	-7.29%	
Program Support	71.5	70.9	68.6	-2.30	-3.24%	
NESDIS	448.8	433.6	615.1	181.50	41.80%	
National Weather Service (NWS)	638.0	653.0	665.0	2.00	0.31%	
Oceanic & Atmospheric Research (OAR)	163.7	215.7	201.0	-14.70	-8.82%	
Sum	1493.5	1536.4	1691.0	154.00		
<b>Recoveries from prior years</b>						
<b>Program</b>						
Recoveries from prior years	-14.0	-24.0	-4.0	20.00	-63.33%	
Sum	-14.0	-24.0	-4.0	20.00		
<b>Sea Grant</b>						
<b>Program</b>						
Sea Grant	54.3	58.0	50.2	-8.00	-10.30%	
Sum	54.3	58.0	50.2	-8.00		
<b>Summary for Agency = DOC/NOAA (11 detail records)</b>						
Sum	1536.8	1599.6	1798.2	188.00		

Agency	DOE				
Account	Clean Coal Technology				
Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Clean Coal Tech.	-2.1	-101.0	-40.0	61.00	-80.40%
<i>Summary for Account = Clean Coal Technology (f detail record)</i>					
Sum	-2.1	-101.0	-40.0	61.00	
Account	Energy Conservation				
Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Building Technology	68.2	64.4	103.9	39.50	61.34%
Industry Sector	115.4	136.2	166.6	30.40	22.52%
Transportation Sector	172.5	183.3	246.1	62.80	27.52%
Policy and Management	26.4	28.8	44.4	15.60	55.24%
Use of Prior Year Balances	-30.5	-20.6	-35.0	-14.40	69.80%
Energy Efficiency Science Initiative	0.0	0.0	0.0	0.00	#N/A
<i>Summary for Account = Energy Conservation (f detail record)</i>					
Sum	352.0	401.8	526.0	124.10	
Account	Energy Supply				
Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Photo Voltaic	59.2	67.8	61.7	13.90	20.60%
Field Operations	66.4	66.0	104.5	9.50	10.00%
Renewable Indian Energy Resources	4.0	3.9	0.0	-3.90	-100.00%
Operations & Maintenance	2.3	1.6	2.3	0.70	43.75%

Program direction	8.7	7.5	7.5	7.5	0.00	0.00%
Energy Storage Systems	4.0	3.9	6.0	2.10	53.05%	53.05%
Construction	1.0	1.0	0.0	-1.00	-100.00%	-100.00%
Biomass/Biofuels Energy Research	0.0	38.6	27.2	-11.40	-29.53%	-29.53%
Hydrogen Research	14.8	19.1	27.0	7.90	41.39%	41.39%
Energy Supply (Research)	0.0	0.0	0.0	0.00	0.00%	0.00%
Geothermal Tech. Development	29.8	29.1	33.0	3.90	13.40%	13.40%
Construction:95-100, Golden, CO	2.8	2.2	0.0	-2.20	-100.00%	-100.00%
Operation & Maintenance	0.5	1.0	5.0	4.00	400.00%	400.00%
Solar Technology Transfer	0.0	0.0	1.4	1.40	0.00%	0.00%
International Solar Energy Program	0.7	1.4	8.8	7.40	528.57%	528.57%
High temperature superconducting R&D	19.5	32.0	32.0	0.00	0.00%	0.00%
Wind Energy Systems/Research	28.8	32.8	43.8	11.00	33.54%	33.54%
Renewable Energy Research Program	0.0	-44.3	-47.9	-3.80	8.13%	8.13%
Transportation (Rohala)	27.2	30.7	46.9	16.20	52.77%	52.77%
Power Energy Systems	27.2	26.2	42.9	14.70	52.19%	52.19%
Solar Thermal System	22.0	16.5	22.5	6.00	36.39%	36.39%
98-U-201, Storage Yards, Kentucky	4.0	2.8	0.0	-2.80	-100.00%	-100.00%
Exotic and Magnetic Fields R&D	7.9	6.9	0.0	-6.90	-100.00%	-100.00%
Solar Building Technology Research	2.3	2.7	5.0	2.30	85.19%	85.19%
Use of prior year balances	-22.4	-24.4	-17.0	7.40	-30.33%	-30.33%
Renewable Energy Production Incentive Program	2.0	3.0	4.0	1.00	33.33%	33.33%

Solar & Renewable Energy Science Initiative	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	#Error
Use of Prior Year Balances	-1.4	-1.2	0.0	0.0	1.20				-100.00%
Operations & Maintenance	2.0	2.8	4.6	1.70					88.82%
Nuclear Energy Research Initiative	0.0	0.0	24.0	24.00					#Error
Oak Ridge Landfill	11.5	9.5	12.5	3.00					31.59%
Nuclear Technology R&D	19.5	20.0	25.0	5.00					25.00%
Advanced radioisotope power system	38.7	40.0	40.5	0.50					1.29%
Light Water Reactor	37.0	0.0	0.0	0.00					#Error
Idaho National Engineering Lab. 95-E-201	1.0	4.4	2.4	-2.00					-45.45%
Federal Building/Renewable Power Initiative	0.0	4.8	0.0	-4.80					-100.00%
Advanced test reactor station irradiation	0.8	0.0	0.0	0.00					#Error
Solar Photocconversion Energy Research	0.0	0.0	14.5	14.50					#Error
Fuel Flux Test Facilities	32.1	30.9	31.2	0.30					0.97%
95-E-201, Production Facility, LBNL	0.0	0.0	6.0	6.00					#Error
Use of Prior Year Balances	-17.8	0.0	0.0	0.00					#Error
Use of Prior Year Balances	-2.1	-4.7	0.0	0.70					-100.00%
Use of Prior Year Balances	-3.3	-0.1	0.0	0.07					-100.00%
Advanced Vapor Laser Isotope Laser Separation	0.0	80.0	0.0	-80.00					-100.00%
Climate Challenge	0.0	0.0	0.5	0.50					#Error
Program direction	13.1	15.7	17.0	1.30					8.29%
Program Division	18.1	21.0	23.8	2.80					12.38%
Hydropower Development	1.0	0.7	4.0	3.30					471.43%

86-11-200, Storage Yards, Kentucky	0.0	0.4	0.0	-0.40	-100.00%
Nuclear Energy Plant Optimization	0.0	0.0	10.0	10.00	6000%
87-E-200 Argonne National Lab	1.2	0.0	0.0	0.00	6000%
Solar Program Support	0.0	0.0	14.0	14.00	6000%
Program direction	43.2	38.8	36.4	-0.40	-1.00%
87-E-201 ANL-W	1.0	0.0	0.0	0.00	6000%
Fusion Energy Sciences Research Program	218.4	228.7	228.2	-1.50	-0.60%
Operations & Maintenance	11.7	18.4	16.5	-2.90	-14.50%
Operations & Maintenance	52.5	60.9	66.7	6.80	9.50%
88-E-200, TPA Electrical, Idaho	0.0	0.0	0.3	0.30	6000%
Checkout of access facilities	78.4	68.1	68.0	-0.10	-1.00%
Use of Prior Year Balances	-4.8	-8.2	0.0	8.20	-100.00%
Use of Prior Year Balances	-0.7	-0.3	0.0	0.30	-40.00%
University Reactor Fuel Assistance & Support	4.0	7.0	10.0	3.00	42.00%
Use of Prior Year Balances	0.0	0.2	0.0	-0.20	-100.00%
Environment, safety & health (post-shipment)	43.9	41.7	37.8	-4.10	-8.00%
<b>Summary for "Account" = Energy Supply (for field records)</b>					
<b>Sum</b>	<b>944.5</b>	<b>1004.5</b>	<b>1128.1</b>	<b>184.57</b>	
<b>Account</b>	<b>Fossil Energy</b>				
<b>Program</b>	<b>FY97 Enclosed FY98 Enclosed FY99 Actual</b>				
Natural Gas	68.5	71.0	67.4	-3.60	-6.60%
Fossil Energy Sciences Initiative	0.0	0.0	0.0	0.00	6000%



Account	131.0	113.6	97.2	-18.40	-14.4%
Operation & Maintenance					
98-E-000, TM-2 Nat. INEL	8.6	0.4	0.0	-8.40	-100.00%
Operation & Maintenance	185.7	80.4	83.9	3.50	4.38%
Summary for Account = Non-Dioxin Environmental Management (8 detail records)					
Sum	571.7	484.2	461.9	-32.30	

Account	FY97 Enacted			FY98 Enacted			FY99 Admin			% Diff. 98 to 99		
Program												
98-E-303, Electrical Safety Rehab PHL	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	REter
98-E-301, Heating Plant Rehab AHL	2.5	3.4	0.0	3.4	0.0	0.0	0.0	0.0	-3.40	-100.00%	-3.40	-100.00%
Energy Research Analysis	1.5	1.3	1.0	1.3	1.0	1.0	1.0	1.0	-0.30	-23.08%	-0.30	-23.08%
MEL-001, Lab Infrastructure Projects	0.0	7.3	14.9	7.3	14.9	14.9	14.9	14.9	7.60	104.11%	7.60	104.11%
98-E-310, Lab Rehab PHL	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00%	0.00	0.00%
94-E-303, Routing Improvements ORNL	0.2	4.0	4.9	4.0	4.9	4.9	4.9	4.9	0.90	22.50%	0.90	22.50%
98-E-305, Lab Upgrade	6.9	5.3	0.3	5.3	0.3	0.3	0.3	0.3	-5.00	-72.46%	-5.00	-72.46%
98-E-307, Fire Safety Imp. III AHL	1.0	0.7	0.0	0.7	0.0	0.0	0.0	0.0	-0.70	-70.00%	-0.70	-70.00%
98-E-308, Sanitary System Mods II BNL	1.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0	-0.60	-60.00%	-0.60	-60.00%
Use of Prior Year Balances	-1.1	-1.8	0.0	-1.8	0.0	0.0	0.0	0.0	1.80	163.64%	1.80	163.64%
Use of Prior Year Balances and Other Adj.	-2.1	-35.0	-7.8	-35.0	-7.8	-7.8	-7.8	-7.8	27.40	-63.73%	27.40	-63.73%
98-O-302, Meth Injector, Fermilab	82.0	31.0	0.0	31.0	0.0	0.0	0.0	0.0	-51.00	-62.20%	-51.00	-62.20%
98-E-309, Leak Prevention Upgrade BNL	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00%	0.00	0.00%
Use of Prior Year Balances	-9.7	-4.8	0.0	-4.8	0.0	0.0	0.0	0.0	4.80	-49.48%	4.80	-49.48%
Medical Applications & Measurement Balance	56.6	68.0	43.9	68.0	43.9	43.9	43.9	43.9	-22.10	-33.40%	-22.10	-33.40%

U.S.M.A.S. Foundation for Science	0.0	0.0	0.0	0.0	0.0	#Error
97-G-303, Substation Upgrade, SLAC	3.0	9.4	0.0	-4.0	-100.00%	
Administrative, Information, & Computational Science	122.2	177.2	141.3	14.10	11.00%	
97-G-305, Various Leverages	2.5	0.0	0.0	0.0	#Error	
98-G-305, Wilson Hall Safety Improvements	0.0	0.0	6.7	6.70	#Error	
98-G-309 Contribution Research Facility	9.0	7.0	4.0	-3.00	-42.86%	
Laboratory Technology Research	23.7	15.8	16.3	0.50	3.16%	
98-G-314 Spectralis Nuclear Science Const.	0.0	0.0	128.4	128.40	#Error	
Advanced Energy Projects	11.4	7.6	3.0	-4.00	-40.35%	
Infrastructure Support	0.0	0.0	1.2	1.20	#Error	
Use of Peer Year Science	-1.4	-0.1	0.0	0.10	-100.00%	
University and Science Education	0.0	0.0	15.0	15.00	#Error	
Small Business Innovation Research	79.3	0.0	0.0	0.00	#Error	
Study to reduce total SO2/SO3 Science Auth.	0.0	0.0	0.0	0.00	#Error	
Environmental Processes	109.1	106.4	119.2	10.00	9.09%	
Environmental Remediation	34.9	86.3	67.4	1.10	1.05%	
Life Sciences	143.5	165.2	162.0	-3.20	-1.94%	
94-95-100, PNL (Richland, Washington)	35.1	0.0	0.0	0.00	#Error	
Research and Technology	207.4	210.0	213.4	3.40	1.62%	
Facility Operations	389.8	418.9	488.8	37.70	9.00%	
98-G-304, Neutronium Injector Facility	0.0	5.5	14.3	8.00	180.00%	
98-G-305, Experimental Hall Facility	0.0	5.0	0.0	-5.00	-100.00%	

94-G-304, B-factory, SLAC	45.0	0.0	0.0	0.0	0.00	PERM
94-E-330, Fire & Safety, ANL	0.2	0.0	0.0	0.0	0.00	PERM
Operations and Maintenance	245.0	281.3	316.0	54.70	20.03%	
Use of Prior Year Balances	-0.1	-1.0	0.0	1.00	-100.00%	
94-E-330, Human Genome Lab, LBL	1.0	0.0	0.0	0.00		PERM
Material Sciences	368.5	391.0	417.2	28.20	6.70%	
Chemical Science	194.5	200.7	208.6	8.90	4.45%	
Engineering & Geo Sciences	40.9	41.2	44.4	3.20	7.77%	
Energy Bio Sciences	27.3	27.4	32.5	5.10	18.61%	
Program Direction	40.6	37.6	30.9	2.30	6.12%	
Use of Prior Year Balances	-6.7	-4.4	0.0	4.40	-100.00%	
Use of Prior Year Balances	-2.6	-1.7	0.0	1.70	-100.00%	
94-G-300, ICM Collider, Brookhaven	85.0	59.4	18.6	-42.90	-72.89%	
Sum	2268.6	2235.7	2482.4	248.70		

Summary for Account = Science (59 detail records)

Summary for Agency = DOE (144 detail records)

Agency	EPA
Account	LUST
Sum	4891.8

Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Leading Underground Storage Tanks (LUST)	0.7	0.6	0.6	0.00	0.00%
Sum	0.7	0.6	0.6	0.00	0.00%

Summary for Account = LUST (1 detail record)

Account	Oil Spill Research				
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Oil Spill Research	1.0	1.0	1.0	0.00	0.00%
Summary for Account = Oil Spill Research (1 detail record)					
Sum	1.0	1.0	1.0	0.00	
Account	Particulate Matter				
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Particulate Matter	28.6	48.6	28.0	-21.80	-43.85%
Summary for Account = Particulate Matter (1 detail record)					
Sum	28.6	48.6	28.0	-21.80	
Account	SAB				
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Science Advisory Board	2.5	2.4	2.5	0.20	8.33%
Summary for Account = SAB (1 detail record)					
Sum	2.5	2.4	2.5	0.20	
Account	Science & Technology				
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Science and Technology	825.4	561.4	605.5	24.10	4.15%
Summary for Account = Science & Technology (1 detail record)					
Sum	825.4	561.4	605.5	24.10	
Account	Superfund				
Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99

	35.0	35.0	40.0	5.00	14.29%
Superfund Research					
Summary for Account* - Superfund (1 detail record)					
Sum	35.0	35.0	40.0	5.00	
Summary for Agency* - EPA (6 detail records)					
Sum	391.2	670.0	677.7	7.70	
Grand Total	6439.6	6487.5	7388.7	791.37	

ORF and PAC within NOAA - the Operations, Research and Facilities account and the Procurement, Acquisition and Construction account.

\* The NOAA numbers include funding for GOES FM

\* Particulate Matter is part of the Sciences and Technology account within EPA, but has been broken out for purposes of this table. The true amount for the Sciences and Technology account should include this number.

