Testimony

Before the Subcommittee on Tactical Air and Land Forces, Committee on Armed Services, House of Representatives

ARMY MODERNIZATION

Army Should Take Steps to Reduce Risk

Accessible Version

Statement of Jon Ludwigson, Acting Director, Contracting and National Security Acquisitions

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ARMY MODERNIZATION

Army Should Take Steps to Reduce Risk

Why GAO Did This Study

The Army is investing in near- and long-term modernization efforts to maintain its technological edge over potential adversaries. It is doing this by upgrading and updating current weapon systems, developing new capabilities, and reshaping its doctrine, force structure, training, and leader development.

This testimony is based on prior GAO work conducted 2016 through 2019 and addresses the Army's progress in: (1) establishing Army Futures Command, and (2) developing its near-term and long-term modernization strategies. It also highlights several actions recommended in prior reports related to Army modernization.

To conduct this work, GAO assessed the Army's near- and long-term modernization efforts, application of leading practices to those efforts, budget documents, and the effectiveness of the process for developing requirements for major weapon systems. This statement includes updates to this information, as of April 2019.

What GAO Recommends

Over the past 2 years, GAO has made recommendations related to this body of work. Department of Defense and Army concurred with all the recommendations and are working to implement them.

View GAO-19-502T. For more information, contact Jon Ludwigson at (202) 512-4841 or ludwigsonj@gao.gov.

What GAO Found

In January 2019, GAO reported on initial steps the Army has taken to consolidate its modernization efforts under one authority—Army Futures Command. Army officials call it their most significant institutional change since 1973, when the Army was reorganized after the Vietnam War. As a precursor to this new command, the Army established eight cross-functional teams as a pilot program to increase the efficiency of requirements and technology development in six key modernization areas. These areas are described in the table below.

Description of Army's Six Prioritized Capability Needs	
Army priority	**Description of priority**
Long-Range Precision Fires	Capabilities, including munitions that restore Army dominance in range, lethality, and target acquisition.
Next Generation Combat Vehicle	Manned and unmanned combat vehicles with modern firepower, protection, mobility, and power generation.
Future Vertical Lift	Manned and unmanned platforms capable of attack, lift, and reconnaissance missions on modern and future battlefields.
Army Network	A mobile system of hardware, software, and infrastructure that can be used to fight cohesively in any environment where the electromagnetic spectrum is denied or degraded.
Air and Missile Defense	Capabilities that ensure future combat formations are protected from modern and advanced air and missile threats.
Soldier Lethality	Capabilities, equipment, and training for all fundamentals of combat—shooting, moving, communicating, protecting, and sustaining. This includes an expansion of simulated training.

Source: GAO review of Army documentation. I GAO-19-502T

Since announcing the modernization efforts in 2017, the Army has directed more funding toward closing near-term capability gaps. For example, as part of the planning for the fiscal year 2019 budget process, the Army identified 67 high-priority programs that require a $16 billion investment between now and fiscal year 2023. In addition to the near-term capabilities the Army is pursuing, it has identified a number of long-term needs—those focused after fiscal year 2024—and taken steps to realign research and development efforts and funding with those needs.

Over the past 2 years, GAO highlighted several steps Army should take to improve its modernization efforts, including:

- Apply leading practices to Army Futures Command's cross-functional teams, and capture their lessons learned.
- Assess the resources, particularly personnel, necessary to support its requirements development process.
- Increase the transparency of its efforts by clarifying how it evaluates whether its modernization efforts are achieving the Army's goals and clearly stating the full costs of pursuing those goals.
- Reduce risk by ensuring technologies are fully mature—such as demonstrating technologies in an operational environment before starting a formal acquisition program.

By implementing these recommendations, Army Futures Command could better ensure its ability to deliver enhanced capabilities to the warfighter and decrease the risk of cost and schedule growth.

