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The Army's Robotic Combat Vehicle (RCV) Program

Background

The RCV is being developed as part of the Army's Next Generation Combat Vehicle (NGCV) family of vehicles. As originally planned, the Army intended to develop three RCV variants: Light, Medium, and Heavy. The Army reportedly envisioned employing RCVs as "scouts" and "escorts" for manned fighting vehicles to deter ambushes and to guard the flanks of mechanized formations. RCVs are intended to be controlled by operators riding in NGCVs, but the Army hopes that improved ground navigation technology and artificial intelligence (AI) might eventually permit a single operator to control multiple RCVs or for RCVs to operate in a more autonomous mode.

Original Three RCV Variants

According to the *Army's Robotic Combat Vehicle Campaign Plan, January 16, 2019*, obtained by CRS, the Army planned to develop three RCV variants.

RCV Light (RCV-L)

The RCV-L was to weigh no more than 10 tons, with dimensions (length, width, height) of no more than 224 x 88 x 94 inches. In terms of transportability, a single RCV-L would be transported by rotary wing aircraft. The RCV-L would also have limited on-board lethality such as self-defense systems, anti-tank guided missiles (ATGMs), or recoilless weapons. The RCV-L was considered an expendable weapon system, meaning its destruction in combat is expected and acceptable.

RCV Medium (RCV-M)

The RCV-M was to weigh between 10 and 20 tons, with dimensions (length, width, height) of no more than 230 x 107 x 94 inches. In terms of transportability, a single RCV-M was to be transported by a C-130 transport aircraft. The RCV-M was to have increased onboard lethality to defeat light- to medium-armored threats. The RCV-M was considered "durable" by the Army, meaning the Army would like the RCV-M to be more survivable than the RCV-L.

RCV Heavy (RCV-H)

The RCV-H was to weigh between 20 and 30 tons, with dimensions (length, width, height) of no more than 350 x 144 x 142 inches. In terms of transportability, two RCV-Hs would be transported by a C-17 transport aircraft. The RCV-H was to have on-board direct fire weapon systems capable of defeating all known enemy armored vehicles. The RCV-H was considered a nonexpendable weapon system, meaning that it should be as survivable as a crewed system.

RCV Program Status

According to an August 2020 Government Accountability Office (GAO) report

The Robotic Combat Vehicle (RCV) effort is currently employing other transaction agreements (OTA) to conduct experiments to determine the availability and maturity of technologies and the validity of operating concepts. The outcome of these experiments will be used to determine whether an acquisition program is feasible, with plans for three vehicle variants—a light, a medium, and a heavy variant. As RCV is not yet a program of record, no acquisition approach has been selected.

On January 10, 2020, the Army announced it would award an Other Transaction Agreement (OTA) to QinetiQ North America (Virginia—main headquarters is in the United Kingdom) to build four RCV-Ls and Textron (Rhode Island) to build four RCV-Ms.

Other Transaction Authority or Agreement (OTA)

refers to the authority (10 U.S.C. §2371b) of the Department of Defense (DOD) to carry out certain prototypes, research, and production projects. Other Transaction (OT) authorities were created to give DOD the flexibility necessary to adopt and incorporate business practices that reflect commercial industry standards and best practices into its award instruments. As of the 2016 National Defense Authorization Act (NDAA; P.L. 114-92) Section 845, the DOD currently has permanent authority to award OT under 10 U.S.C. §2371, for research, prototype, and production purposes.

Army Decides to Focus Efforts on RCV-L

Reportedly, in August 2023, the Assistant Secretary of the Army for Acquisitions, Logistics, and Technology (ASA [ALT]) stated

The Army is still broadly, of course, interested in robots of many different sizes. But we're focusing on RCV-L because we think that's a necessary first step before going to larger platforms.

The ASA (ALT) reportedly noted the Army had plans to "defer RCV-M for the time being."

RCV Program Transitions

According to FY2025 Army budget documents submitted in March 2024

The Robotic Combat Vehicle (RCV) has transitioned from a family of light, medium, and heavy variants to a single vehicle approach with a common chassis. The Army has decided to field a common platform that will pair elements of the previous RCV medium concept with the RCV common chassis. The development programs, which include a RCV Middle-Tier Acquisition

Rapid Prototyping (MTA-RP) and a RCV Software Acquisition Pathway (SWP) program, will produce unmanned ground combat vehicle prototypes.