**Space and Aeronautics Subcommittee**

(in millions)

Agency	Account	DOC/TAI	Program			% Diff. 98 to 99
		FOASC	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99
			0.5	0.5	0.5	0.00
Office of Air & Space Commercialization						
Summary for 'Account' = FOASC (1 detail record)						
Sum			0.5	0.5	0.5	0.00
Summary for 'Agency' = DOC/TAI (1 detail record)						
Sum			0.5	0.5	0.5	0.00
Agency		DOT/FAA1	Program			% Diff. 98 to 99
Account		FOCST	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99
			5.0	6.2	6.3	0.10
Office of Commercial Space Transportation						
Summary for 'Account' = FOCST (1 detail record)						
Sum			5.0	6.2	6.3	0.20
Summary for 'Agency' = DOT/FAA1 (1 detail record)						
Sum			5.0	6.2	6.3	0.20
Agency		NASA	Program			% Diff. 98 to 99
Account		aFISF	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99
			2146.6	2261.3	2270.0	-41.30
Space Station						
			300.0	0.0	0.0	0.00
NASA/Russian Cooperative Program						
						-3.69%
						657%

Account	FT97 Executed	FT98 Executed	FT99 Admin	S DMC 98 to 99	% DMC 98 to 99
oSpace Shuttle	2000.0	2077.0	3000.0	131.20	6.60%
oPayload & Utilization Operators	200.3	227.4	102.0	-8.40	-10.00%
Sum	2074.8	2000.0	3000.0	4.00	
<b>ASAT</b>					
Program	FT97 Executed	FT98 Executed	FT99 Admin	S DMC 98 to 99	% DMC 98 to 99
oSpace Science	1000.0	2000.0	2000.0	24.00	1.20%
oLife & Microgravity Science	200.7	214.2	242.0	27.00	13.00%
oMission to Planet Earth	1301.6	1417.3	1372.0	-43.00	-3.30%
oIntermediate and Space Transportation	1300.5	1400.0	1300.0	-170.00	-13.00%
oMission Communication	410.0	400.0	300.0	-30.00	-7.30%
oAcademic Programs	120.4	120.0	100.0	-20.00	-16.60%
oFuture Planning	0.0	0.0	0.0	0.00	0.00%
Sum	5403.1	5000.0	5407.4	-422.00	
Account	oMS				
Program	FT97 Executed	FT98 Executed	FT99 Admin	S DMC 98 to 99	% DMC 98 to 99
oSafety, Reliability and Quality Assurance	30.0	37.0	30.0	-2.00	-6.00%
oSpace Communication	201.4	200.2	177.0	-22.00	-10.90%
oResearch & Program Management	2070.5	2001.0	2000.0	47.00	2.30%
oContribution of Facilities	100.0	104.4	100.0	20.00	20.00%
Sum	2502.4	2402.2	2477.0	43.00	

Account	dIGNASA		Program		FY97 Executed		FY98 Executed		FY99 Admin		\$ Diff: 98 to 99		% Diff: 98 to 99	
					16.8	18.3	20.0	1.70						3.29%
					Inspector General									
					Summary for "Account" = dIGNASA (1 total row)									
					16.8	18.3	20.0	1.70						
					Summary for Agency = NASA (6 total rows)									
					13708.7	13838.0	13465.0	-173.00						
					13715.0	13644.7	13471.8	-172.98						

DOOTAI = the Department of Commerce, Technology Administration  
 DOTFAAI = the Department of Transportation, Federal Aviation Administration

Accounts: OASC = Office of Air and Space Commercialization; OCST = Office of Commercial Space Transportation; HSF = Human Space Flight; SAT = Science, Aeronautics and Technology; MS = Mission Support; and IGNASA = Inspector General  
 US/Mexico Foundation FTP8 funding is \$1M and is part of the Mission to Planet Earth total.

**Technology Subcommittee**

(in millions)

Agency	Account	DOC/NIST	NIST		F197 Executed		F198 Executed	F199 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
		Program		F197	F198	F199	Admin			
				218.0	182.5	259.9		67.40	38.01%	
				3.0	3.0	5.4		2.40	80.00%	
				-18.0	95.0	96.7		-8.30	-40.32%	
				95.0	113.5	106.8		-6.70	-6.80%	
				18.9	18.9	19.4		0.50	2.65%	
				35.6	35.6	36.6		1.00	2.82%	
				31.8	31.8	30.5		-1.30	-4.10%	
				27.9	27.9	28.4		0.50	1.79%	
				50.9	50.9	51.3		0.40	0.79%	
				13.4	17.2	16.7		-0.50	-2.91%	
				43.0	43.0	43.8		0.80	1.86%	
				14.9	14.9	15.1		0.20	1.34%	
				28.6	28.6	29.2		0.60	2.10%	
Summary for Account - NIST (13 total records)				565.2	673.0	714.9		41.90	7.41%	
Sum										

Summary for Agency - DOC/ST (13 total records)		683.2		673.0		714.9		419.0	
Agency	DOC/TA								
Account	TA								
Program		FT97 Executed	FT98 Executed	FT99 Admin	S Diff. 98 to 99	% Diff. 98 to 99			
TA, Experimental ProgramsCo		0.0	1.5	3.0	1.40	87.50%			
Unlimited SAT		2.5	0.0	0.0	0.00	0.00%			
TA, Office of Technology Policy		0.5	6.4	0.5	0.10	1.56%			
Summary for Account - TA (3 total records)		3.0	8.0	3.5	1.50				
Sum		3.0	8.0	3.5	1.50				
Summary for Agency - DOC/TA (3 total records)		3.0	8.0	3.5	1.50				
Sum		3.0	8.0	3.5	1.50				
Agency	DOT								
Account	Federal Highway Admin.								
Program		FT97 Executed	FT98 Executed	FT99 Admin	S Diff. 98 to 99	% Diff. 98 to 99			
Intelligent Transportation System		230.4		230.0					
Research and Tech. Developm		170.2		246.5					
Summary for Account - Federal Highway Admin. (2 total records)		400.6		476.5					
Sum		400.6		476.5					
Summary for Agency - DOT (2 total records)		400.6		476.5					
Sum		400.6		476.5					

Agency Account	DOT/FAA RE&D	Program	1997 Enacted	1998 Enacted	1999 Admin	\$ DMF 98 to 99	% DMF 98 to 99
	FAA, RE & D		208.4	198.2	200.0	0.80	0.40%
	Flight 2000		0.0	0.0	90.0	90.00	9.00%
<i>Summary for 'Account' = RE&amp;D (2 detail records)</i>							
Sum.			208.4	198.2	290.0	90.80	
<i>Summary for 'Agency' = DOT/FAA (2 detail records)</i>							
Sum			208.4	198.2	290.0	90.80	
Grand Total			1186.2	880.2	1318.9	134.28	

DOC/NIST = The Department of Commerce National Institute of Standards and Technology

DOC/TA = The Department of Commerce Technology Administration

DOT = The Department of Transportation Surface transportation program

DOT/FAA = The Department of Transportation Federal Aviation Administration Research, Engineering and Development Account

The Technology Administration (TA) contains funding for the Office of Air and Space Commercialization. This funding is \$.3M across the board. Therefore, the total for TA in this report does not contain this funding as it is under the jurisdiction of the Space and Aeronautics Subcommittee.

1998 enacted numbers for the Department of Transportation surface transportation programs do not appear because of the 1/2 year extension of 1997 enacted funds for ISTEA.



**COMMITTEE on SCIENCE  
MAJORITY CAUCUS  
Chairman F. James Sensenbrenner, Jr.**

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***COMMITTEE ON SCIENCE: ANALYSIS AND REVIEW***

**THE CLINTON SCIENCE AND TECHNOLOGY  
BUDGET FOR FISCAL YEAR 1999**

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**AGENCY TABLES**

**Department of Energy (DOE) Accounts**  
(in millions)

Account	Clean Coal Technology				
Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Clean Coal Tech.				61.00	-80.40%
Sum	-2.1	-101.0	-40.0		
Summary for 'Account' = Clean Coal Technology (1 detail record)					
Account	Energy Conservation			61.00	
Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Use of Prior Year Balances	-30.5	-20.6	-35.0	-14.40	69.90%
Building Technology	88.2	64.4	103.9	39.50	61.34%
Industry Sector	115.4	138.2	188.6	30.40	23.32%
Transportation Sector	172.5	163.3	248.1	52.80	27.32%
Policy and Management	26.4	26.6	44.4	15.80	55.24%
Energy Efficiency Science Initiative	0.0	0.0	0.0	0.00	6.80%
Sum	352.0	401.9	526.0	124.10	
Summary for 'Account' = Energy Conservation (6 detail records)					
Account	Energy Supply				
Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Use of Prior Year Balances	-1.4	-1.2	0.0	1.20	-100.00%
Federal Building/Retrofit Power Initiative	0.0	4.9	0.0	-4.90	-100.00%
98-LI-200, Storage Yards, Kentucky	0.0	0.4	0.0	-0.40	-100.00%

Renewable Indian Energy Resources	4.0	3.9	0.0	-3.90	-100.00%
98-U-201, Storage Yards, Kentucky	4.0	2.6	0.0	-2.60	-100.00%
Biomass/Biofuels Energy Research	0.0	38.6	27.2	-11.40	-29.53%
Nuclear Energy Plant Optimization	0.0	0.0	10.0	10.00	#Error
97-E-200 Argonne National Lab	1.2	0.0	0.0	0.00	#Error
Solar Program Support	0.0	0.0	14.0	14.00	#Error
Renewable Energy Research Program	0.0	-44.3	-47.9	-3.60	8.13%
Field Operations	98.4	95.0	104.5	9.50	10.00%
Wind Energy Systems/Research	28.6	32.8	43.8	11.00	38.46%
Hydropower Development	1.0	0.7	4.0	3.30	471.43%
Hydrogen Research	14.8	19.1	27.0	7.90	41.29%
Geothermal tech. development	29.6	29.1	33.0	3.90	13.40%
Construction:96E-100, Golden, CO	2.8	2.2	0.0	-2.20	-100.00%
Operation & Maintenance	0.5	1.0	5.0	4.00	400.00%
Solar Technology Transfer	0.0	0.0	1.4	1.40	#Error
Use of prior year balances	-22.4	-24.4	-17.0	7.40	-30.35%
Renewable Energy Production Incentive Program	2.0	3.0	4.0	1.00	33.33%
Program direction	13.1	15.7	17.0	1.30	8.28%
Energy Supply (Reclamation)	0.0	0.0	0.0	0.00	#Error
Electric and Magnetic Fields R&D	7.9	6.9	0.0	-6.90	-100.00%
High temperature superconducting R&D	19.5	32.0	32.0	0.00	0.00%
Energy Storage Systems	4.0	3.9	6.0	2.10	53.85%
Climate Challenge	0.0	0.0	0.5	0.50	#Error
Solar & Renewable Energy Science Initiative	0.0	0.0	0.0	0.00	#Error

97-E-201 ANL-W	1.0	0.0	0.0	0.0	0.0	#Error
International Solar Energy Program	0.7	1.4	8.8	7.40	628.07%	
Use of Prior Year Balances	-0.3	-0.1	0.0	0.07	-100.00%	
Closure of excess facilities	76.4	66.1	95.0	-3.10	-4.95%	
University Reactor Fuel Assistance & Support	4.0	7.0	10.0	3.00	42.86%	
Advanced test reactor fusion irradiation	0.8	0.0	0.0	0.00	#Error	
Solar Photoconversion Energy Research	0.0	0.0	14.5	14.50	#Error	
Fuel Flux Test Facilities	32.1	30.9	31.2	0.30	0.97%	
98-E-201, Production Facility, LLNL	0.0	0.0	6.0	6.00	#Error	
Transportation (Bikeable)	27.2	30.7	46.9	16.20	62.77%	
Use of Prior Year Balances	-2.1	-0.7	0.0	0.70	-100.00%	
Operations & Maintenance	11.7	19.4	16.5	-2.90	-14.95%	
Advanced Vapor Laser Isotope Laser Separation	0.0	60.0	0.0	-60.00	-100.00%	
Idaho National Engineering Lab. 95-E-201	1.0	4.4	2.4	-2.00	-46.49%	
Operations & Maintenance	2.0	2.9	4.6	1.70	88.62%	
Oak Ridge Landfill	11.5	9.5	12.5	3.00	31.30%	
Nuclear Technology R&D	19.5	20.0	25.0	5.00	25.00%	
Advanced multi-stage power system	36.7	40.0	40.5	0.50	1.25%	
Light Water Reactor	37.0	0.0	0.0	0.00	#Error	
Use of Prior Year Balances	-17.8	0.0	0.0	0.00	#Error	
Use of Prior Year Balances	0.0	0.2	0.0	-0.20	-100.00%	
Construction	1.0	1.0	0.0	-1.00	-100.00%	
Solar Thermal System	22.0	16.5	22.5	6.00	36.36%	
Photo Vehicle	50.2	67.8	81.7	13.90	28.00%	

Account	99-E-200, TRA Electrical, Inho	0.0	0.0	0.3	0.30	95%
Solar Building Technology Research	2.3	2.7	5.0	2.30	85.19%	
Use of Prior Year Balance	-4.6	-8.2	0.0	8.20	-100.00%	
Program direction	6.7	7.5	7.5	0.00	0.00%	
Operations & Maintenance	82.5	80.9	86.7	6.80	8.25%	
Operations & Maintenance	2.3	1.6	2.3	0.70	43.79%	
Fusion Energy Sciences Research Program	218.4	228.7	228.2	-1.50	-0.69%	
Program direction	43.2	38.8	36.4	-6.40	-1.05%	
Nuclear Energy Research Initiative	0.0	0.0	24.0	24.00	95%	
Environment, safety & health (non-defensed)	43.9	41.7	37.6	-4.10	-8.89%	
Program direction	18.1	21.0	23.6	2.80	12.39%	
Power Energy Systems	27.2	28.2	42.9	14.70	82.15%	
Use of Prior Year Balance	-0.7	-0.3	0.0	0.30	-100.00%	
Summary for Account - Energy Supply (64 detail records)	844.5	1024.5	1178.1	104.57		

Account	Fossil Energy	F197 Enacted	F198 Enacted	F199 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Natural Gas	66.5	71.0	67.4	-3.60	-4.07%	
Fossil Energy Science Initiative	0.0	0.0	0.0	0.00	95%	
Advanced Metallurgical Processes	5.0	5.0	5.0	0.00	0.00%	
General Plant Projects	2.0	2.5	2.6	0.10	4.00%	
Coal	100.9	107.4	130.0	22.60	21.04%	
General Production	0.0	0.0	0.0	0.00	95%	
Energy Technology Center Program Direction	54.3	52.1	51.9	-0.20	-0.39%	

Account	FY97 Enacted		FY98 Enacted		FY99 Admin		% Diff. 98 to 99	
	14.4	14.7	15.1	14.7	393.4	21.00		
Headquarters Program Direction								
Fuel Cells	48.8	40.2	42.2				2.72%	
Environmental Restoration	13.1	12.9	11.0				-4.98%	
Oil Technology	46.2	48.6	50.2				-14.73%	
Use of Prior Year Balances	-1.1	0.0	0.0				3.29%	
Cooperative R&D	5.4	5.8	5.8				#Error	
Fuels Program	2.2	2.2	2.2				0.00%	
<b>Sum</b>	<b>358.7</b>	<b>382.4</b>	<b>393.4</b>				<b>0.00%</b>	
<b>Non-Defense Environmental</b>								
	FY97 Enacted		FY98 Enacted		FY99 Admin		% Diff. 98 to 99	
Operation & Maintenance	165.7	80.4	83.9				4.36%	
Operation & Maintenance	131.0	113.6	97.2				-14.44%	
Site Closure	286.7	270.0	284.3				-5.81%	
Science and Technology	17.5	27.9	26.5				-5.02%	
93-E-000, TMA-2 A&I, INEL	6.8	0.4	0.0				-100.00%	
94-E-002 Oak Ridge National Lab	1.1	1.9	0.0				-100.00%	
91-E-000 ANL	2.1	0.0	0.0				#Error	
98-R-000 ORNL	2.7	0.0	0.0				#Error	
Use of Prior Year Balances	-11.7	0.0	0.0				#Error	
<b>Sum</b>	<b>571.7</b>	<b>484.2</b>	<b>461.9</b>				<b>-32.30</b>	

Account	Science	Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
		95-E-310, Lab Rehab PNL	3.0	0.0	0.0	0.00	#Err
		MEL-001, Lab Infrastructure Projects	0.0	7.3	14.9	7.60	104.11%
		95-E-301, Heating Plant Rehab ANL	2.5	3.4	0.0	-3.40	-100.00%
		95-E-303, Electrical Safety Rehab PNL	1.5	0.0	0.0	0.00	#Err
		Energy Research Analyses	1.5	1.3	1.0	-0.30	-20.00%
		94-E-303, Roofing Improvements ORNL	0.2	4.0	4.9	0.90	22.50%
		95-E-303, Lab Upgrades	6.9	5.3	0.3	-5.00	-64.34%
		95-E-307, Fire Safety Imp. III ANL	1.0	0.7	0.0	-0.70	-100.00%
		95-E-308, Sanitary System Mods II BNL	1.0	0.6	0.0	-0.60	-100.00%
		95-E-309, Loss Prevention Upgrades BNL	4.3	0.0	0.0	0.00	#Err
		Use of Prior Year Balances and Other Adj.	-2.1	-35.0	-7.6	27.40	-78.25%
		Operations and Maintenance	245.0	261.3	316.0	54.70	20.90%
		Use of Prior Year Balances	-1.1	-1.8	0.0	1.80	-100.00%
		Entry to reflect total 95059 Science Auth.	0.0	0.0	0.0	0.00	#Err
		95-E-300 Combustion Research Facility	9.0	7.0	4.0	-3.00	-42.86%
		Life Sciences	143.5	165.2	162.0	-3.20	-1.94%
		95-E-304 Spallation Neutron Source Const.	0.0	0.0	128.4	128.40	#Err
		Use of Prior Year Balances	-8.7	-4.8	0.0	4.80	-100.00%
		Infrastructure Support	0.0	0.0	1.2	1.20	#Err
		Use of Prior Year Balances	-1.4	-0.1	0.0	0.10	-100.00%
		94-O-304, B-factory, SLAC	45.0	0.0	0.0	0.00	#Err

