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Management of Sleep and Fatigue in Military Aviation

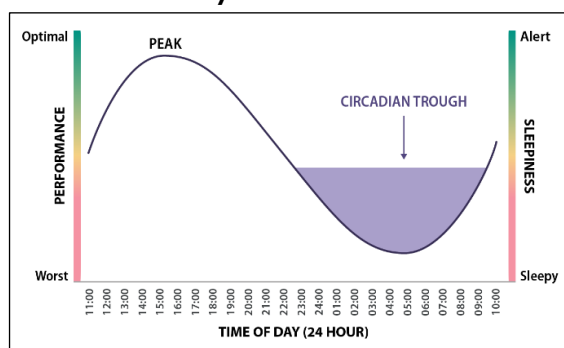
Over the past decade, Congress has expressed interest in the effects of sleep deprivation on servicemember health and military readiness, as well as its impact on military aviation safety. Aviators in all military services of the Department of Defense (DOD) with high operational, psychological, and physiological demands may experience sleep deprivation and fatigue. To counter potential effects of sleep deprivation and fatigue, the military services use mitigation strategies (i.e., non-pharmacological and pharmacological measures) to enhance aviator safety and prevent aviation mishaps. This In Focus provides an overview of those mitigation strategies and offers issues for congressional consideration.

Background

The U.S. Centers for Disease Control and Prevention estimates that nearly one in three adults do not get enough sleep, nor meet the Healthy People 2030 (HP2030) criteria for sufficient sleep (i.e., at least seven hours of sleep per day). In comparison, the most recently available data from the 2018 DOD Health Related Behaviors Survey estimated 64.3% of active duty servicemembers did not meet HP2030 criteria. In 2021, DOD reported that 14% of active duty servicemembers were “diagnosed with at least one sleep disorder.” Research indicates a variety of detrimental health effects arise from sleep deprivation and fatigue.

Sleep deprivation and fatigue are two distinct physiological states. The National Institutes of Health define *sleep deprivation* as a condition that occurs when someone “[does not] get enough sleep.” Sleep deprivation is a contributor to fatigue. The National Library of Medicine defines *fatigue* as a “feeling of weariness, tiredness or lack of energy.” Sleep deprivation and fatigue can be most apparent when an individual is awake counter to their circadian rhythm (i.e., during the *circadian trough* of alertness), typically during the early morning hours (see **Figure 1**).

Figure 1. Relative Level of Alertness and Wakefulness Based on Time of Day



Source: CRS graphic adapted from Shappell, et al., *Crew Rest and Duty Restrictions for Commercial Space Flight*, 2007.

Military aviators may experience sleep deprivation and fatigue due to a variety of factors, including inhospitable sleep environments, operational demands, unpredictable schedules, long-duty days or flight durations, challenging flight conditions, and circadian-rhythm disruption due to crossing multiple time zones, known as *chronodisruption*. In a March 2021 report to Congress, DOD stated sleep deprivation has “significant effects on the physical, cognitive, and emotional functioning needed for readiness, occupational, and operational mission fulfillment.” The report also stated, “[r]isk of accident in training, operational, and combat environments significantly increases if Service members are sleep deprived.”

Fatigue Management in Military Aviation

DOD Instruction 1010.10 directs department leaders to “[h]elp prevent and mitigate the effects of sleep deprivation among Service members.” Each military service is responsible for implementing its own policies and procedures to mitigate aviator fatigue and sleep deprivation. The military services use varied approaches to mitigate aviator fatigue, including (1) administrative and behavioral (i.e., non-pharmacological) measures, and (2) the voluntary use of pharmacological measures. Regulations for each service emphasize non-pharmacological measures as the primary means of mitigating fatigue.

Administrative and Behavioral Measures

Administrative and behavioral measures vary by service and airframe, but all military services limit the length of an aviator’s duty day, total flight hours over a given period, and standards for rest and time available for sleep. The services also educate aviators on the impact of sleep loss and the benefits of consistent sleep.

Pharmacological Measures

Historical Use of Pharmacological Measures. The U.S. military historically has approved pharmacological measures for aviators in certain mission contexts. For example, since at least the Vietnam War, the Air Force and Navy have authorized the use of pharmacological measures for select missions and aircrew during combat operations. The operational need for these measures and comparative effectiveness with non-pharmacological measures have been the subject of debate in modern warfare.

Current Use. Sustained high-operations tempo over the past several decades, among other factors, has generated persistent demand for the use of pharmacological measures. The military services authorize aviation medicine specialists (i.e., flight surgeons) to prescribe U.S. Food and Drug Administration (FDA)-approved pharmacological agents as a fatigue management measure when administrative and behavioral measures are known or expected to be insufficient.