Ongoing RCV Testing and Timeline

Reportedly, the Army planned to receive prototypes during the late summer of 2024 from the four teams competing to build the RCV: McQ, Textron Systems, General Dynamics Land Systems, and Oshkosh Defense. The Army then planned to initiate a competition and “pick the best of breed” for eventual production. The Army intends to field to the first unit in FY2028 following a production decision scheduled for FY2027.

During the summer of 2024, the Army reportedly planned to conduct two training rotations at the National Training Center (NTC) with on-hand RCV prototypes. Reportedly in June 2024, the Army conducted an “off-road autonomy software assessment,” with one official noting

The good news is we are moving forward in that area. The bad news is industry is nowhere near where people think in terms of off-road autonomy. There's still a lot of development to do.

Reportedly, the Army planned to conduct another evaluation in December 2024 “to continue software development.” In terms of the developmental timeline, the Army reportedly plans to

[d]own-select in about the March [2025] timeframe from the four vendors to one and that'll give us the base platform. The chosen vendor will deliver eight prototypes for the next phase. Then once we have that, that vendor will actually do another prototype spin.... We've tiered the requirements so they're going to add some new requirements when they go into the second prototypes.

Industry Concerns with RCV Development and Acquisition Approach

Reportedly, some in industry are raising “red flags” over RCV development and the Army's acquisition approach. They contend the Army is “trying to cobble together its own robot piece by piece, without a clear competition strategy for the payloads or key communications and network equipment—essential components to make an unmanned vehicle work.” Another concern is the Army is too “wedded” to an internally developed autonomy package called the Robotic Technology Kernel (RTK), which has experienced developmental difficulties. Reportedly

Service officials said they are hearing some of those program structure complaints from industry too. And even the most optimistic service leaders caution that RTK isn't where it needs to be yet, and concede that soldiers will only be able to use those early robots in limited types of missions. But they also counter that the only way to get the program to work is by putting it out in the field and seeing how things go.

Another reported industry concern is “that the Army's plans to acquire all those additional critical parts are in various

stages, and there is a lack of communication from the Army about how they will all line up.” It was further noted that industry is “unclear how the government plans to competitively down select many of the other subcomponents and once it does, will it internally integrate those onto the platforms or pick a prime integrator.” The Army has reportedly acknowledged developmental challenges and that it is “spreading our risks with RCV by not going with a single end-to-end solution, which could wed them to a system that ends up the wrong fit down the road.”

Related Congressional Concern

Congress has also expressed concern with the Army's RCV acquisition approach. In the Senate Armed Services Committee Report for the National Defense Authorization Act for Fiscal Year 2025, it noted, on page 84,

Despite this, the committee is concerned that the U.S. Army continues to fund the Robotic Technology Kernel, now known as Autonomous Robotic Control System, to support government autonomy software development while Program Executive Offices have turned to mid-tier acquisition to secure and deliver capability. The committee believes the U.S. Army should reexamine its funding decisions and consider further engagement with providers in the ground autonomy industrial base.

Considerations for Congress

Oversight considerations for Congress could include the following:

- Given industry and congressional concern over RCV development and acquisition, is a more detailed examination of the RCV program warranted? Will the Army's current approach, particularly concerning RTK, prove detrimental to industry participation in the overall program?
- What are the autonomous ground navigation and artificial intelligence (AI) challenges affecting RCV development? How confident is the Army that these challenges can be overcome in the next 5 to 10 years?
- A number of reports have suggested that RCV off-road autonomy is problematic, with one Army official reportedly noting that the current technology is “not that great,” requiring “a lot of intervention where the soldier has to step in” to control the RCV. Is this a common characteristic of all current RCV prototypes? If so, why is the Army planning to down select to a single vendor in March 2025 when there appears to be significant unsolved challenges in autonomous ground navigation, particularly off-road?
- Are there lessons learned about RCV use by Russia and Ukraine in the ongoing conflict that are being factored into current and future Army RCV development?

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