Small Business Innovation Research	79.3	0.0	0.0	0.0	0.00	#Error
Mathematical, Information, & Computational Science	122.2	127.2	141.3	14.10	11.08%	11.08%
Environmental Processes	109.1	108.4	119.2	10.80	9.96%	9.96%
Environmental Remediation	34.9	66.3	67.4	1.10	1.69%	1.69%
Medical Applications & Measurement Science	99.6	66.0	43.9	-22.10	-33.46%	-33.46%
U.S./Mexico Foundation for Science	0.0	0.0	0.0	0.00	#Error	#Error
Laboratory Technology Research	23.7	15.8	16.3	0.50	3.16%	3.16%
Advanced Energy Projects	11.4	7.6	3.0	-4.80	-40.53%	-40.53%
Use of Prior Year Balances	-2.6	-1.7	0.0	1.70	-100.00%	-100.00%
University and Science Education	0.0	0.0	15.0	15.00	#Error	#Error
91-SM-100, PNL, Richland, Washington	35.1	0.0	0.0	0.00	#Error	#Error
Research and Technology	207.4	210.0	213.4	3.40	1.62%	1.62%
Facility Operations	360.6	418.9	456.6	37.70	9.00%	9.00%
96-G-304, Neutron/MeV Injector Fermilab	0.0	5.5	14.3	8.80	160.00%	160.00%
96-G-305, Experimental Hall Fermilab	0.0	5.0	0.0	-5.00	-100.00%	-100.00%
97-G-303, Substation Upgrade, SLAC	3.0	9.4	0.0	-9.40	-100.00%	-100.00%
92-G-302, MeV Injector, Fermilab	52.0	31.0	0.0	-31.00	-100.00%	-100.00%
90-E-320, Fire & Safety, ANL	0.2	0.0	0.0	0.00	#Error	#Error
99-G-305, Wilson Hall Safety Improvements	0.0	0.0	6.7	6.70	#Error	#Error
94-E-308, Human Genome Lab, LBL	1.0	0.0	0.0	0.00	#Error	#Error
97-E-305, Various Locations	2.5	0.0	0.0	0.00	#Error	#Error
Material Science	368.5	391.0	417.2	26.20	6.70%	6.70%
Chemical Science	194.5	200.7	209.6	8.90	4.43%	4.43%
Engineering & Geo Sciences	40.9	41.2	44.4	3.20	7.77%	7.77%

Energy Bio Sciences	27.3	27.4	32.5	5.10	18.61%
Program Direction	40.6	37.6	39.9	2.30	6.12%
Use of Prior Year Balances	-8.7	-4.4	0.0	4.40	-100.00%
Use of Prior Year Balances	-0.1	-1.0	0.0	1.00	-100.00%
91-G-300, ION Collider, Brothstein	65.0	59.4	16.6	-42.80	-72.06%
Summary for Account = Science (50 detail records)					
Sum	2266.8	2235.7	2482.4	246.70	
Grand Total	4491.6	4417.7	4942.6	525.07	

**Federal Aviation Administration (FAA) Research, Engineering and Development Accounts**

(in millions)

Account	Program	RE&D	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
	Flight 2000		0.0	0.0	90.0	90.00	90.00%
	FAA, R.E.&D		208.4	199.2	200.0	0.80	0.40%
			208.4	199.2	290.0		
Summary for Account = RE&D (2 detail records)			208.4	199.2	290.0		
Sum			208.4	199.2	290.0		
Grand Total			208.4	199.2	290.0	90.80	90.80%

**Environmental Protection Agency Accounts**

(in millions)

**Account LUST**

Program	Y97 Enacted	Y98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Leaking Underground Storage Tanks (LUST)	0.7	0.6	0.6	0.00	0.00%
<b>Sum</b>	<b>0.7</b>	<b>0.6</b>	<b>0.6</b>	<b>0.00</b>	<b>0.00%</b>

Summary for Account = LUST (1 detail record)

**Account Oil Spill Research**

Program	Y97 Enacted	Y98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Oil Spill Research	1.0	1.0	1.0	0.00	0.00%
<b>Sum</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>0.00</b>	<b>0.00%</b>

Summary for Account = Oil Spill Research (1 detail record)

**Account Particulate Matter**

Program	Y97 Enacted	Y98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Particulate Matter	26.6	49.6	26.0	-21.00	-43.35%
<b>Sum</b>	<b>26.6</b>	<b>49.6</b>	<b>26.0</b>	<b>-21.00</b>	<b>-43.35%</b>

Summary for Account = Particulate Matter (1 detail record)

**Account S&B**

Program	Y97 Enacted	Y98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Science Advisory Board	2.5	2.4	2.6	0.20	8.33%
<b>Sum</b>	<b>2.5</b>	<b>2.4</b>	<b>2.6</b>	<b>0.20</b>	<b>8.33%</b>

Summary for Account = S&B (1 detail record)

**Account Science & Technology**

Program	Y97 Enacted	Y98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Science & Technology	2.5	2.4	2.6	0.20	8.33%
<b>Sum</b>	<b>2.5</b>	<b>2.4</b>	<b>2.6</b>	<b>0.20</b>	<b>8.33%</b>

Summary for Account = Science & Technology (1 detail record)

Account	Y97 Erected	Y98 Erected	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Science and Technology	525.4	581.4	605.5	24.10	4.15%
Summary for 'Account' = Science & Technology (1 detail record)					
Sum	525.4	581.4	605.5	24.10	
<b>Superfund</b>					
Program	Y97 Erected	Y98 Erected	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Superfund Research	35.0	35.0	40.0	5.00	14.29%
Summary for 'Account' = Superfund (1 detail record)					
Sum	35.0	35.0	40.0	5.00	
Grand Total	591.2	676.6	677.7	7.76	

\* Particulate Matter is part of the Science and Technology account, but has been broken out for purposes of this table. The true amount for the Science and Technology account should include this number.

### National Aeronautics and Space Administration (NASA) Accounts

(in millions)

Account	aHSF				
Program	FY97 Executed	FY98 Executed	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
eSpace Station	2148.8	2261.3	2276.0	-81.20	-3.48%
ISS/Russian Cooperative Program	300.0	0.0	0.0	0.00	0%
eSpace Shuttle	2880.9	2827.8	3098.0	131.20	4.49%
ePayload & Utilization Operations	265.3	227.4	182.0	-83.40	-18.89%
State	5674.8	5366.5	5311.0	4.50	
Account	bSAT				
Program	FY97 Executed	FY98 Executed	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
eSpace Science	1888.3	2033.8	2088.4	24.80	1.21%
eLife & Microgravity Science	243.7	214.2	242.0	27.80	12.89%
eMission to Planet Earth	1361.8	1417.3	1372.0	-45.30	-3.29%
eAeronautics and Space Transportation	1338.5	1483.9	1305.0	-178.80	-12.89%
eMission Communication	418.8	400.8	380.0	-38.80	-9.19%
eAcademic Programs	120.4	130.0	100.0	-30.00	-23.00%
eFuture Planning	0.0	0.0	0.0	0.00	0%
State	5433.1	5690.0	5457.4	-232.80	
Summary for Account = aHSF (if detail records)					
Summary for Account = bSAT (if detail records)					

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Account	Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
	<b>cMS</b>					
	<b>Program</b>					
	mSafety, Reliability and Quality Assurance	38.6	37.8	35.6	-2.20	-5.82%
	nSpace Communication	291.4	209.2	177.0	-32.20	-15.39%
	oResearch & Program Management	2078.5	2051.8	2099.0	47.20	2.30%
	pConstruction of Facilities	155.3	134.4	165.0	30.60	22.77%
	<b>Sum</b>	<b>2564.0</b>	<b>2432.2</b>	<b>2476.6</b>	<b>43.40</b>	

Summary for Account = cMS (4 detail records)

Account	Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
	<b>dIG/NASA</b>					
	<b>Program</b>					
	qInspector General	16.8	16.3	20.0	1.70	9.29%
	<b>Sum</b>	<b>16.8</b>	<b>16.3</b>	<b>20.0</b>	<b>1.70</b>	
	<b>Grand Total</b>	<b>13766.7</b>	<b>13638.0</b>	<b>13463.0</b>	<b>-173.00</b>	

Summary for Account = dIG/NASA (7 detail records)

US/Mexico Foundation FY98 funding is \$1M and is part of the Mission to Planet Earth total.

**National Institute of Standards and Technology (NIST)/Technology Administration  
(ITA) Accounts**

(in millions)

Account	NIST		Construction		NIST		Construction			
Sub Account 1	FT97	FT98	FT99 Admin	SDiff. 98 to 99	% Diff. 98 to 99	FT97	FT98	FT99 Admin	SDiff. 98 to 99	% Diff. 98 to 99
Program										
NIST construction										
Summary for Sub Account 1 - Construction (1 detail record)	-16.0	95.0	56.7	-38.30	-40.32%					
Sum	-16.0	95.0	56.7	-38.30						
Sub Account 1	ITS		NIST		ITS		NIST		ITS	
Program	FT97	FT98	FT99 Admin	SDiff. 98 to 99	% Diff. 98 to 99	FT97	FT98	FT99 Admin	SDiff. 98 to 99	% Diff. 98 to 99
NIST ITS, ATP	216.0	192.5	259.9	67.40	35.01%					
NIST ITS, MEP	95.0	113.5	108.8	-8.70	-8.00%					
Summary for Sub Account 1 - ITS (2 detail records)										
Sum	313.0	306.0	368.7	60.70						
Sub Account 1	STRS		NIST		STRS		NIST		STRS	
Program	FT97	FT98	FT99 Admin	SDiff. 98 to 99	% Diff. 98 to 99	FT97	FT98	FT99 Admin	SDiff. 98 to 99	% Diff. 98 to 99
Manufacturing Engineering	18.9	18.9	19.4	0.50	2.65%					
Baldridge National Quality Awards	3.0	3.0	5.4	2.40	80.00%					
Electronics & Electrical Engineering	35.8	35.8	36.6	2.80	7.82%					
Research Support	26.6	26.6	29.2	0.80	2.10%					
Chemical Sciences and Technologies	31.8	31.8	39.5	7.70	24.21%					
Physics	27.9	27.9	28.4	0.50	1.79%					

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Material Sciences	50.9	51.3	0.40	0.78%
Building and Fire	13.4	16.7	-0.50	-2.91%
Computer Science and Applied Mathematics	43.0	43.9	0.90	2.09%
Technical Assistance	14.9	18.1	4.20	28.19%
Summary for 'Sub Account 1' - STRS (10 detail records)	288.2	272.0	291.5	19.50
Sum				
Summary for 'Account' - NST (13 detail records)	585.2	673.0	714.9	41.90
Sum				

Account	TA
Sub Account 1	

Program	FT97	FT98	FT99 Admin	\$Diff: 98 to 99	% Diff: 98 to 99
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TA, Experimental Programs/Competitive Tech, EP9C	0.0	1.8	3.0	1.40	87.50%
TA, Office of Technology Policy	6.5	6.4	6.5	0.10	1.56%
US/Israel SET	2.5	0.0	0.0	0.00	0.00%

Summary for 'Sub Account 1' - (8 detail records)	9.0	8.0	9.5	1.50
Sum				
Summary for 'Account' - TA (8 detail records)	9.0	8.0	9.5	1.50
Sum				
Grand Total	574.2	681.0	724.4	43.40

ITS - International Technology Service  
 STRS - Scientific and Technical Research and Services  
 The Technology Administration (TA) contains funding for the Office of Air and Space Commercialization. This funding is \$ .5M across the board. Therefore, the total for TA in this report does not contain this funding as it is under the jurisdiction of the Space Subcommittee.

**National Oceanic and Atmospheric Administration (NOAA) Accounts**  
(in millions)

Account	Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
	<b>Construction</b>					
	Construction	14.0	16.7	16.0	-0.70	26.76%
	Summary for Account = Construction (1 detail record)					
Sum		14.0	16.7	16.0	-0.70	
	<b>Fleet Maintenance &amp; Planning</b>					
	Fleet Maintenance and Planning	0.0	13.5	9.6	-3.90	66.98%
	Summary for Account = Fleet Maintenance & Planning (1 detail record)					
Sum		0.0	13.5	9.6	-3.90	
	<b>Fleet Modernization</b>					
	Fleet Modernization	8.0	0.0	0.0	0.00	0.00%
	Summary for Account = Fleet Modernization (1 detail record)					
Sum		8.0	0.0	0.0	0.00	
	<b>NEXRAD WFO</b>					
	NEXRAD Weather Forecast Office, Maintenance	1.0	1.0	5.4	4.40	2000.00%
	Summary for Account = NEXRAD WFO (1 detail record)					
Sum		1.0	1.0	5.4	4.40	

**ORF&PAC**

Account	Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
	Program Support	71.5	70.9	68.6	-2.30	-70.38%
	NEBDIS	448.6	433.6	815.1	181.50	-45.16%
	National Weather Service (NWS)	638.0	653.0	655.0	2.00	-48.76%
	Coastal & Atmospheric Research (CAR)	183.7	215.7	201.0	-14.70	-40.28%
	National Ocean Service (NOS)	142.7	183.2	151.3	-11.90	-57.13%
Sum		1483.5	1838.4	1691.0	154.60	

Summary for Account = ORF&PAC (9 detail records)

**Recoveries from prior years**

Account	Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
	Recoveries from prior years	-14.0	-24.0	-4.0	20.00	-167.86%
Sum		-14.0	-24.0	-4.0	20.00	

Summary for Account = Recoveries from prior years (1 detail record)

**Sea Grant**

Account	Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
	Sea Grant	54.3	58.0	50.2	-6.80	-42.80%
Sum		54.3	58.0	50.2	-6.80	
Grand Total		1556.8	1599.6	1768.2	168.60	

Summary for Account = Sea Grant (1 detail record)

ORF and PAC = Operations, Research and Facilities account and the Procurement, Acquisition and Construction account.  
Includes funding for GOES I-M

**National Science Foundation (NSF) Accounts**  
(in millions)

Account	a/RRR				
Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
lBiological Sciences	320.2	370.6	417.8	47.00	12.89%
mComputer & Info Science & Engineering	273.4	284.2	331.1	46.90	16.50%
nEngineering	347.9	358.0	400.6	42.60	11.80%
oGeosciences	448.1	485.1	507.3	52.20	11.47%
qMath & Physical Sciences	665.9	715.7	792.0	76.29	10.89%
rSocial, Behavioral & Economic Sciences	121.8	130.7	150.3	19.00	15.00%
sPolar Research Programs	161.4	165.9	182.4	16.50	9.89%
tMetric Logistics	62.6	62.6	62.6	0.00	0.00%
uCritical Technologies Institute	2.7	2.7	2.7	0.00	0.00%
vUnspecified account					
Sum	2432.0	2543.7	2846.6	301.09	

Summary for Account = a/RRR (10 detail records)

Sum

Account

b/EHR

Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
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Education and Human Resources

Sum

Account

c/MRE

Program	FT97 Enacted	FT98 Enacted	FT99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Education and Human Resources	618.0	632.5	683.0	60.50	7.89%
Sum	618.0	632.5	683.0	60.50	

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Account	Program	FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Major Research Equipment		80.0	108.0	94.0	-15.00	-13.76%
Summary for 'Account' = e/MSRE (1 detail record)						
Sum		80.0	108.0	94.0	-15.00	
Account	dS&E					
Program		FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Salaries and Expenses		194.3	137.0	144.0	7.00	5.11%
Summary for 'Account' = e/S&E (1 detail record)						
Sum		194.3	137.0	144.0	7.00	
Account	e/G/NSF					
Program		FY97 Enacted	FY98 Enacted	FY99 Admin	\$ Diff. 98 to 99	% Diff. 98 to 99
Inspector General/NSF		4.7	4.8	5.2	0.40	8.33%
Summary for 'Account' = e/G/NSF (1 detail record)						
Sum		4.7	4.8	5.2	0.40	
Grand Total		3278.6	3428.6	3775.6	347.0	10.28%

\* \$23M for Next Generation Internet is provided by the Internet Infrastructure Fund. This funding is not reflected in the R and RA account.  
 \* The FY97 Enacted total on this table does not reflect the FY97 Enacted total in the NSF justification book as a result of carryover funds used by NSF during FY97 which they added to their bottom line. The difference is \$29M.

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GAO DOCUMENTS DATA BASE

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TITLE: [Comments on Laws' Applicability to NAS]  
 ACCESSION NUMBER: 161448 DOCUMENT DATE: 11/24/98  
 DESCRIPTIVE NOTE:  
 Refer to RCED-99-17, November 13, 1998, Accession Number 161410.  
 ADDRESSEE INFORMATION:  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science  
 BACKGROUND:  
 GAO commented on several questions pertaining to the National Academy of Sciences, focusing on whether: (1) the Federal Advisory Committee Act Amendments of 1997 are applicable to the subgroups of the Academy (National Research Council, National Academy of Engineering, and Institute of Medicine); (2) the Freedom of Information Act (FOIA) is applicable to the Academy, its subgroups or their advisory panels; and (3) there are statutory or contractual barriers to the release of underlying data by the Academy and its subgroups to federal agencies, Congress or the public. GAO noted that: (1) the 1997 amendments apply to the subgroups of the Academy and thus federal agencies may not use the advice or recommendation of the Academy and its subgroups unless the requirements added by the 1997 amendments are met; (2) FOIA does not apply to the Academy, its subgroups or their advisory panels; and (3) other than criminal statutes that prohibit the disclosure of national security type information, federal laws generally do not directly bar private entities like the Academy from releasing data; however, contractual provisions with government agencies, private entities or individuals could preclude the Academy's release of the data, and section 15(b) added by the 1997 amendments could also limit the Academy's ability to release documents if their release would disclose matters exempt under FOIA.