United States Government Accountability Office

Chairman Norcross, Ranking Member Hartzler, and Members of the Subcommittee:

Thank you for the opportunity to be here today to discuss our recent work on the Army's efforts to upgrade or replace its capabilities—a process generally referred to as modernization. The Army has determined that it must undertake this modernization in order to maintain its edge over potential adversaries, or risk falling behind. Over the past 2 years, our reports have highlighted some aspects of modernization including where the Army has taken some positive steps and where we have identified opportunities for improvement.[1]

According the Army Strategy of 2018, the Army's modernization efforts fall within broader efforts to maintain the ability to deter or defeat potential adversaries. Simultaneous with modernization of its weapon systems, the Army has begun an effort to reshape its warfighting concepts for engaging with potential adversaries across all domains; including land, air, sea, space, and cyberspace. These new operational concepts will shape not only the Army's equipment modernization priorities, but also its doctrine, force structure, training, and leader development.

This statement will address the Army's progress in: (1) establishing Army Futures Command, and (2) developing its near-term and long-term modernization strategies. In addition, it will highlight several key actions that we recommended in our prior reports related to Army modernization.

This statement is based on prior work in three GAO reports. The prior work that we drew from, among other things, assessed the Army's near- and long-term modernization efforts, application of leading practices to those efforts, budget documents, and the effectiveness of process for developing requirements for the major weapon systems. The statement

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[1]GAO, *Army Modernization: Steps Needed to Ensure Army Futures Command Fully Applies Leading Practices*, GAO-19-132 (Washington, D.C.: Jan. 23, 2019); *Army Modernization: Actions Needed to Measure Progress and to Fully Identify Near-Term Costs*, GAO-18-604SU (Washington, D.C.: Sept. 28, 2018); *Army Weapon System Requirements: Need to Address Workforce Shortfalls to Make Necessary Improvements*, GAO-17-568 (Washington, D.C.: June 22, 2017). GAO-18-604SU is a For Official Use Only document, but we use only information that is not labelled For Official Use Only.

also includes updates to information as of April 2019 as appropriate, based on Army documentation. The reports cited throughout this statement contain more details on the scope of the work and the methodology used to carry it out.

We conducted the body of work on which this testimony is based from March 2016 to January 2019 in accordance with generally accepted government auditing standards.[2] Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

The Army Can Take Steps to Improve the Way Army Futures Command Operates

Army Futures Command Established to Lead Modernization Efforts

In January 2019, we reported on the initial steps the Army has taken to consolidate all its modernization efforts under one authority.[3] Establishing Army Futures Command is reported to be the most significant institutional change to the Army since it reorganized in 1973 after the Vietnam War. According to Army documentation, the intent of the new command is to provide unity of command, accountability, and modernization at the speed and scale required to prevail in future conflicts. The organization is led by a four-star general like its organizational peers: Army Materiel Command, Training and Doctrine Command, and Forces Command. The Army declared the commencement of operations for the command in July 2018, and has begun to define its organizational structures. Army Futures Command is expected to be fully operational by July 2019, meaning it will have sufficient staff with operational facilities, secure funding, and the ability to execute its assigned mission, roles, and responsibilities.

Army Futures Command is headquartered in Austin, Texas. According to Army officials and documentation, the Army chose Austin because of its

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[2]GAO-19-132, GAO-18-604SU, and GAO-17-568.

[3]GAO-19-132

proximity to science, technology, engineering, and mathematics talent, as well as private sector innovators that officials believe will assist the command in achieving its modernization goals. According to senior Army leadership, the new command headquarters will have around 300 staff in place by July 2019, a workforce that may grow to as many as 500 employees—100 military and 400 civilians. Our analysis of Army's plans for initial staffing at the Army Futures Command headquarters, based on data from July 1, 2018, found that about one-third of headquarters staff would be involved directly in modernization efforts, such as engineers and operations specialists, and the remaining two-thirds would consist of support staff, including legal counsel and contracting professionals.

According to Army Futures Command officials and documentation, the new organization will be organized around three major components:

- **Futures and Concepts Center** is responsible for identifying and prioritizing capability and development needs and opportunities. This organization subsumed the Army Capabilities Integration Center on December 7, 2018. The center was formerly part of Army Training and Doctrine Command and is located at Fort Eustis, Virginia.