CRS has not identified any DOD-wide policy that standardizes the situations or conditions for use of pharmacological measures. Each military service sets its own policies for which aviators may use pharmacological measures and under which conditions. The services are all similar in limiting pharmacological measures to specific operational circumstances, establishing a process by which authorization for use is conducted (e.g., in both medical and command channels), limiting the amounts prescribed and duration of use, and monitoring use by flight surgeons. In all services, use of pharmacological measures by aviators is voluntary. **Table 1** lists selected pharmacological agents that certain military services may use for fatigue management among aviators and aircrews.

Table 1. Selected Pharmacological Agents Authorized for Fatigue Management in the U.S. Military

Drug Category	Drug Name (Trade Name)	Military Services
Stimulant	Dextroamphetamine (Dexedrine, Geldex, Procentra)	All
Stimulant	Modafinil (Provigil)	Air Force
Sedative-Hypnotic	Temazepam (Restoril)	All
Sedative-Hypnotic	Zaleplon (Sonata)	Air Force, Army
Sedative-Hypnotic	Zolpidem (Ambien)	All

Source: CRS graphic based on analysis of DOD's "Study on Effects of Sleep Deprivation on Readiness of Members of the Armed Forces," February 2021; and DOD policies on pharmacological measures for fatigue management.

Stimulants. A flight surgeon may prescribe stimulants, commonly called *go-pills*, when authorized by a unit commander to counter aviator fatigue and improve alertness and performance. The military services' policies differ by authorizing which aviators may receive stimulants, but generally stipulate the parameters in which flight surgeons may issue limited quantities, monitor aviators, and collect unused medications. Selected aviators may be prescribed dextroamphetamine. The FDA classifies this stimulant as having a "high potential for abuse and misuse, which can lead to the development of a substance use disorder, including addiction." Air Force policy also allows the use of the non-amphetamine-based stimulant, modafinil. The FDA stipulates that the effects of modafinil "may lead to abuse or dependence."

Sedative-hypnotics. A flight surgeon may prescribe for limited periods sedative-hypnotics, commonly called *no-go pills*, when authorized by a unit commander to aid in sleep initiation when an operational need exists. Situations might include inhospitable sleep settings, the need to shift sleep schedules, or crossing multiple time zones. In a 2021 report to Congress, DOD cautioned sedative-hypnotics have a "wide range of side effects" that can impact readiness. Side

effects can include drowsiness, disinhibition, impaired cognition, learning deficits, and increased risk of vehicle accidents. To mitigate some effects, regulations prohibit aviators from flying for specific periods of time after ingesting, based on drug type. Flight surgeons must monitor aviators' use of the drugs and level of fatigue.

Federal Aviation Administration (FAA) Management of Fatigue

Similar to the services' non-pharmacological measures, FAA regulations stipulate a variety of fatigue mitigation regulations for pilots conducting commercial flights. Some measures include maximum duty time, rest requirements, and number of consecutive nights of flying. FAA regulations do not permit the use of stimulants. However, FAA-certified medical examiners may authorize the use of sedative-hypnotics (including some not authorized by DOD) and melatonin supplements for occasional or limited use by civilian pilots.

Questions for Aviation Oversight

The following lines of inquiry may assist Congress in considering military aviation safety and support congressional oversight of DOD programs and initiatives to prevent sleep deprivation and fatigue.

Impacts to Military Operations and Readiness

- What lessons-learned from non-pharmacological or pharmacological measures in aviation can be applied to other military occupations (e.g., naval vessel crew, medical personnel, special operations)?
- How do authorized pharmacological measures affect the risk for substance use or abuse among aviators?
- What opportunities do human performance optimization efforts (e.g., biotechnologies, biometrics) offer to manage sleep and fatigue among aviators?
- To what extent do fatigue and sleep deprivation considerations affect force structure requirements and operational tempo for low density aviation subcommunities (e.g., long-range/endurance aviators)?

Effectiveness of Fatigue Management Strategies

- What scientific consensus exists regarding the effectiveness of current methods to prevent or mitigate fatigue and sleep deprivation in DOD aviators?
- What DOD efforts are in progress to identify novel or emerging fatigue management strategies?
- How, if at all, could military aviation safety be improved by a DOD-wide policy on aviation fatigue management strategies?
- Since at least 2018, the U.S. Government Accountability Office (GAO) has assessed various DOD efforts to address sleep and fatigue in the military. In a 2024 report, GAO issued nine recommendations to address DOD "oversight structure limitations" and "fragmented fatigue-related research" efforts. Does DOD intend to implement these recommendations? If so, which policies would be updated to reflect these recommendations and what is the timeline for changes?

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