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TITLE: Federal Research: The National Academy of Sciences and the Federal Advisory Committee Act  
 ACCESSION NUMBER: 161410 RPTNO: RCED-99-17  
 DOCUMENT DATE: 11/13/98  
 ADDRESSEE INFORMATION:  
 Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science  
 BACKGROUND:  
 Pursuant to a congressional request, GAO reviewed the committee process at the National Academy of Sciences, focusing on the: (1) reasons the Academy sought relief from the Federal Advisory Committee Act; (2) Academy's committee procedures for providing advice to the federal government; and (3) Academy's implementation of the new requirements for providing information to the public.  
 FINDINGS:  
 GAO noted that: (1) according to Academy officials, the Academy sought relief from the act for a number of reasons; (2) central to its concerns

was the Academy's ability to maintain sole authority in appointing committee members and to conduct its work independently from sponsoring agencies' influence; (3) in addition, the Academy opposed opening deliberative meetings on the grounds that such an action could stifle open debate and could impact the Academy's ability to recruit committee members; (4) finally, the Academy was concerned about the amount of time and expense to perform the administrative requirements of the act, which could render

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the Academy unresponsive to the government; (5) prior to the enactment of the amendments, the Academy developed a number of procedures governing its committees' activities, including project formulation, committee selection, committee work, report review, and the release and dissemination of reports; (6) according to Academy officials, these procedures are intended to help ensure the integrity of advice provided to the federal government; (7) for example, committee selection includes procedures for identifying conflicts of interest and potential bias of committee members; (8) the committee work phase provides an opportunity for some public participation, and committee reports are reviewed by an Academy review committee before they are released to the sponsoring agency and the public; (9) in response to section 15, the Academy developed a web site to increase public access to current project information, however, GAO found that some descriptive information on current projects was not always posted in a timely manner and was not always complete; and (10) during this audit, the Academy addressed these problems and developed additional written guidelines regarding the posting of committee information as well as additional quality assurance procedures.

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TITLE: Environmental Protection: EPA's Science and Technology Funds  
 ACCESSION NUMBER: 161329 RPTNO: RCED-99-12  
 DOCUMENT DATE: 10/30/98

## ADDRESSEE INFORMATION:

Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science  
 Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science

## BACKGROUND:

Pursuant to a congressional request, GAO reviewed the Environmental Protection Agency's (EPA) budget justifications for its Science and Technology account for fiscal years 1998 and 1999, focusing on: (1) identifying EPA's Science and Technology requested funds by the agency's strategic goals and objectives; (2) determining for each of EPA's program offices the amount of Science and Technology funds they plan to administer in fiscal year (FY) 1999; and (3) providing a crosswalk of funds appropriated for FY 1998 by program components to strategic goals and objectives and determine the process or information available that can be used to readily compare the funds that are requested for EPA's Science and Technology account in future years.

## FINDINGS:

GAO noted that: (1) EPA organized its request for \$633 million for its Science and Technology account for FY 1999 according to the agency's strategic goals and objectives in its budget justification provided to the appropriations committees; (2) these funds are divided under all 10 goals and further segmented into 25 to 45 objectives that are identified under the strategic goals; (3) 71 percent of the Science and Technology funds is proposed to fund two of EPA's strategic goals--Sound Science and Clean Air; (4) the funds in this account are divided among nine objectives under these

two goals; (5) in FY 1999, 6 of EPA's 14 program offices will administer the requested Science and Technology funds; (6) two program offices, the Office of Research and Development and the Office of Air and Radiation, will administer \$485 and \$132 million, respectively, or over 97 percent of all the Science and Technology funds requested; (7) the remaining 3 percent of these funds will be administered by four other program offices; (8) EPA did not maintain financial records by both program components and strategic goals and objectives for all 1998 appropriated Science and Technology

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funds; (9) estimates of the 1998 appropriated amounts were subsequently developed by EPA, at GAO's request, to fully compare that year's amounts to the FY 1999 requested amounts; (10) EPA plans to submit future budget justifications and maintain appropriated amounts for FY 1999 in the format of its strategic goals and objectives; (11) this format will facilitate comparisons of future requests with the FY 1999 budget justification; and (12) EPA also plans to provide additional information in the FY 2000 justification to facilitate comparisons of strategic goals and objectives with major components of its programs.

TITLE: Responses to Questions on FAA's Computer Security and Year 2000 Program  
 ACCESSION NUMBER: 161182 RPTNO: AIMD-98-301R  
 DOCUMENT DATE: 09/14/98

## DESCRIPTIVE NOTE:

Refer to T-AIMD-98-251, August 6, 1998, Accession Number 160950.

## ADDRESSEE INFORMATION:

Rep. Constance A. Morella (Chairman)  
 House Committee on Science: Technology Subcommittee

## BACKGROUND:

Pursuant to a congressional request, GAO provided responses to questions following its August 6, 1998, testimony on the Federal Aviation Administration's (FAA) management of technology issues, focusing on: (1) why risk assessments are essential in the design of the new air traffic control (ATC) systems; (2) what role should the National Airspace System (NAS) Infrastructure Management System play in protecting critical airspace infrastructure; (3) whether FAA will be able to adapt its systems to protect it from evolving threats; (4) what FAA has done to comply with the planning requirements of the Presidential Decision Directive 63; (5) the reasons why 15 mission-critical ATC systems were dropped from the list of systems needing repair prior to the July 31 milestone; (6) when FAA plans to run end-to-end tests of all key business processes; (7) whether FAA included key user groups in its formulation of year 2000 contingency plans; (8) whether FAA's contingency plans include the possibility of complete systemwide breakdown; (9) whether FAA can successfully complete its ATC modernization, given its poor track record for completing large computer and software-intensive projects; and (10) what is the chance that FAA will not complete all of its year 2000 renovation and testing activities before time runs out. These responses cover two areas--FAA's computer security and year 2000 program.

## FINDINGS:

GAO noted that: (1) without knowing the specific vulnerabilities of its new ATC systems, FAA cannot adequately protect them from attack; (2) FAA does not have a common set of security standards to which all new ATC systems are being built; (3) as a result, implementation of security requirements across ATC development efforts is sporadic and ad hoc; (4) the NAS Infrastructure Management System will play a vital role in protecting the

future ATC network since it will provide connectivity to many systems; (5) it is essential that this system have adequate access controls to protect against unauthorized access and an intrusion detection capability to detect unauthorized access should it occur; (6) FAA will be better positioned to protect its systems from evolving threats if it strengthens its current computer security program; (7) FAA has not provided an official written response on how it plans to comply with instructions in Presidential Decision Directive 63 to develop and implement a comprehensive NAS security program; (8) of the 15 mission-critical ATC systems removed from the list

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of systems needing repair prior to the July 31 milestone, FAA reported that: (a) 13 were removed because they were found to be year 2000 compliant, and thus did not require repair; (b) 1 was removed because FAA determined that this system would be replaced, instead of repaired; and (c) 1 was removed because FAA later determined that the system had no year 2000 issues; (9) FAA plans to perform NAS end-to-end testing beginning in January 1999 and ending by March 31, 1999; (10) FAA's year 2000 program manager decided not to issue the year 2000 NAS Continuity and Contingency Plan in final form until December 1998 in order to coordinate with system users; (11) year 2000 program officials told GAO that the agency recently decided to revise its draft contingency plan to incorporate the comments of system users, including the concern that the continuity plans do not currently include the possibility of multifacility breakdowns; (12) over the past 15 years, FAA's ATC modernization has experienced cost overruns, schedule delays, and performance shortfalls of large proportions; (13) FAA lacks the organizational structure and process discipline to manage complex technology initiatives; and (14) while it is difficult to respond in terms of percentage, FAA must still correct, test, and implement many of its mission-critical systems, and it is doubtful that FAA can adequately do all of this in the time remaining.

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**TITLE:** Department of Energy: Uncertain Progress in Implementing National Laboratory Reforms  
**ACCESSION NUMBER:** 161189 **RPTNO:** RCED-98-197  
**DOCUMENT DATE:** 09/10/98

**DESCRIPTIVE NOTE:**  
Refer to RCED-95-10, January 27, 1995, Accession Number 153378; and T-RCED-98-274, September 23, 1998, Accession Number 161178.

**ADDRESSEE INFORMATION:**  
Rep. F. James Sensenbrenner (Chairman)  
House Committee on Science  
Rep. George E. Brown, Jr. (Ranking Minority Member)  
House Committee on Science

**BACKGROUND:**  
Pursuant to a congressional request, GAO reviewed the Department of Energy's (DOE) progress in making needed management reforms in its national laboratories, focusing on: (1) the recommendations made by various advisory groups for addressing management weaknesses at DOE and the laboratories; and (2) how DOE and its laboratories have responded to these recommendations.

**FINDINGS:**  
GAO noted that: (1) for nearly 20 years, many advisory groups have found that while DOE's national laboratories do impressive research and development, they are unfocused, micromanaged by DOE, and do not function as an integrated national research and development system; (2) weaknesses in DOE's leadership and accountability are often cited as factors hindering

fundamental reform of the laboratories' management; (3) as a result, advisory groups have made dozens of recommendations ranging from improving strategic planning to streamlining internal processes; (4) several past advisory groups have also suggested major organizational changes in the way the laboratories are directed; (5) to address past recommendations by advisory groups, DOE, at GAO's request, documented the actions it has taken, from creating new task forces to developing strategic laboratory plans; (6) while DOE has made some progress--principally by reducing paperwork burdens on its laboratories--most of its actions are still under way or have unclear outcomes; (7) furthermore, these actions lack the

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objectives, performance measures, and milestones needed to effectively track progress and account for results; (8) consequently, the Department cannot show how its actions have resulted, or may result, in fundamental change; (9) for example, its Strategic Laboratory Missions Plan, which was developed to give more focus and direction to the national laboratories, does not set priorities and is not tied to the annual budget process; (10) few experts and officials GAO consulted could show how the plan is used to focus missions or integrate the laboratory system; (11) DOE's latest technique for focusing the laboratories' missions is the technology roadmap; (12) roadmaps are plans that show how specific DOE activities relate to missions, goals, and performers; (13) roadmaps are a promising step but have been used in only a few mission areas and are not directly tied to DOE's budget process; (14) moreover, several laboratory directors questioned both the accuracy of the actions DOE has reported taking and their applicability at the laboratory level; (15) DOE's organizational weaknesses, which include unclear lines of authority, are a major reason why the Department has been unable to develop long-term solutions to the recurring problems reported by advisory groups; and (16) although DOE created the Laboratory Operations Board to help oversee laboratory management reform, it is only an advisory body within DOE's complex organizational structure and lacks the authority to direct change.

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TITLE: Year 2000 Computing Crisis: Actions Needed on Electronic Data Exchanges  
 ACCESSION NUMBER: 160926 RPTNO: AIMD-98-124  
 DOCUMENT DATE: 07/01/98  
 DESCRIPTIVE NOTE:  
 Refer to AIMD-10.1.14, September 1, 1997, Accession Number 159273.  
 ADDRESSEE INFORMATION:  
 Rep. James A. Barcia (Ranking Minority Member)  
 House Committee on Science: Technology Subcommittee

BACKGROUND:  
 Pursuant to a congressional request, GAO provided information on actions taken to address year 2000 issues for electronic data exchanges, focusing on the: (1) key actions taken to date to address electronic data exchanges among federal, state, and local governments; (2) actions the federal government has taken to minimize the adverse economic impact of non-compliant year 2000 data from other countries' information systems corrupting critical functions of the United States; and (3) international forums where the worldwide economic implications of this issue have been or could be addressed.

FINDINGS:  
 GAO noted that: (1) key actions to address year 2000 data exchange issues are still in the early stages; however, federal and state coordinating organizations have agreed to use a 4-digit contiguous year format and

establish joint federal and state policy and working groups; (2) to implement these agreements, the Office of Management and Budget (OMB) issued instructions in January 1998 to federal agencies to inventory all data exchanges with outside parties by February 1, 1998, and coordinate with these exchange partners by March 1, 1998; (3) at the time of GAO's review, no actions had been taken to establish target dates for additional key tasks; (4) about half of the federal agencies reported during the first quarter of 1998 that they have not yet finished assessing their data exchanges to determine if they will be able to process data with dates beyond 1999; (5) two of the 39 state-level organizations reported having finished assessing their data exchanges; (6) for the exchanges already

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identified as not year 2000 ready, respondents reported that little progress has yet been made in completing key steps such as reaching agreements with partners on data formats, developing and testing bridges and filters, and developing contingency plans for cases in which year 2000 readiness will not be achieved; (7) most federal agency actions to address year 2000 issues with international data exchanges have been in the financial services area; (8) ten federal agencies reported having a total of 702 data exchanges with foreign governments or the foreign private sector; (9) these foreign data exchanges represented less than 1 percent of federal agencies' total reported exchanges; (10) federal agencies reported reaching agreements so far on formats of 98 of the foreign data exchanges; (11) international organizations addressing year 2000 issues have been the most active in the financial services area; and (12) during 1997, several international organizations initiated activities to increase awareness, provide guidance, and monitor the status of year 2000 efforts.

TITLE: Results Act: Observations on the Department of Commerce's Annual Performance Plan for Fiscal Year 1999  
 ACCESSION NUMBER: 160692 RPTNO: GGD-98-135R  
 DOCUMENT DATE: 06/24/98

## DESCRIPTIVE NOTE:

Refer to GGD-97-109, June 2, 1997, Accession Number 158745;  
 GGD/AIMD-10.1.18, February 1, 1998, Accession Number 159829;  
 GGD-10.1.20, April 1, 1998, Accession Number 160296; and GGD-98-44,  
 January 30, 1998, Accession Number 159883.

## ADDRESSEE INFORMATION:

Rep. Thomas J. Bliley, Jr. (Chairman)  
 House Committee on Commerce  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science

## BACKGROUND:

Pursuant to a congressional request, GAO reviewed the Department of Commerce's annual performance plan for fiscal year (FY) 1999, focusing on: (1) the extent to which Commerce's performance plan provides a clear picture of intended agencywide performance; (2) how well Commerce's performance plan discusses the strategies and resources it will use to achieve its performance goals; and (3) the extent to which Commerce's performance plan provides confidence that its performance information will be credible.

## FINDINGS:

GAO noted that: (1) Commerce's FY 1999 annual performance plan does not fully answer the core questions that are key to developing useful plans for congressional decisionmaking; (2) to some extent, the plan discusses the strategies and resources that individual Commerce bureaus will use in FY

1999 to help achieve the Department's performance goals; (3) the plan does not provide sufficient evidence or confidence that the Department's performance data will be accurate, complete, and credible; (4) there are several areas where Commerce's plan could be improved to better facilitate congressional oversight and decisionmaking; (5) these areas are: (a) ensuring that outcome goals are included in the plan wherever possible and more clearly showing how the output-oriented performance goals and measures relate to results; (b) presenting the annual performance goals more explicitly as goals in the plan and more clearly identifying the relationships between longterm strategic goals and objectives and annual performance goals and measures; (c) more consistently referring the reader to other Department documents for more details, where appropriate; (d) more

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fully acknowledging and discussing the significance and performance implications of known management and data capacity problems, high-risk programs, and external factors beyond the Department's direct control; (e) more closely linking the Department's annual performance goals with the strategies and resources of Commerce bureaus; (f) including more information on the Department's planned performance verification and validation strategies and procedures; and (g) more fully recognizing and addressing crosscutting efforts; and (6) at the same time, Commerce's FY 1999 annual performance plan represents an improvement over the Department's earlier strategic plan and has several strengths that the Department can build on in future plans, including: (a) linking the Department's annual performance goals and measures to its strategic themes, goals, and objectives; (b) presenting quantifiable and measurable performance targets for most strategic goals and objectives, and discussing the Department's efforts to develop them; (c) providing outcome-oriented performance goals for some key activities; (d) discussing the Department's high-priority program initiatives and relating them to its three strategic themes; and (e) identifying the major management challenges facing the Department.

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TITLE: Budget Trends: Federal Investment Outlays, Fiscal Years 1981-2003  
 ACCESSION NUMBER: 160610 RPTNO: AIMD-98-184  
 DOCUMENT DATE: 06/15/98

## DESCRIPTIVE NOTE:

Refer to AIMD-97-88, May 21, 1997, Accession Number 158691; and  
 AIMD-94-40, November 9, 1993, Accession Number 150355.

## ADDRESSEE INFORMATION:

Sen. Frank R. Lautenberg (Ranking Minority Member)  
 Senate Committee on Budget  
 Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science

## BACKGROUND:

Pursuant to a congressional request, GAO updated its 1997 report on federal investment trends.