- **Combat Capabilities Development Command** is responsible for conceptualizing and developing solutions for identified needs and opportunities. This organization subsumed the Research, Development and Engineering Command on February 3, 2019 and is located at Aberdeen Proving Ground, Maryland.

- **Combat Systems Directorate** is responsible for refining, engineering, and producing new capabilities. This directorate will communicate with the program executive offices and program management offices reporting to the Assistant Secretary of the Army for Acquisition, Logistics and Technology. Combat Systems Directorate is in the process of being established and is located in Austin, Texas.

Among other things, the reorganization is intended to establish Army Futures Command to oversee development of Army's six modernization priorities. The Army's then-Acting Secretary and the Chief of Staff in an October 3, 2017 memorandum identified these priorities to guide Army modernization:

- long-range precision fires,

- next generation combat vehicle,

- future vertical lift,

- network,
- air and missile defense, and
- soldier lethality.

Army Established Cross-Functional Teams to Improve How it Develops Capabilities

As we reported in January 2019, to pursue the six priority areas, the Army established eight cross-functional teams.[4] These teams were initially created as a pilot effort to increase the efficiency of requirements and technology development for modernization before the announcement of the new command. They were subsequently moved into Army Futures Command in 2018. These cross-functional teams are located throughout the country in areas of relevance to their mission. The eight cross-functional teams and the priority areas they address are outlined in table 1.

Table 1: Army Modernization Priorities and Assigned Cross-Functional Teams

Army priority	Description of priority	Cross-functional team location
Long-Range Precision Fires	Capabilities, including munitions that restore Army dominance in range, lethality, and target acquisition.	Long-Range Precision Fires – Fort Sill, Okla.
Next Generation Combat Vehicle	Manned and unmanned combat vehicles with modern firepower, protection, mobility, and power generation.	Next Generation Combat Vehicle - Detroit Arsenal, Mich.
Future Vertical Lift	Manned and unmanned platforms capable of attack, lift, and reconnaissance missions on modern and future battlefields.	Future Vertical Lift – Redstone Arsenal, Ala.
Army Network	A mobile system of hardware, software, and infrastructure that can be used to fight cohesively in any environment where the electromagnetic spectrum is denied or degraded.	Network Command, Control, Communication, and Intelligence – Aberdeen Proving Ground, Md.
Army Network	A mobile system of hardware, software, and infrastructure that can be used to fight cohesively in any environment where the electromagnetic spectrum is denied or degraded.	Assured Positioning, Navigation, and Timing – Redstone Arsenal, Ala.
Air and Missile Defense	Capabilities that ensure future combat formations are protected from modern and advanced air and missile threats.	Air and Missile Defense – Fort Sill, Okla.

[4]GAO-19-132

Soldier Lethality	Capabilities, equipment, and training for all fundamentals of combat—shooting, moving, communicating, protecting, and sustaining. This includes an expansion of simulated training.	Soldier Lethality – Fort Benning, Ga.
Soldier Lethality	Capabilities, equipment, and training for all fundamentals of combat—shooting, moving, communicating, protecting, and sustaining. This includes an expansion of simulated training.	Synthetic Training Environment – Orlando, Fla.

Source: GAO review of Army documentation. | GAO-19-502T

Note: Two of the modernization priorities—Army Network and Soldier Lethality—were subdivided into two cross-functional teams while the other four priorities each were assigned one cross-functional team.

These cross-functional teams are intended to:

- take steps toward achieving the six modernization priorities;

- leverage expertise from industry and academia;

- identify ways to use experimentation, prototyping, and demonstrations; and

- identify opportunities to improve the efficiency of requirements development and the overall defense systems acquisition process.

The cross-functional team pilots were structured to help achieve these goals. Each cross-functional team consists of core staff and subject matter experts from across the Army. To facilitate the rapid approval of requirements, each cross-functional team is led by a general officer or a senior civilian official who could communicate directly with the highest levels of the Army. The goal of staffing these teams is to ensure that each team had individuals who specialized in acquisition, requirements, science and technology, test and evaluation, resourcing, contracting, cost analysis, sustainment, and military operations. The goal of bringing different experts together is to facilitate collaboration and immediate opportunities for stakeholders to provide input as opposed to the more traditional requirements development process, in which input has typically been provided separately. Officials told us that, while all of these subject matter experts may have provided input on the requirements development process in the past, placing them on a single team offers the promise of streamlining those efforts and could eliminate the need for multiple reviews. Figure 1 below compares the requirements development process under cross-functional teams to how the Army has traditionally developed requirements.