## FINDINGS:

GAO noted that: (1) the annual levels of investment spending for the period 1998 through 2002 in the President's 1999 budget is estimated to range from slightly more than \$2 billion to almost \$11 billion higher each year than the levels estimated in the President's 1998 budget for the same period; (2) only one budget function--energy--has lower estimates for 1998 through 2002 than in the 1998 budget; (3) the share of total federal budget outlays and of gross domestic product (GDP) devoted to investment declined slightly from the early 1980s through 1997; (4) according to the administration's

policy estimates contained in the President's 1999 budget, investment's share of both outlays and GDP will increase slightly from 1998 through 2000 and then fall slightly through 2003; (5) these new estimates represent a change from the 1998 budget estimates which showed a continuing gradual decline from 1998 through 2002; (6) when investment outlays are converted to constant 1992 dollars, roughly the same picture emerges over this time period; (7) investment spending in estimated constant dollar outlays generally increased from the mid-1980s through 1995 before dropping in 1996 and 1997; (8) in the 1999 budget, investment spending is projected to increase from 1998 through 2000 and then gradually decrease through 2003; (9) after dropping from 1981 to 1983, physical capital remained relatively stable through 1995, with slight declines in 1996 and 1997; (10) the 1999 budget estimates for fiscal years 1998 through 2003 show a relatively

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stable level--around \$33 billion to \$34 billion each year; (11) this is a higher level than the 1998 budget estimates, which showed a steady decline from 1998 through 2002; (12) the research and development category had relatively steady increases from the mid-1980s through 1997 and estimates for 1998 through 2003 continue to increase; (13) this is a change from the estimates for 1998 through 2002 made in the 1998 budget which had shown modest decreases after 1998; (14) the pattern of investment from 1981 through 2003 in constant dollars varies across budget functions; (15) seven functions contain about 95 percent of investment outlays; (16) four of those functions, Education and Training, Transportation, Health, and General Science, Space, and Technology show general increases over this period; (17) the National Defense function shows several fluctuations but remains relatively flat overall; and (18) the Natural Resources and Environment and Energy functions shows a continued downward trend from the 1980s through 2003.

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TITLE: Managing for Results: Observations on NASA's Fiscal Year 1999  
 Performance Plan  
 ACCESSION NUMBER: 160621 RPTNO: NSIAD-98-181  
 DOCUMENT DATE: 06/05/98

DESCRIPTIVE NOTE:  
 Refer to T-NSIAD-97-178, July 24, 1997, Accession Number 159050;  
 HR-97-30, May 16, 1997, Accession Number 158859; and GGD/AIMD-10.1.18,  
 February 1, 1998, Accession Number 159829.

ADDRESSEE INFORMATION:  
 Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science

BACKGROUND:  
 Pursuant to a congressional request, GAO reviewed the National Aeronautics and Space Administration's (NASA) performance plan for fiscal year (FY) 1999, focusing on: (1) NASA's goals and objectives, including how the agency plans to measure its progress toward achieving these goals and objectives; (2) the agency's strategies and resources needed to achieve its goals; and (3) the availability and reliability of data necessary to achieve progress.

FINDINGS:  
 GAO noted that: (1) NASA's FY 1999 performance plan could provide a clearer picture of intended performance across the agency, does not fully portray how NASA's strategies and resources will help it achieve the plan's performance goals, and partially provides confidence that the information

NASA will use to assess performance will be accurate, complete, and credible; (2) among its strengths, NASA's performance plan reflects the mission statement and goals in its strategic plan and provides good linkage between these strategic goals and the plan's performance goals and targets; (3) it incorporates performance measures that are generally objective, quantifiable, and useful for assessing progress toward the plan's performance objectives; and provides for annual external assessments by its Advisory Council and semi-annual internal assessments by its Senior Management Council to validate progress toward meeting the agency's goals and objectives; (4) to make the plan more useful for purposes of the Government Performance and Results Act, NASA's performance plan should: (a) better link performance goals and measures to the program activities in NASA's budget; (b) more fully explain NASA's procedures for verifying and validating performance data by recognizing the limitations that affect the

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credibility of data that will be used to measure performance; and (c) acknowledge NASA's major management challenges and associated corrective actions in order to provide a more comprehensive understanding of the importance of the goals and performance measures chosen for its internal crosscutting processes; (5) some of the concerns GAO has regarding NASA's performance plan are similar to its observations on NASA's strategic plan issued on September 30, 1997; and (6) for example, NASA's strategic plan did not contain evidence that NASA had coordinated the plan with those agencies whose programs and activities complement NASA's and did not discuss the human, capital, and information resources needed to achieve the goals and objectives in the plan.

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**TITLE:** Aviation Safety: FAA Has Not Fully Implemented Weather-Related Recommendations  
**ACCESSION NUMBER:** 160558 **RPTNO:** RCED-98-130  
**DOCUMENT DATE:** 06/02/98

**DESCRIPTIVE NOTE:**  
Refer to AIMD-95-81, April 21, 1995, Accession Number 154087; and RCED-98-246, September 28, 1998, Accession Number 161186.

**ADDRESSEE INFORMATION:**  
Rep. Constance A. Morella (Chairman)  
House Committee on Science, Technology Subcommittee  
Rep. Bart Gordon (Ranking Minority Member)  
House Committee on Science, Technology Subcommittee

**BACKGROUND:**  
Pursuant to a congressional request, GAO examined the Federal Aviation Administration's (FAA) efforts to implement the weather-related recommendations made by the National Research Council (NRC) and FAA's advisory committee, focusing on: (1) policy and leadership; (2) interagency coordination; (3) meeting different types of users' needs for weather information; and (4) the level of funding provided for weather activities.

**FINDINGS:**  
GAO noted that: (1) the panel of experts GAO convened concluded that FAA had made limited progress in implementing the weather-related recommendations made by NRC and FAA's advisory committee; (2) regarding the first area of concern, policy and leadership, the reports concluded that FAA is the agency best suited for leading federal aviation weather efforts but that it had not accepted that role; (3) the NRC report linked this criticism to the dispersal of responsibilities among several FAA organizations; (4) the reports also concluded that FAA did not have clear policy guidance to define its role in aviation weather activities; (5)

since 1995, FAA has attempted to address these twin concerns by creating a new organization to direct aviation weather activities and by issuing a policy that states that FAA takes the responsibility for leading aviation weather activities; (6) GAO's expert panel concluded that because FAA has not yet produced a plan to implement the new policy, its actions did not go far enough to address the concerns that the report originally raised; (7) with regard to the second concern, interagency coordination, the reports questioned the adequacy of FAA's efforts to coordinate aviation weather activities with other federal agencies; (8) concerning the third area--FAA's efforts to meet the needs all types of users--the reports concluded that FAA was not providing consistent information or adequate training; (9) as evidence that it is meeting the needs of all types of users, FAA cited a list of systems it is developing to provide weather information to various users and a list of the training courses it offers; (10) GAO's expert panel expressed continuing concerns about whether the

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equipment FAA listed would form an integrated system to serve all users; (11) panelists also raised concerns about the training offered by FAA, stating that better training could help reduce disparities in the abilities of air traffic controllers to interpret weather information; (12) with respect to the amount of funding FAA has allocated for aviation weather activities, the reports raised questions about the low level of funding provided to weather-related projects compared with other activities; and (13) GAO's review of FAA's budget information for fiscal year (FY) 1990 through FY 1998 confirms that the agency has allocated less funding for aviation weather during this period than for most other acquisition and research priorities.

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TITLE: Results Act: Observations on the Federal Emergency Management Agency's Fiscal Year 1999 Annual Performance Plan  
 ACCESSION NUMBER: 160571 RPTNO: RCED-98-207R  
 DOCUMENT DATE: 06/01/98

ADDRESSEE INFORMATION:  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science  
 Rep. Bud Shuster (Chairman)  
 House Committee on Transportation and Infrastructure

BACKGROUND:  
 GAO reviewed the Federal Emergency Management Agency's (FEMA) performance plan for fiscal year (FY) 1999, focusing on whether the: (1) agency's performance plan provides a clear picture of intended performance across the agency; (2) performance plan discusses the strategies and resources the agency will use to achieve its performance plan; and (3) agency's performance plan provides confidence that its performance information will be credible.

FINDINGS:  
 GAO noted that: (1) FEMA's FY 1999 performance plan: (a) provides a partial picture of intended performance across the agency; (b) does not fully portray how FEMA's strategies and resources will help it achieve the plan's performance goals; and (c) could more fully provide confidence that the information FEMA will use to assess its performance will be accurate, complete, and credible; (2) FEMA's performance plan has a clear structure, reflects the agency's mission statement and is well-linked to the strategic goals outlined in the agency's strategic plan, includes annual performance goals or indicators that are quantifiable, includes outcome goals when possible, and briefly describes the agency's strategies for accomplishing

its performance goals; (3) to be more useful for the purposes of the Government Performance and Results Act, the plan should more thoroughly discuss FEMA's efforts and plans to coordinate with other agencies whose programs and activities complement FEMA's, identify more of the external factors that could affect the agency's ability to achieve its performance goals and discuss actions that FEMA can take to mitigate the effects of these factors, more explicitly link the annual performance goals to program activities in FEMA's budget, discuss whether any significant limitations affect the credibility of the agency's data that will be used to measure performance, and more fully describe FEMA's procedures for verifying and validating performance data; (4) the quality of FEMA's performance plan closely reflects the quality of the agency's strategic plan issued on September 30, 1997; (5) like the strategic plan, the performance plan does not fully identify the external factors that could affect the agency's ability to achieve its performance goals or discuss how achieving the goals could be influenced by these factors; (6) there is also little evidence

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that FEMA coordinated the performance plan with those agencies whose programs and activities complement FEMA's; and (7) the performance plan does not discuss the specific resources required to develop the proposed measurement processes and data, raising the issue of whether FEMA's financial and information management systems will have the capacity to generate sufficiently reliable information to monitor the agency's progress toward its goals.

TITLE: Results Act: Observations on DOE's Annual Performance Plan for Fiscal Year 1999  
 ACCESSION NUMBER: 160550 RPTNO: RCED-98-194R  
 DOCUMENT DATE: 05/28/98

ADDRESSEE INFORMATION:  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science

## BACKGROUND:

Pursuant to a congressional request, GAO provided information on the Department of Energy's (DOE) annual performance plan for fiscal year (FY) 1999, focusing on: (1) the extent to which DOE's performance plan provides a clear picture of intended performance across the agency; (2) how well the performance plan discusses strategies and resources that DOE will use to achieve its performance goals; and (3) the extent to which DOE's performance plan provides confidence that its performance information will be credible.

## FINDINGS:

GAO noted that: (1) DOE's performance plan for FY 1999 partially: (a) addresses annual performance issues across DOE; (b) discusses how DOE's strategies and resources will help achieve DOE's performance goals; and (c) provides confidence that its performance information is credible; (2) one of the plan's strengths is that its annual goals and measures cover mission-critical management problems and issues; (3) in addition, the annual performance plan contains a mission statement and strategic goals, as identified in DOE's strategic plan; (4) however, GAO believes that opportunities exist to improve the performance plan; (5) these opportunities include providing a clearer picture of intended performance departmentwide by enhancing the annual goals to better define expected performance, specifying further how the annual performance goals and the structure of DOE's program activities described in its budget are related, and describing how DOE plans to coordinate with other agencies having

similar strategic or performance goals; (6) DOE should also elaborate more on how its strategies and resources will help achieve its goals by showing more clearly how its strategies are related to the annual performance goals and should discuss the resources it will need to achieve them; and (7) in addition, DOE could increase the validity of its performance information by elaborating further on how DOE will help ensure that its performance information is sufficiently complete, accurate, and consistent--specifically, by identifying significant data limitations and their implications for assessing the achievement of its performance goals.

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TITLE: Department of Energy: Clear Strategy on External Regulation Needed  
for Worker and Nuclear Facility Safety  
ACCESSION NUMBER: 160513 RPTNO: RCED-98-163  
DOCUMENT DATE: 05/21/98

ADDRESSEE INFORMATION:  
Rep. F. James Sensenbrenner (Chairman)  
House Committee on Science

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## GAO DOCUMENTS DATA BASE

Rep. George E. Brown, Jr. (Ranking Minority Member)  
House Committee on Science

## BACKGROUND:

Pursuant to a congressional request, GAO reviewed the Department of Energy's (DOE) position on external regulation, and its strategy for conducting pilots on external regulation, focusing on: (1) issues related to worker safety and nuclear facility safety; and (2) DOE's laboratories, for which DOE is evaluating issues related to external regulation.

## FINDINGS:

GAO noted that: (1) DOE's position on the external regulation of safety is unclear; (2) five years ago, DOE's leadership made a commitment to subject worker safety in its multibillion-dollar nuclear research and defense network to external regulation; (3) to achieve this goal, DOE endorsed recommendations to phase out its self-regulation practices over a 10-year period, starting with legislation by 1998 to authorize external regulation; (4) in late 1997, however, DOE embarked on a 2-year pilot program to simulate regulation by the Nuclear Regulatory Commission (NRC) at 6 to 10 of DOE's nuclear sites; (5) at the end of this pilot, DOE and NRC will jointly decide if external regulation by NRC is warranted; (6) DOE's decision to conduct pilots represents a shift from its former strong endorsement to externally regulate all of its facilities; (7) DOE's uncertain position has both NRC and the Occupational Safety and Health Administration (OSHA) concerned about the Department's commitment to external regulation; (8) although DOE's pilot will provide useful insights, the information collected will not represent the size and the complexity of DOE's vast nuclear complex and thus will not yield the practical data needed to address many critical issues on external regulation; (9) for example, NRC estimates that it could regulate the Lawrence Berkeley National Laboratory in California--the site of DOE's first pilot--for about one-fifth of one staff person per year; (10) this estimate, however, does not represent the cost of regulating the vast majority of DOE's nuclear facilities, nor will much of the information obtained from the other two pilot sites be representative; (11) the three sites in the pilot program contain no nuclear reactors, weapons plants, or heavily contaminated facilities, even though these kinds of facilities were the reason for seeking external regulation in the first place and defense and environmental cleanup sites constitute 80 percent of the Department's complex; and (12) moreover, DOE is not integrating OSHA with NRC in its

pilots; instead, each regulatory agency is proceeding under a separate strategy without the benefit of collaborating to better understand jurisdictional overlaps.

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TITLE: Results Act: NSF's Annual Performance Plan for Fiscal Year 1999  
 ACCESSION NUMBER: 160520 RPTNO: RCED-98-192R  
 DOCUMENT DATE: 05/19/98

ADDRESSEE INFORMATION:  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science

BACKGROUND:  
 Pursuant to a congressional request, GAO reviewed the National Science Foundation's (NSF) annual performance plan for fiscal year (FY) 1999, focusing on the: (1) extent to which the plan provides a clear picture of intended performance across the agency; (2) strategies and the resources NSF will use to achieve its performance goals; and (3) extent to which the plan provides confidence that NSF's performance information will be credible.

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## FINDINGS:

GAO noted that: (1) NSF's performance plan for FY 1999: (a) partially addresses annual performance issues across the agency; (b) partially discusses how the agency's strategies and resources will help it achieve its goals; and (c) partially provides confidence that its performance information is credible; (2) the strengths of the plan are that it does a good job of describing performance expectations for the agency's scientific research and education programs, discussing how the agency's strategies and resources will help achieve scientific research and education goals, and providing some confidence that the agency's performance information for these programs will be credible; (3) however, the plan contains several weaknesses; (4) these weaknesses are related to areas that needed further attention in NSF's first strategic plan prepared under the Government Performance and Results Act; and (5) in addition, the plan does not present sufficient information on strategies, nonfinancial resources needed to achieve annual goals, and data verification and validation for management and other important activities that support NSF's programs--to explain the agency's expectations and needs in these areas.

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TITLE: Information Technology Workers: Employment and Starting Salaries  
 ACCESSION NUMBER: 160496 RPTNO: HEHS-98-159R  
 DOCUMENT DATE: 05/12/98

DESCRIPTIVE NOTE:  
 Refer to HEHS-98-106R, March 20, 1998, Accession Number 160111.

ADDRESSEE INFORMATION:  
 Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science  
 Rep. John D. Dingell (Ranking Minority Member)  
 House Committee on Commerce

BACKGROUND:  
 Pursuant to a congressional request, GAO provided information on recent trends in information technology (IT) employment and starting salaries for IT jobs, focusing on the: (1) unemployment rates for workers in IT occupations; (2) number of workers employed in IT industries and occupations; (3) number of degrees awarded in IT fields of study; and (4) starting salaries offered bachelor's degree candidates in IT jobs.

## FINDINGS:

GAO noted that: (1) unemployment rates for workers in IT occupations are well below those for all workers; (2) at 1.3 percent in 1997, the rate was less than one-third the rate for all workers; (3) employment in IT industries has grown steadily, as has employment of workers in IT occupations, which has nearly doubled in the last decade to about 1.9 million in 1997; (4) despite employment increases averaging 90,000 jobs a year in IT occupations, the number of degrees awarded in IT fields of study has remained fairly constant throughout the 1990s at about 48,000 annually--of which about 27,000 were bachelor's degrees; and (5) salary offers for bachelor's degree candidates in IT fields averaged about \$37,500 in 1997--slightly higher than the salaries offered in 1989, after adjusting for inflation, and above the salaries offered in the early 1990s when starting salaries dipped to under \$35,000.

TITLE: Year 2000 Computing Crisis: Potential for Widespread Disruption Calls for Strong Leadership and Partnerships  
 ACCESSION NUMBER: 160327 RPTNO: AIMD-98-85  
 DOCUMENT DATE: 04/30/98  
 DESCRIPTIVE NOTE:

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Refers to numerous documents on the Year 2000 computing crisis; T-AIMD-98-205, June 10, 1998, Accession Number 160619; T-AIMD-98-212, June 16, 1998, Accession Number 160658; T-AIMD-98-161, May 7, 1998, Accession Number 160397; T-AIMD-98-218, June 22, 1998, Accession Number 160682; and AIMD/GGD-99-14, October 22, 1998, Accession Number 161308.

## ADDRESSEE INFORMATION:

Sen. Trent Lott  
 Senate: Majority Leader  
 Sen. Robert F. Bennett (Chairman)  
 Senate Committee on Banking, Housing and Urban Affairs: Financial Services and Technology Subcommittee  
 Sen. Fred Thompson (Chairman)  
 Senate Committee on Governmental Affairs  
 Sen. John Glenn (Ranking Minority Member)  
 Senate Committee on Governmental Affairs  
 Sen. Richard G. Lugar (Chairman)  
 Senate Committee on Agriculture, Nutrition, and Forestry  
 Rep. Stephen Horn (Chairman)  
 House Committee on Government Reform and Oversight: Government Management, Information and Technology Subcommittee  
 Rep. Dennis J. Kucinich (Ranking Minority Member)  
 House Committee on Government Reform and Oversight: Government Management, Information and Technology Subcommittee  
 Rep. Constance A. Morella (Chairman)  
 House Committee on Science: Technology Subcommittee  
 Rep. James A. Barcia (Ranking Minority Member)  
 House Committee on Science: Technology Subcommittee  
 Rep. Jim Leach (Chairman)  
 House Committee on Banking and Financial Services  
 Rep. John J. LaFalce (Ranking Minority Member)  
 House Committee on Banking and Financial Services

## BACKGROUND:

Pursuant to a congressional request, GAO reviewed the year 2000 computing crisis facing the nation, focusing on: (1) the year 2000 risks facing the

government and nation; (2) the evolution of the federal government's year 2000 strategy; and (3) additional actions that can be taken by the Executive Branch to prepare the nation for the year 2000.

**FINDINGS:**

GAO noted that: (1) while progress has been made in addressing the federal government's year 2000 readiness, serious vulnerabilities remain; (2) many agencies are behind schedule; (3) at the current pace, it is clear that not all mission-critical systems will be fixed in time; (4) much more action is needed to ensure that federal agencies satisfactorily mitigate year 2000 risks to avoid debilitating consequences; (5) vital economic sectors of the nation likewise remain vulnerable to problems that the change of century will bring; (6) moreover, a high degree of information and systems interdependence exists among various levels of government and the private sector in each of these sectors; (7) these interdependencies increase the risk that a cascading wave of failures or interruptions of essential services could occur; (8) as the change of century grows closer and the breadth of year 2000 work that remains has become known, the federal government's response to the crisis has increased; (9) originally, the Office of Management and Budget (OMB) expressed a high degree of confidence about the federal government's ability to meet the year 2000 deadline; (10) more recently, as many agencies have reported their limited progress in

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solving the year 2000 problem, OMB has become increasingly concerned; (11) accordingly, at the urging of key congressional leaders, OMB has improved its response to the crisis by issuing much needed policies and increasing its monitoring of agencies; (12) most encouraging is the President's recent announcement of the establishment of a President's Council on Year 2000 Conversion to oversee federal efforts and promote public/private relationships; and (13) the establishment of the President's Council on Year 2000 Conversion provides an opportunity for the Executive Branch to take further key implementation steps to avert disruptions to critical services.

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**TITLE:** Federal Research: Observations on the Small Business Innovation Research Program  
**ACCESSION NUMBER:** 160257 **RPTNO:** RCED-98-132  
**DOCUMENT DATE:** 04/17/98

**DESCRIPTIVE NOTE:**  
Refer to RCED-92-37, March 30, 1992, Accession Number 146114;  
RCED-95-59, March 8, 1995, Accession Number 153660; T-RCED-98-170,  
April 22, 1998, Accession Number 160276; and T-RCED-98-218, June 4,  
1998, Accession Number 160578.

**ADDRESSEE INFORMATION:**  
Sen. Christopher S. Bond (Chairman)  
Senate Committee on Small Business  
Sen. John F. Kerry (Ranking Minority Member)  
Senate Committee on Small Business  
Rep. James M. Talent (Chairman)  
House Committee on Small Business  
Rep. Nydia M. Velazquez (Ranking Minority Member)  
House Committee on Small Business  
Sen. Bill Frist (Chairman)  
Senate Committee on Commerce, Science and Transportation: Science,  
Technology, and Space Subcommittee  
Sen. John D. Rockefeller, IV (Ranking Minority Member)  
Senate Committee on Commerce, Science and Transportation: Science,

Technology, and Space Subcommittee  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science  
 Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science

**BACKGROUND:**

Pursuant to a legislative requirement, GAO provided a final report on aspects of the Small Business Innovation Research (SBIR) program, focusing on: (1) agencies' adherence to statutory funding requirements; (2) agencies' audits of extramural (external) research and development (R&D) budgets; (3) the effect of the application review process and funding cycles on award recipients; (4) the extent of companies' project activity after receiving SBIR funding and agencies' techniques to foster commercialization; (5) the number of multiple-award recipients and the extent of their project-related activity after receiving SBIR funding; (6) the occurrence of funding for single-proposal awards; (7) participation by women-owned businesses and socially and economically disadvantaged businesses; (8) SBIR's promotion of the critical technologies; (9) the extent to which foreign firms benefit from the results of SBIR; and (10) the geographical distribution of SBIR awards.

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**FINDINGS:**

GAO noted that: (1) the agencies' SBIR officials reported that they have adhered to the requirements that preclude them from using SBIR funds to pay for the administrative costs of the program; (2) the program officials also believe that they are adhering to statutory funding levels for the program; (3) however, some said that they are uncertain whether the agencies are correctly adhering to the requirements for establishing their extramural research budgets; (4) only two of the five agencies that GAO reviewed have conducted audits of their extramural research budgets; (5) in 1997, the Office of Inspector General at the National Science Foundation audited the agency's extramural budget and found that it contained over \$100 million of unallowable costs; (6) while most of the SBIR officials GAO interviewed said that neither the application review process nor current funding cycles have had an adverse effect on award recipients' financial status or ability to commercialize their ideas, some recipients have said that any interruption in funding awards, for whatever reason, affects them negatively; (7) the companies responding to GAO's and the Department of Defense's (DOD) surveys reported that approximately 50 percent of their projects had sales of products or services related to the research or received additional developmental funding after receiving SBIR funding; (8) the number of companies receiving multiple awards, defined here as those phase I award recipients that also received 15 or more phase II awards in the preceding 5 years, grew from 10 companies in 1989 to 17 in 1996; (9) GAO found that the funding of single-proposal awards was rare; (10) all of the agencies GAO examined reported that they engaged in activities to foster the participation of women-owned businesses or socially and economically disadvantaged small businesses; (11) all of the agencies' SBIR officials GAO interviewed felt that the listings of critical technologies are used in developing their respective research topics or that the research being conducted falls within one of the two lists; (12) GAO found little evidence of foreign firms, or U.S. firms with substantial foreign ownership interests, benefiting from technology or products developed as a direct result of SBIR-funded research; (13) SBIR awards are concentrated in the states of California and Massachusetts; (14) however, every state received at least two awards; and (15) previous studies have linked the concentration of awards to local characteristics, such as the prevalence of

small high-tech firms.

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TITLE: Information Technology: Assessment of the Department of Commerce's  
Report on Workforce Demand and Supply  
ACCESSION NUMBER: 160142 RPTNO: HEHS-98-106  
DOCUMENT DATE: 03/20/98

DESCRIPTIVE NOTE:  
This is an alternate version of HEHS-98-106R. Refer to T-HEHS-98-144,  
April 21, 1998, Accession Number 160277.

ADDRESSEE INFORMATION:  
Rep. John D. Dingell (Ranking Minority Member)  
House Committee on Commerce  
Rep. George E. Brown, Jr. (Ranking Minority Member)  
House Committee on Science

BACKGROUND:  
Pursuant to a congressional request, GAO provided information on the  
Department of Commerce's analysis of the information technology (IT) labor  
market, focusing on: (1) Commerce's analysis of IT worker supply and  
demand; and (2) the basis for its conclusion that a shortage of IT workers  
exists in the United States.

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FINDINGS:

GAO noted that: (1) Commerce's report has serious analytical and  
methodological weaknesses that undermine the credibility of its conclusion  
that a shortage of IT workers exists; (2) however, the lack of support  
presented in this one report should not necessarily lead to a conclusion  
that there is no shortage; (3) instead, as the Commerce report states,  
additional information and data are needed to more accurately characterize  
the IT labor market now and in the future; (4) the report appears to  
appropriately establish that the demand for IT workers is expected to grow,  
but it does not adequately describe the likely supply of IT workers; (5)  
although Commerce reported that only 24,553 U.S. students earned bachelor's  
degrees in computer and information sciences in 1994, Commerce also stated  
that the Bureau of Labor Statistics projects increasing job growth--an  
annual average of 95,000 new computer programmers, systems analysts and  
computer scientists and engineers will be required to satisfy the  
increasing demand for IT workers between 1994 and 2005; (6) pointing to the  
disparity between these two numbers and referring to evidence from other  
sources, Commerce concludes in the report's title and introduction that  
there is a shortage of IT workers; (7) Commerce did not, however, consider  
other likely sources of workers, such as college graduates with degrees in  
other areas; and (8) as a result, rather than supporting its conclusion  
that a shortage of IT workers exists, the data and analysis support the  
report's observation that more needs to be known about the supply and  
demand for IT workers.

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TITLE: Information Technology: Assessment of the Department of Commerce's  
Report on Workforce Demand and Supply  
ACCESSION NUMBER: 160111 RPTNO: HEHS-98-106R  
DOCUMENT DATE: 03/20/98

DESCRIPTIVE NOTE:  
Refer to HEHS-98-159R, May 12, 1998, Accession Number 160496.

ADDRESSEE INFORMATION:  
Rep. John D. Dingell (Ranking Minority Member)  
House Committee on Commerce

Rep. George E. Brown, Jr. (Ranking Minority Member)  
House Committee on Science

**BACKGROUND:**

Pursuant to a congressional request, GAO provided information on the Department of Commerce's analysis of the information technology (IT) labor market, focusing on: (1) Commerce's analysis of IT worker supply and demand; and (2) the basis for its conclusion that a shortage of IT workers exists in the United States.

**FINDINGS:**

GAO noted that: (1) Commerce's report has serious analytical and methodological weaknesses that undermine the credibility of its conclusion that a shortage of IT workers exists; (2) however, the lack of support presented in this one report should not necessarily lead to a conclusion that there is no shortage; (3) instead, as the Commerce report states, additional information and data are needed to more accurately characterize the IT labor market now and in the future; (4) the report appears to appropriately establish that the demand for IT workers is expected to grow, but it does not adequately describe the likely supply of IT workers; (5) although Commerce reported that only 24,553 U.S. students earned bachelor's degrees in computer and information sciences in 1994, Commerce also stated that the Bureau of Labor Statistics projects increasing job growth--an annual average of 95,000 new computer programmers, systems analysts and

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computer scientists and engineers will be required to satisfy the increasing demand for IT workers between 1994 and 2005; (6) pointing to the disparity between these two numbers and referring to evidence from other sources, Commerce concludes in the report's title and introduction that there is a shortage of IT workers; (7) Commerce did not, however, consider other likely sources of workers, such as college graduates with degrees in other areas; and (8) as a result, rather than supporting its conclusion that a shortage of IT workers exists, the data and analysis support the report's observation that more needs to be known about the supply and demand for IT workers.

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**TITLE:** National Weather Service: Events Surrounding Fiscal Year 1997 Budget  
**ACCESSION NUMBER:** 159993 **RPTNO:** AIMD-98-69  
**DOCUMENT DATE:** 03/04/98

**DESCRIPTIVE NOTE:**

Refer to HR-95-1, February 1, 1995, Accession Number 153507; and  
HR-97-9, February 1, 1997, Accession Number 158134.

**ADDRESSEE INFORMATION:**

Rep. George E. Brown, Jr. (Ranking Minority Member)  
House Committee on Science  
Rep. F. James Sensenbrenner (Chairman)  
House Committee on Science

**BACKGROUND:**

Pursuant to a congressional request, GAO reviewed the key events related to the fiscal year (FY) 1997 budget shortfall of the National Weather Service (NWS), focusing on: (1) the formulation and execution of the NWS' FY 1997 budget; and (2) key events regarding NWS' FY 1997 budget shortfall and efforts to address it.

**FINDINGS:**

GAO noted that: (1) based on guidance provided by the Department of Commerce and the Office of Management and Budget (OMB), the National Oceanic and Atmospheric Administration (NOAA) prepared a FY 1997 budget proposal for each of its components--including NWS; (2) the Department of

Commerce reviewed this proposal and asked OMB to include \$693 million for NWS in the President's budget; (3) based on OMB's direction regarding NOAA-wide and NWS-specific reductions, this request was revised to the \$671 million that appeared in the President's budget submission to Congress; (4) Congress further reduced this amount, enacting appropriations that included \$638 million in FY 1997; (5) although NWS believed it had a budget shortfall because of the reductions that OMB and Congress made to its FY 1997 budget request, as well as inflationary and other cost increases, NOAA and NWS reported varying amounts to Congress about the size of this shortfall; (6) according to NOAA and NWS officials, the information provided to Congress responded to specific questions asked at particular points in time and did not necessarily include all known elements of the shortfall; (7) NWS ultimately succeeded in staying within its FY 1997 budget level by implementing a number of temporary and permanent actions; (8) other events associated with the shortfall raised concerns among department officials and Congress; (9) the first event centered on a NWS reprogramming request to NOAA and NWS' intention to start filling critical field vacancies prior to receiving NOAA authorization; (10) NWS assumed that the reprogramming request would be approved by Commerce and funds would be available to fill these vacancies; (11) NOAA informed NWS that the vacancies could not be filled because the reprogramming request had not yet been approved; (12) the second event involved NWS' effort to obtain certification approval from NOAA to consolidate, automate, and close

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weather service offices; (13) upon learning that NWS would not be able to fill critical field vacancies, NWS recommended to NOAA that selected certification packages be held back because, according to NWS, this would have resulted in a degradation of weather services at locations; (14) however, Commerce noted that the certification packages, as submitted by NWS on April 22, 1997, did not indicate that there were vacancies in these offices that would preclude proceeding with certification; and (15) no link was made during this time between the ability to proceed with certification and the need for reprogramming approval by Congress.

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**TITLE:** Federal Research: Information on the Advanced Technology Program's 1997 Award Selection  
**ACCESSION NUMBER:** 159973 **RPTNO:** RCED-98-82R  
**DOCUMENT DATE:** 02/24/98

**ADDRESSEE INFORMATION:**  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science

**BACKGROUND:**  
 Pursuant to a congressional request, GAO provided information on the Advanced Technology Program (ATP) proposal application and review process.

**FINDINGS:**  
 GAO noted that: (1) according to program officials, the National Institute of Standards and Technology made the determination of whether the applicants could probably find funding elsewhere on the basis of information gathered throughout the fiscal year 1997 competitions' proposal review process; (2) in addition, ATP officials said that applicants were questioned during the oral review phase if any doubt remained as to whether they could have found funding elsewhere; (3) in December 1997, ATP revised its requirements, requiring that in the future applicants indicate on the proposal application their efforts to find private funding; (4) in addition, program officials told GAO that all of the information acquired during the proposal review was used to determine of program support was

important to the project from a national economic perspective; (5) specifically, the officials said that one of the five selection criteria for evaluating proposals, potential net broad-based economic benefits, relates to whether or not funding a project would create a serious national economic concern; and (6) according to the ATP Proposal Preparation Kit, the proposal review process included a review of the proposal by panels of outside experts in business and economics to determine the proposed project's potential for broad-based benefits and its commercial viability.

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TITLE: FAA Computer Systems: Limited Progress on Year 2000 Issue Increases  
Risk Dramatically  
ACCESSION NUMBER: 159824 RPTNO: AIMD-98-45  
DOCUMENT DATE: 01/30/98

## DESCRIPTIVE NOTE:

Refer to AIMD-10.1.14, September 1, 1997, Accession Number 159273; AIMD-97-47, March 21, 1997, Accession Number 158357; AIMD-97-30, February 3, 1997, Accession Number 158080; T-AIMD-98-63, February 4, 1998, Accession Number 159813; T-RCED/AIMD-98-93, February 26, 1998, Accession Number 159961; and AIMD-99-40R, December 4, 1998, Accession Number 161443.

## ADDRESSEE INFORMATION:

Rep. Constance A. Morella (Chairman)  
House Committee on Science: Technology Subcommittee  
Rep. Bart Gordon (Ranking Minority Member)

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House Committee on Science: Technology Subcommittee  
Rep. Stephen Horn (Chairman)  
House Committee on Government Reform and Oversight: Government  
Management, Information and Technology Subcommittee  
Rep. Carolyn B. Maloney (Ranking Minority Member)  
House Committee on Government Reform and Oversight: Government  
Management, Information and Technology Subcommittee

## BACKGROUND:

Pursuant to a congressional request, GAO reviewed the effectiveness of the Federal Aviation Administration's (FAA) year 2000 program, including the reliability of its year 2000 cost estimate.