Figure 1: Comparison of Cross-Functional Teams and Traditional Requirements Development Processes
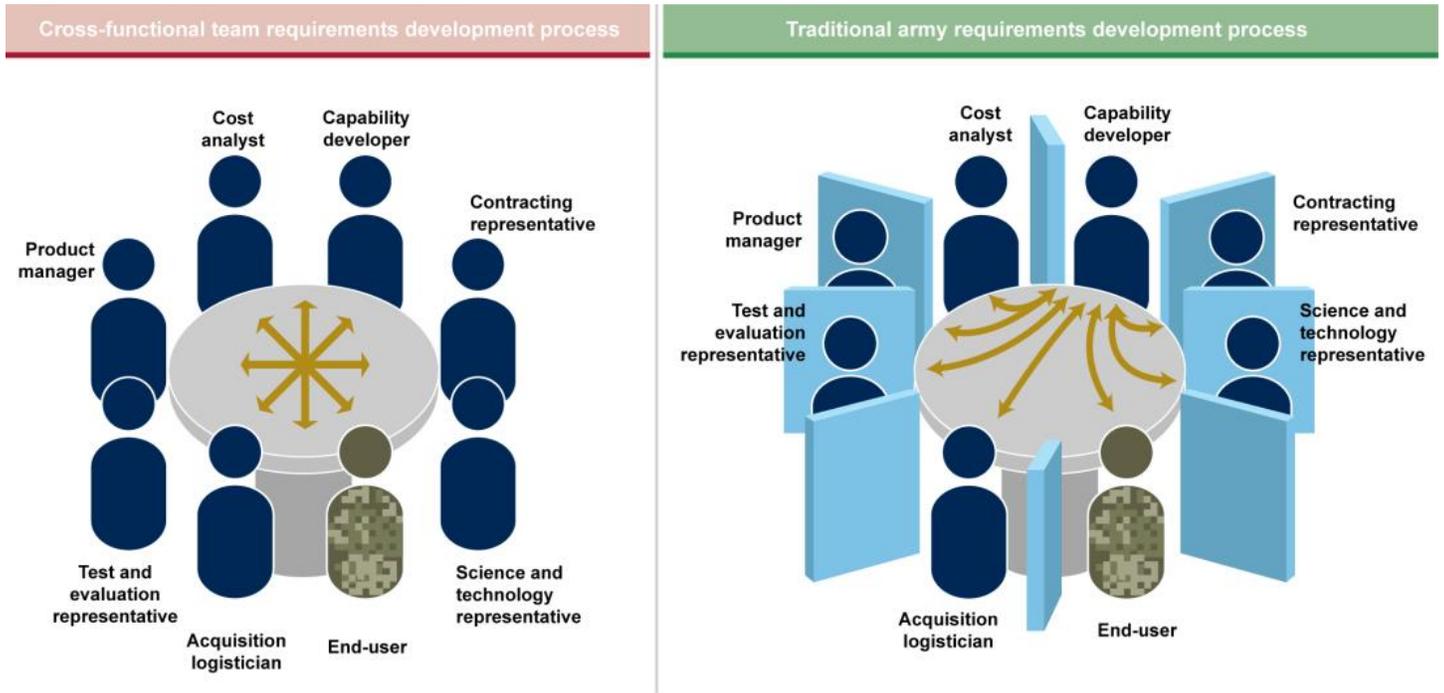
Source: GAO interpretation of Army information. | GAO-19-502T

Further Implementation of Leading Practices Could Reduce Risk for Army Futures Command

In January 2019, we recommended that Army Futures Command incorporate leading practices for effective cross-functional teams. We determined that the documentation that established the cross-functional team pilots fully addressed four of our eight leading practices for effective teams, and at least partially addressed another four. The leading practices and their implementation by the cross-function teams are described in table 2 below.