## FINDINGS:

GAO noted that: (1) FAA's progress in making its systems ready for the year 2000 has been too slow; (2) at its current pace, it will not make it in time; (3) the agency has been severely behind schedule in completing basic awareness activities, a critical first phase in an effective year 2000 program; (4) for example, FAA appointed its initial program manager with responsibility for the year 2000 only 6 months ago, and its overall year 2000 strategy is not yet final; (5) FAA also does not know the extent of its year 2000 problem because it has not completed most key assessment phase activities, the second critical phase in an effective year 2000 program; (6) it has yet to analyze the impact of systems' not being year 2000 date compliant, inventory and assess all of its systems for date dependencies, develop plans for addressing identified date dependencies, or develop plans for continuing operations in case systems are not corrected in time; (7) FAA currently estimates it will complete its assessment activities by the end of January 1998; (8) until these activities are completed, FAA cannot know the extent to which it can trust its systems to operate safely after 1999; (9) the potential serious consequences include degraded safety, grounded or delayed flights, increased airline costs, and customer inconvenience; (10) delays in completing awareness and assessment

activities also leave FAA little time for critical renovation, validation, and implementation activities--the final three phases in an effective year 2000 program; (11) with 2 years left, FAA is quickly running out of time, making contingency planning for continuity of operations even more critical; (12) FAA's inventory and assessment actions will define the scope and magnitude of its year 2000 problem; since they are incomplete, FAA lacks the information it needs to develop reliable year 2000 cost estimates; and (13) FAA's year 2000 project manager currently estimates that the entire program will cost \$246 million based on early estimates from managers throughout the agency.

TITLE: Space Surveillance: DOD and NASA Need Consolidated Requirements and a Coordinated Plan  
 ACCESSION NUMBER: 159611 RPTNO: NSIAD-98-42  
 DOCUMENT DATE: 12/01/97

DESCRIPTIVE NOTE:

Refer to NSIAD-95-163, June 12, 1995, Accession Number 154552; and NSIAD-98-147, May 22, 1998, Accession Number 160559.

ADDRESSEE INFORMATION:

Rep. Dana Rohrabacher (Chairman)  
 House Committee on Science: Space and Aeronautics Subcommittee  
 Rep. Robert E. (Bud) Cramer, Jr. (Ranking Minority Member)  
 House Committee on Science: Space and Aeronautics Subcommittee

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BACKGROUND:

GAO reviewed the Department of Defense's (DOD) and the National Aeronautics and Space Administration's (NASA) space surveillance requirements and DOD's space surveillance capabilities, focusing on: (1) how well DOD's existing surveillance capabilities support DOD's and NASA's current and future surveillance requirements; and (2) the extent to which potential surveillance capabilities and technologies are coordinated to provide opportunities for improvements.

FINDINGS:

GAO noted that: (1) DOD's existing space surveillance network is not capable of providing the information NASA needs to adequately predict collisions between space objects orbiting the earth and multibillion dollar space programs like the space station; (2) the existing network cannot satisfy DOD's emerging space surveillance requirements, which are currently under review; (3) DOD's plans--to modernize an existing surveillance network radar system and develop three new ballistic missile warning systems that could contribute to performing the surveillance function--do not adequately consider DOD's or NASA's surveillance requirements; (4) these four systems are separately managed by the Navy, the Air Force, and the Army; (5) an opportunity exists to consider these systems' potential capabilities to enhance the surveillance network to better satisfy requirements and achieve greater benefits from planned investment in space sensor technology; (6) despite NASA's dependency on DOD to provide space object information, the 1996 National Space Policy makes no provision for an interagency mechanism--either organizational or funding--to ensure that DOD's surveillance capabilities satisfy NASA's requirements; (7) overall, there is no authoritative direction, formal agreement, or clear plan on how DOD and NASA could consolidate their space surveillance requirements for a common capability; (8) a coordinated interagency plan that considers all existing and planned space surveillance capabilities could be beneficial in making cost-effective decisions to satisfy a consolidated set of national security and civil space surveillance requirements; (9) unless DOD and NASA

can agree on such a plan, an opportunity may be missed to simultaneously:  
 (a) achieve efficiencies; (b) better ensure the safety of the planned  
 multibillion dollar space station; and (c) help satisfy national security  
 needs, including the U.S. forces' future needs for space asset information.

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TITLE: Department of Energy: Information on the Tritium Leak and Contractor  
 Dismissal at the Brookhaven National Laboratory  
 ACCESSION NUMBER: 159557 RPTNO: RCED-98-26  
 DOCUMENT DATE: 11/04/97

## DESCRIPTIVE NOTE:

Refer to RCED-93-72, August 31, 1993, Accession Number 149814.

## ADDRESSEE INFORMATION:

Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science

## BACKGROUND:

Pursuant to a congressional request, GAO reviewed the events surrounding the leak of the radioactive element tritium from a research reactor at the Brookhaven National Laboratory and the resulting termination of Associated Universities, Inc., as the laboratory's contractor.

## FINDINGS:

GAO noted that: (1) because Brookhaven employees did not aggressively monitor its reactor's spent-fuel pool for leaks, years passed before

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tritium contamination was discovered in the aquifer near the spent-fuel pool; (2) reliance on incomplete tests of the water level in the spent-fuel pool and on sample data from monitoring wells scattered about the site led Brookhaven and Department of Energy (DOE) officials to give low priority to a potential tritium leak; (3) even after laboratory and DOE staff agreed with Suffolk County regulatory officials to install monitoring wells near the reactor in 1994, Brookhaven officials postponed their installation in favor of environmental, safety, and health activities they considered more important; (4) once the wells were installed and the high levels of tritium were discovered, the laboratory reported that the spent-fuel pool could have been leaking for as long as 12 years; (5) although the tritium poses little threat to the public, the delay in installing the monitoring wells raised serious concerns in the Long Island community about: (a) the laboratory's ability to take seriously its responsibilities for environment and for human health and safety; and (b) DOE's competence as an overseer of the laboratory's activities; (6) the responsibility for failing to discover Brookhaven's tritium leak has been acknowledged by laboratory managers, and DOE admits it failed to properly oversee the laboratory's operations; (7) DOE's on-site oversight office, the Brookhaven Group, was directly responsible for Brookhaven's performance, but it failed to hold the laboratory accountable for meeting all of its regulatory commitments, especially its agreement to install monitoring wells; (8) senior DOE leadership also shares responsibility because they failed to put in place an effective system that encourages all parts of DOE to work together to ensure that contractors meet their responsibilities for environmental, safety and health issues; (9) DOE's latest strategic plan, submitted in support of the Government Performance and Results Act of 1993, offers an opportunity to focus attention on the need to address DOE's management structure and accountability problems from a strategic perspective; and (10) the Secretary of Energy's decision to terminate Associated Universities' 50 years as the laboratory's contractor was based, according

to DOE's official statements, on the laboratory's loss of the public's trust and DOE's own investigation, which concluded that the laboratory had not kept pace with contemporary expectations for the protection of the environment and human health and safety.

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TITLE: 1998 NASA Budget: Review of Selected Activities  
 ACCESSION NUMBER: 159356 RPTNO: NSIAD-97-252R  
 DOCUMENT DATE: 09/30/97

## DESCRIPTIVE NOTE:

Refer to AIMD-98-182, September 15, 1998, Accession Number 161123.

## ADDRESSEE INFORMATION:

Sen. Christopher S. Bond (Chairman)  
 Senate Committee on Appropriations: VA, HUD, and Independent Agencies  
 Subcommittee  
 Sen. Barbara A. Mikulski (Ranking Minority Member)  
 Senate Committee on Appropriations: VA, HUD, and Independent Agencies  
 Subcommittee  
 Sen. John McCain (Chairman)  
 Senate Committee on Commerce, Science and Transportation  
 Sen. Ernest F. Hollings (Ranking Minority Member)  
 Senate Committee on Commerce, Science and Transportation  
 Rep. Jerry Lewis (Chairman)  
 House Committee on Appropriations: VA, HUD, and Independent Agencies  
 Subcommittee  
 Rep. Louis Stokes (Ranking Minority Member)

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House Committee on Appropriations: VA, HUD, and Independent Agencies  
 Subcommittee  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science  
 Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science

## BACKGROUND:

GAO provided information on potential reduction in the National Aeronautics and Space Administration's (NASA) fiscal year (FY) 1998 budget request and prior years' appropriations for selected programs. GAO noted that the information did not reflect any adjustments taken by congressional authorization and appropriations committees during their review of the FY 1998 NASA budget request.

## FINDINGS:

GAO noted that: (1) it identified opportunities to reduce NASA's FY 1998 budget request by about \$108 million; (2) these opportunities are primarily in the human space flight (\$54.4 million) and mission support (\$53 million) areas; and (3) it also identified another \$24 million in potential excess funding in the science, aeronautics, and technology areas, which could be restricted, but the exact amount available for reprogramming or rescission will not be known until the Cassini mission to Saturn is launched in FY 1998.

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TITLE: National Weather Service: Modernization Activities Affecting  
 Northwestern Pennsylvania  
 ACCESSION NUMBER: 159357 RPTNO: AIMD-97-156  
 DOCUMENT DATE: 09/26/97

## DESCRIPTIVE NOTE:

Refer to AIMD-95-81, April 21, 1995, Accession Number 154087.

ADDRESSEE INFORMATION:  
 Rep. F. James Sensenbrenner (Chairman)  
 House Committee on Science  
 Rep. Phil English

## BACKGROUND:

Pursuant to a congressional request, GAO examined how the National Weather Service (NWS) had implemented modernization and restructuring activities in northwestern Pennsylvania, focusing on identifying: (1) why the Erie, Pennsylvania, weather service office (WSO) was spun down prior to the Department of Commerce's October 1995 report on 32 areas of concern; (2) what types of services were provided to the counties served by the Erie office before and after office spin-down, as well as what public concerns have been raised, and how NWS responded to them; (3) what safety concerns have been raised to weather services at the Erie airport and to the timeliness of small-craft advisories for Lake Erie, including how NWS responded to public concerns about these issues; and (4) whether any reliable statistical or other evidence exists that addresses whether a degradation of service in the Erie area has occurred as a result of the modernization and office restructuring.

## FINDINGS:

GAO noted that: (1) NWS started spinning down the Erie WSO by transferring warning responsibilities to the three assuming Weather Forecast Offices (WFO) in August 1994 before the Department of Commerce began its review of the 32 areas of concern in June 1995; (2) concerns about the Erie office closure, however, were made known as early as June 1994; (3) NWS continued with its plans to spin down the office because officials believed that they would be providing the best service to the area by relying on modernized

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radars in other offices; (4) the three WFOs that assumed responsibility for the counties formerly served by the Erie WSO provide generally the same types of services that the Erie office had provided, with the exception of the general public's local or toll-free telephone access to NWS personnel; (5) the major concerns surrounding the transfer of responsibilities relate to whether radar coverage over the counties formerly served by Erie would be adequate, and whether forecasts and warnings are at least equal in accuracy and timeliness to those previously issued by Erie; (6) NWS responses to such concerns include analyzing its ability to detect severe weather phenomena over northwestern Pennsylvania, as well as providing data on how well the assuming offices are issuing forecasts and warnings; (7) a few concerns also have been raised regarding NWS service to the Erie airport and the timeliness of small-craft advisories for Lake Erie; (8) the most commonly voiced concern regarded an automated surface observing system (ASOS) and requirements for air traffic controllers to augment it with human observations; (9) the Federal Aviation Administration (FAA) has sponsored a study of the impact of its augmentation responsibilities at airports such as Erie and will be issuing a report in the fall of 1997; (10) several studies present evidence that a degradation in service has not occurred in northwestern Pennsylvania; however, the ability to detect and predict lake-effect snow remains a concern; (11) NWS is completing a lake-effect snow study to determine the effectiveness of the modernized weather system in detecting and forecasting lake-effect snow; (12) the Director of NWS' Office of Meteorology told GAO that he will recommend a radar for the Erie area; and (13) however, NWS has not yet taken a position on the need for a radar, and the Secretary of Commerce is scheduled to make the final decision on any action to be taken in northwestern Pennsylvania.

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TITLE: Surface Transportation: The Department of Transportation Proposes Significant Changes to Its Automated Highway System Program  
 ACCESSION NUMBER: 158805 RPTNO: RCED-97-177R  
 DOCUMENT DATE: 06/09/97

DESCRIPTIVE NOTE:  
 Refer to RCED-96-233, September 6, 1996, Accession Number 157406.

ADDRESSEE INFORMATION:  
 Rep. Constance A. Morella (Chairman)  
 House Committee on Science: Technology Subcommittee

**BACKGROUND:**

Pursuant to a congressional request, GAO provided information on the current goals and future direction of the Department of Transportation's (DOT) Automated Highway System program, focusing on: (1) the potential benefits and drawbacks of implementing a fully automated highway system; and (2) DOT's proposed changes to the Automated Highway System program and the implications of these changes.

**FINDINGS:**

GAO noted that: (1) according to DOT and the National Automated Highway System Consortium, a fully automated highway system could significantly enhance the safety of highway travel by reducing or eliminating accidents caused by "human factors", that is, by fatigue, inattentiveness, or poor decisions on the part of drivers; (2) in addition, a fully automated system could increase highway capacity and reduce travel times because automatically driven vehicles could travel on an intelligent roadway within a few meters of one another at normal highway speeds or faster; (3) however, automated highway system analysts have noted that before these benefits can be realized, significant operational issues will have to be resolved; (4) in addition, a fully automated highway system raises

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important questions about the technology's impact on air quality and land use, about liability, and about the program's costs and benefits; (5) these issues have been studied but not yet resolved under the Automated Highway System program's initial research efforts; (6) according to DOT officials, in January 1997 DOT began to consider refocusing the direction of the program from long-term efforts to deploy a fully automated system to shorter-term research designed primarily to develop and test near-term technologies; (7) as a result, the program will no longer focus on developing "revolutionary" technologies intended to produce a fully automated highway in the next 20 or 30 years; (8) instead, the program will be "evolutionary", testing and deploying increasingly advanced technologies over the next 6 to 8 years to enhance drivers' ability to avoid accidents and improve safety on the nation's highways; (9) for example, the program will focus on collision avoidance warning systems that notify drivers when they are too close to other vehicles; (10) DOT is proposing these changes because the administration and the system's potential users did not widely support the long-term fully automated vision and DOT believed that the program needed to produce short-term benefits to remain viable; (11) the program's shift from a long- to a short-term focus creates uncertainties, including: (a) whether the public/private consortium leading the Automated Highway System program will restructure its membership or dissolve; (b) how the refocused program will coordinate its research with comparable research conducted by the National Highway Traffic Safety Administration; and (c) how DOT will sustain investments in important long-term, high-risk research; and (12) DOT officials expect to resolve many of these issues by the end of the summer.

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TITLE: Budget Trends: Federal Investment Outlays, Fiscal Years 1981-2002  
 ACCESSION NUMBER: 158691 RPTNO: AIMD-97-88  
 DOCUMENT DATE: 05/21/97  
 DESCRIPTIVE NOTE:  
 Refer to AIMD-94-40, November 9, 1993, Accession Number 150355; and  
 AIMD-98-184, June 15, 1998, Accession Number 160610.  
 ADDRESSEE INFORMATION:  
 Sen. Frank R. Lautenberg (Ranking Minority Member)  
 Senate Committee on Budget  
 Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science

BACKGROUND:  
 Pursuant to congressional requests, GAO provided information on federal investment trends and estimates of future outlays for investments through fiscal year 2002. GAO did not independently verify this information but traced totals to published budget documents.

FINDINGS:  
 GAO noted that: (1) the share of total federal budget outlays and of gross domestic product devoted to investment gradually declined from the early 1980s through 1996; (2) according to the administration's policy estimates, this decline will continue for 1997 through 2002; (3) however, over the same time period, a slightly different picture emerges when investment outlays are converted to constant 1992 dollars; (4) investment spending in estimated constant dollar outlays increased slightly from the 1980s to the mid-1990s, with a gradual decline through 2002; (5) investment by category (character class) in constant dollars shows varying patterns; (6) physical capital remained relatively stable from the 1980s through 1995, with slight declines in 1996 and in the President's policy estimates for fiscal years 1997 through 2002; (7) research and development shows increases from the

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1980s through 1990 and then drops off gradually; (8) in contrast, education and training has shown a relatively steady increase from 1981 that is projected to continue through 2002; (9) the pattern of investment from 1981 through 2002 in constant dollars varies across budget functions; (10) seven functions contain about 96 percent of investment outlays; (11) two of those functions, Education and Training and Health, show a general increase over the period; (12) the General Science function shows an increase to the mid-1990s and then levels off; (13) the National Defense and Transportation functions show increases followed by declines in the 1990s and through 2002; and (14) investment spending in the Natural Resources and Environment and Energy functions show a continued downward trend from the 1980s through 2002.

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TITLE: Department of Energy: Opportunity for Enhanced Oversight of Major System Acquisitions  
 ACCESSION NUMBER: 158573 RPTNO: RCED-97-146R  
 DOCUMENT DATE: 04/30/97  
 DESCRIPTIVE NOTE:  
 Refer to T-RCED-97-92, March 6, 1997, Accession Number 158274; and  
 RCED-97-17, November 26, 1996, Accession Number 157875.  
 ADDRESSEE INFORMATION:  
 Rep. George E. Brown, Jr. (Ranking Minority Member)  
 House Committee on Science

BACKGROUND:  
 Pursuant to a congressional request, GAO provided information on how the Federal Acquisition Streamlining Act of 1994, the Clinger-Cohen Act of

1996, and Office of Management and Budget (OMB) Circular A-11 can help address the Department of Energy's (DOE) problems in completing its largest and most significant systems projects.

**FINDINGS:**

GAO noted that: (1) Title V of the Federal Acquisition Streamlining Act is designed to foster the development of: (a) measurable cost, schedule, and performance goals; and (b) incentives for acquisition personnel to reach these goals; (2) subtitle B, which applies to civilian agencies, provides that agency heads are to establish cost, schedule, and performance goals for acquisition programs and annually report on the progress in meeting these goals; (3) these goals are to include achieving, on average, 90 percent of the established cost and schedule goals without reducing the performance or capabilities of the items being acquired; (4) subtitle B also requires that agency heads manage employees in acquisition positions, including their education, training, and career development, by relating their evaluations, pay, and promotions to their performance in helping achieve cost, schedule, and performance goals; (5) furthermore, the Clinger-Cohen Act of 1996 provides for the establishment of policies and procedures for the management, education, and training of the civilian acquisition workforce; (6) the career development of this workforce is to include the identification of appropriate career paths, mandatory education and training in the critical duties and tasks of these career paths, and an enhanced system of performance incentives to encourage agencies to specify in their budget justification documents the funding levels requested for educating and training the acquisition workforce; (7) under the act, the funds appropriated for this purpose may not be used for any other purpose; (8) OMB issued Circular A-11, which included new guidance for agencies to use in the planning, budgeting, and acquisition of fixed assets, such as land, buildings, and equipment; (9) one purpose of this guidance is to ensure that agencies acquisition plans support the agencies mission

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statements, long-term goals and objectives, and annual performance plans developed under the Government Performance and Results Act of 1993; (10) GAO believes that these changes in procurement law could help DOE recruit additional contracting staff and improve the technical capabilities of its existing staff; and (11) hence, these changes could help to address a long-standing departmental problem.

TITLE: National Oceanic and Atmospheric Administration: Follow-up on Weather Service Modernization and NOAA Corps Issues  
 ACCESSION NUMBER: 158470 RPTNO: AIMD/GGD-97-75R  
 DOCUMENT DATE: 04/10/97

**DESCRIPTIVE NOTE:**

Refer to T-AIMD/GGD-97-63, March 13, 1997, Accession Number 158327; AIMD-97-37, March 13, 1997, Accession Number 158295; and GGD-97-10, October 31, 1996, Accession Number 157767.

**ADDRESSEE INFORMATION:**

Rep. Ken Calvert (Chairman)  
 House Committee on Science: Energy and Environment Subcommittee

**BACKGROUND:**

Pursuant to a congressional request, GAO provided responses to questions submitted by Members of the Subcommittee on Energy and Environment, House Committee on Science, on various National Oceanic and Atmospheric Administration (NOAA) issues.

**FINDINGS:**

GAO noted that: (1) these responses cover two National Weather Service

modernization projects, the Advanced Weather Interactive Processing System and the Geostationary Operational Environmental Satellite (GOES) program, and the NOAA Commissioned Corps; and (2) the basis for GAO's responses is its testimony and recent reports on GOES and the NOAA Commissioned Corps.

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TITLE: Measuring Performance: Strengths and Limitations of Research Indicators  
 ACCESSION NUMBER: 158473 RPTNO: RCED-97-91  
 DOCUMENT DATE: 03/21/97

DESCRIPTIVE NOTE:  
 Refer to PAD-79-69, August 27, 1979, Accession Number 110217;  
 T-GGD/RCED-96-214, July 10, 1996, Accession Number 157117;  
 NSIAD-97-205R, July 22, 1997, Accession Number 159083; T-RCED-98-144,  
 March 31, 1998, Accession Number 160180; RCED-98-147, April 10, 1998,  
 Accession Number 160325; and RCED-98-249, September 25, 1998,  
 Accession Number 161287.

ADDRESSEE INFORMATION:  
 Rep. Constance A. Morella (Chairman)  
 House Committee on Science: Technology Subcommittee  
 Rep. Bart Gordon (Ranking Minority Member)  
 House Committee on Science: Technology Subcommittee  
 Rep. John S. Tanner

BACKGROUND:  
 Pursuant to a congressional request, GAO provided information on the indicators used to evaluate the results of research and development (R&D), focusing on the relative strengths and limitations of the input and output indicators used by the federal and private sectors to measure the results of R&D.

FINDINGS:  
 GAO noted that: (1) the amount of money spent on research and development, the primary indicator of the investment in research, is useful as a measure

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of how much research is being performed; (2) having been refined over many years, these data are generally available for the research efforts in both the public and private sectors; (3) however, the level of spending is not a reliable indicator of the level of results achieved by research; (4) unlike the situation with the input measures of R&D, there is no primary indicator of the outputs; (5) output indicators include quantitative analyses of return on investment, patents granted, and other outputs as well as qualitative assessments based on peer review; (6) the companies that GAO spoke with collect data on various output indicators but, in general, make limited use of them in their investment decisions; (7) instead, the companies emphasized that R&D contribute directly to their "bottom line"; (8) because companies are profit-oriented, many of the indicators tracked by the private sector cannot be directly applied to the federal government; and (9) experiences from pilot efforts made under the Government Performance and Results Act have reinforced the finding that output measures are highly specific to the management and mission of each federal agency and that no single indicator exists to measure the results of research.

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TITLE: Weather Satellites: Planning for the Geostationary Satellite Program Needs More Attention  
 ACCESSION NUMBER: 158295 RPTNO: AIMD-97-37  
 DOCUMENT DATE: 03/13/97

## DESCRIPTIVE NOTE:

Refer to NSIAD-97-252, July 24, 1991, Accession Number 144550;  
 AIMD-96-141R, September 13, 1996, Accession Number 157495; and  
 AIMD-96-29, February 29, 1996, Accession Number 156268.

## ADDRESSEE INFORMATION:

Rep. Ken Calvert (Chairman)  
 House Committee on Science: Energy and Environment Subcommittee

## BACKGROUND:

Pursuant to a congressional request, GAO reviewed the National Oceanic and Atmospheric Administration's (NOAA) management of the Geostationary Operational Environmental Satellite (GOES) Program, focusing on: (1) NOAA's strategy for procuring satellites in the GOES continuation series; (2) what steps NOAA should be taking now to prepare for the next generation series of satellites; and (3) whether the potential exists for improving the system and reducing costs in the long term.

## FINDINGS:

GAO noted that: (1) based on the best available analysis, the potential for a gap in geostationary satellite coverage will be significant in the early years of the next century if procurement of new satellites does not begin soon; (2) to prevent this problem, NOAA plans to competitively procure two to four continuation series spacecraft that will carry the same meteorological instruments as the current spacecraft and incorporate modest technical improvements; (3) the satellites are planned for launch beginning in 2002; (4) given the importance of maintaining continuous geostationary weather coverage, NOAA's plans are reasonable; (5) however, there are inherent difficulties in determining exactly when and how many of the continuation series spacecraft will be needed; (6) despite these difficulties, GAO identified several specific shortcomings in NOAA's spacecraft planning process that, if remedied, could improve planning in the future; (7) based on the President's fiscal year (FY) 1998 budget, NOAA does not plan to begin a follow-on GOES program until FY 2003 at the earliest; (8) given that the opportunity now exists to consider alternatives for a follow-on system, current usage of GOES data by weather

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forecasters suggests that a reexamination of the GOES satellite architecture is warranted; (9) before a decision can be made about what kind of follow-on satellite system to build, an updated analysis of user needs must be completed; (10) several new approaches and technologies for geostationary satellite meteorology have been suggested in recent years by government, academic, and industry experts, however, identifying and evaluating the full range of options will require thorough engineering analysis; (11) in addition, past NOAA experience shows that developing new technologies is done most efficiently as a separate line of effort, outside of the operational satellite program; (12) such an effort would benefit from greater collaboration with the National Aeronautics and Space Administration, whose expertise and support have, in the past, significantly contributed to the development of NOAA's weather satellite systems; (13) the longer that NOAA continues without actively considering other options for a future system, the more it risks having to procure additional continuation series satellites, because the availability date for a fully developed new satellite system will slip farther into the future; and (14) the potential advantages of advanced technologies and small satellite constellations as well as questions about changing user requirements suggest that alternatives to the present architecture should be seriously considered.

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Mar. 24, 1998	Educating Our Children With Technology Skills To Compete In the Next Millennium (Joint Hearing before the Subcommittee on Technology, Committee on Science, and the Subcommittee on Early Childhood, Youth and Families, Committee on Education and the Workforce)	50.
May 20, 1998	EPA's Rule On Paints And Coatings: Has EPA Met The Research Requirements Of The Clean Air Act? (Hearing before the Subcommittee on Energy and Environment)	51.
Feb. 25, 1998	DOE FY 99 Budget Authorization Request: H.R. 1806, To Provide For The Consolidation Of The DOE Offices Of Fossil Energy, Renewable Energy, And Energy Efficiency; S. 965, To Amend Title II Of The Hydrogen Future Act of 1996 (Hearing before the Subcommittee on Energy and Environment)	52. Vol. I&II
Mar. 10, 1998	Review of H.R. 3007, The Advancement of Women in Science, Engineering, and Technology Development Act (Joint Hearing before the Subcommittee on Technology and the Subcommittee on Basic Research)	53.
Apr. 22, 1998	Fiscal Year 1999 Budget Authorization Request: National Science Foundation (Hearing before the Subcommittee on Basic Research)	54.
Mar. 18, 1998	Year 2000 (Joint Hearing before the Subcommittee on Technology, Committee on Science, and the Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight)	55.
Mar. 18, 1998	Diesel Technology for the 21st Century (Hearing before the Subcommittee on Energy and Environment)	56.
May 7, 1998	Aviation Manufacturing and The Fastener Quality Act (Hearing before the Subcommittee on Technology)	57.
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Mar. 4, 11, 25, 1998 Apr. 1, 22, 1998 May 14, 1998 Jun. 10, 1998	National Science Policy Study, Parts I-VII (Hearing before the Committee on Science)	60.
Mar. 20, 1997	Fiscal Year 1998 Budget Authorization Request: Department of Energy (DOE)-Nuclear Energy; Environment, Safety and Health; and Environmental Restoration and Waste Management (Non-Defense) (Hearing before the Subcommittee on Energy and Environment)	61.

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Jul. 15, 1998	The Science of Risk Assessment: Implications for Federal Regulation (Hearing before the Subcommittee on Energy and Environment)	62.
Mar. 25, 1998	Fiscal Year 1999 Budget Authorization Request for the Department of Energy, Environmental Protection Agency Research and Development, and National Oceanic and Atmospheric Administration (Hearing before the Subcommittee on Energy and Environment)	63.
Jul. 23, 1998	The National Science Foundation's Statewide Systemic Initiatives: Are SSI's The Best Way To Improve K-12 Math and Science Education? (Hearing before the Subcommittee on Basic Research)	64.
May 21, 1998	External Regulation of DOE Labs: Status of OSHA and NRC Pilot Programs (Joint Hearing before the Subcommittee on Basic Research and the Subcommittee on Energy and Environment)	65.
Jun. 17, 1998	The Human Genome Project: How Private Sector Developments Affect the Government Program (Hearing before the Subcommittee on Energy and Environment)	66.
Mar. 19, 1998	Fiscal Year 1999 Budget Request for the National Aeronautics and Space Administration, Parts I-IV (Hearing before the Subcommittee on Space and Aeronautics)	67.
Aug. 4, 1998	Developing Partnerships for Assistive and Universally Designed Technologies for Persons with Disabilities (Hearing before the Subcommittee on Technology)	68.
Sept. 17, 1998	Industrial Biotechnology: A Solution For The Future? (Hearing before the Subcommittee on Technology)	69.
Aug. 6, 1998	Technology Development at the Federal Aviation Administration: Computer and Information Technology Challenges of the 21st Century (Hearing before the Subcommittee on Technology)	70.
May 21, 1998	Asteroids: Perils and Opportunities (Hearing before the Subcommittee on Space and Aeronautics)	71.
Mar. 19, 1997	FY 1998 Budget Request: Department of Energy, Fossil Energy, R&D, Clean Coal Technology Program, and Energy Efficiency and Renewable Energy; and H.R. 363, to amend section 2118 of the Energy Policy Act of 1992 to extend the Electric and Magnetic Fields Research and Public Information Dissemination Program (Hearing before the Subcommittee on Energy and Environment)	72.
Feb. 4, 1998	Road From Kyoto, Part I: Where Are We, Where Are We Going, and How Do We Get There? (Hearing before the Committee on Science)	73.
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Mar. 5, 1998	Road From Kyoto, Part III: State Department Overview (Hearing before the Committee on Science)	75.
Oct. 9, 1998	Road From Kyoto, Part IV: The Kyoto Protocol's Impact on U.S. Energy Markets and Economic Activity (Hearing before the Committee on Science)	76.
Mar. 4, 1998	Fiscal Year 1999 Budget Request: NOAA (Hearing before the Subcommittee on Energy and Environment)	77.

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Jul. 21, 1998	Community Colleges in the 21st Century: Tackling Technology (Hearing before the Subcommittee on Technology)	82.
Sept. 10, 1998	Delays in NASA's Earth Science Enterprise (Hearing before the Subcommittee on Space and Aeronautics)	83.
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Sept. 23, 1998	GAO Report on DOE National Laboratory Management Reform (Joint Hearing before the Subcommittee on Basic Research and the Subcommittee on Energy and Environment)	85.
Sept. 24, 1998	Year 2000: What Every Consumer Should Know (Hearing before the Subcommittee on Technology)	86.
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Sept. 29, 1998	U.S. Spacepower in the 21st Century (Joint Hearing before the Subcommittee on Space and Aeronautics, Committee on Science; Subcommittee on Military Research and Development, and the Subcommittee on Military Procurement, Committee on National Security)	88.
Sept. 29, 1998	Aviation and the Year 2000 (Joint Hearing before the Committee on Transportation and Infrastructure; Subcommittee on Technology, Committee on Science; and the Subcommittee on Government Management, Information and Technology, Committee on Government Reform and Oversight)	89.
Oct. 1, 1998	NASA At 40: What Kind Of Space Program Does America Need For The 21st Century? (Hearing before the Subcommittee on Space and Aeronautics)	90.
Oct. 2, 1998	Hear Comes La Nina: What To Expect From The Weather In The Winter Of 1998-1999 (Hearing before the Subcommittee on Energy and Environment)	91.
Oct. 2, 1998	Status of the District of Columbia's Year 2000 Compliance Effort (Joint Hearing before the Subcommittee on District of Columbia, Committee on Government Reform and Oversight; Subcommittee on Technology, Committee on Science; and Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight)	92.
Oct. 6, 1998	High-Performance Computing (Hearing before the Subcommittee on Basic Research)	93.

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## COMMITTEE PUBLICATIONS

## REPORTS

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Apr. 21, 1997	National Sea Grant College Program Reauthorization Act of 1997 (H.R. 437)	H.Rept. 105-22, Pt. 2
Apr. 21, 1997	To amend section 2118 of the Energy Policy Act of 1992 to extend the Electric and Magnetic Fields Research and Public Information Dissemination Program (H.R. 363)	H.Rept. 105-60, Pt. 2
Apr. 21, 1997	FAA Research, Engineering, and Development Authorization Act of 1997 (H.R. 1271)	H.Rept. 105-61
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May 16, 1997	Environmental Research, Development, and Demonstration Authorization Act of 1997 (H.R. 1276)	H.Rept. 105-99, Pt. 1
Aug. 1, 1997	Human Cloning Research Prohibition Act (H.R. 922)	H.Rept. 105-239, Pt. 1
Aug. 1, 1997	To authorize appropriations for carrying out the Earthquake Hazards Reduction Act of 1997 for fiscal years 1998 and 1999, and for other purposes (H.R. 2249)	H.Rept. 105-238, Pt. 1
Sept. 3, 1997	Computer Security Enhancement Act of 1997 (H.R. 1903)	H.Rept. 105-243
Sept. 23, 1997	Small Business Technology Transfer Program Reauthorization (H.R. 2429)	H.Rept. 105-259, Pt. 1
Oct. 24, 1997	Commercial Space Act of 1997 (H.R. 1702)	H.Rept. 105-347
Apr. 29, 1998	Surface Transportation Research and Development Act of 1997 (H.R. 860)	H.Rept. 105-503, Pt. 1
Jun. 3, 1998	Commission on the Advancement of Women in Science, Engineering, and Technology Development Act (H.R. 3007)	H.Rept. 105-562, Pt. 1
Jun. 9, 1998	Fastener Quality Act Amendments (H.R. 3824)	H.Rept. 105-574, Pt. 1
Jul. 14, 1998	Technology Transfer Commercialization Act of 1998 (H.R. 2544)	H.Rept. 105-620, Pt. 1
Jun. 1997	The Science Behind The U.S. EPA's Proposed Revisions To The Primary National Ambient Air Quality Standards For Ozone And Particulate Matter: Hearing Summaries, Findings, and Recommendations (Report prepared by Chairman Ken Calvert and Ranking Minority Member Tim Roemer of the Subcommittee on Energy and Environment and transmitted to the Committee on Science.)	A.
Sept. 1998	Unlocking Our Future Toward A New National Science Policy (A Report To Congress By The House Committee on Science)	B.