Table 2: Implementation of Leading Practices for Establishing Effective Cross-Functional Teams

Leading practice	Description	Cross-functional team implementation
Open and regular communication	Efficient cross-functional teams have effective communication mechanisms.	Fully applied

Leading practice	Description	Cross-functional team implementation
Well-defined team goals	Effective cross-functional teams have clear, updated, and well-defined goals common to the team, team leader, and management.	Fully applied
Inclusive team environment	Effective cross-functional teams invest in a supportive and inclusive team environment where all team members have collective responsibility and individual accountability for the team's work.	Partially applied
Well-defined team structure	Effective cross-functional teams have well-defined team operations with project-specific rules and procedures established for each team.	Partially applied
Autonomy	Effective cross-functional teams are independent and have the ability to make decisions independently and rapidly.	Fully applied
Senior management support	Effective cross-functional teams have senior managers who view the teams as a priority within the organization and provide these teams with resources and rewards to recognize their work.	Partially applied
Committed cross-functional team members	Effective cross-functional teams have members committed to the team's goals.	Fully applied
Empowered cross-functional team leader	The selected cross-functional team leader should provide clear guidance for team members, be proactive and empowered to make decisions, and provide feedback and developmental opportunities to team members.	Partially applied

Source: GAO | GAO-19-502T

In addition to the practices listed above, the cross-functional team pilots generally applied leading practices for requirements development. One leading practice the teams generally applied was promoting communication between requirements developers, warfighters, and industry representatives. This enables the cross-functional teams to better match developer resources with end-user needs.

While applying this practice, the cross-functional team pilots had initial progress in writing requirements documents more efficiently. According to cross-functional team officials, they were able to shorten the requirements development process for several capabilities.

However, we found that Army Futures Command does not have a formal plan to identify and share lessons learned from cross-functional team pilots to incorporate or expand application of these leading practices. Doing so would allow Army Futures Command the opportunity to accelerate the progress these teams made and spread the benefits across all of the teams and a wider range of specific military capabilities they are pursuing. We recommended that the Army (1) incorporate cross-functional teams' experiences in applying leading practices and (2)

execute a process for identifying and incorporating lessons learned. The Department of Defense concurred with these recommendations, and stated that Army Futures Command expects to apply leading practices and capture lessons learned by the end of 2019.

Our January 2019 report also identified leading practices for mergers and organizational transformations. These leading practices are listed in table 3 below.

Table 3: Leading Practices for Mergers and Organizational Transformations

Leading practice
Ensure top leadership drives the transformation.
Establish a coherent mission and integrated strategic goals to guide the transformation.
Focus on a key set of principles and priorities at the outset of the transformation.
Set implementation goals and a timeline to build momentum and show progress from day one.
Dedicate an implementation team to manage the transformation process.
Use the performance management system to define responsibility and assure accountability for change.
Establish a communication strategy to create shared expectations and report related progress.
Involve employees to obtain their ideas and gain their ownership for the transformation.
Build a world-class organization.

Source: GAO | GAO-19-502T

We found that the Army Futures Command had implemented some of these practices, particularly leadership's dedication to the new command and the clear statement of its mission. However, we have previously reported that, according to federal internal controls standards, it is important to implement all of these practices in order to establish the organizational structure necessary to enable an entity to plan, execute, control, and assess the organization in achieving its objectives. Establishment of this structure is particularly important for the Army where leadership and its priorities can change frequently. Therefore, we recommended in January 2019 that Army Futures Command fully apply these leading practices. The Department of Defense concurred with the recommendation, and stated that it would start pilot processes in fiscal years 2019 and 2020.

Army Futures Command Should Assess Availability of Key Acquisition Personnel Needed for Requirements Development

In addition to further implementing leading practices, Army Futures Command can reduce risk to meeting its goals by fully assessing the workforce necessary to develop requirements—the testable and measurable characteristics necessary for the design of a proposed system. Historically, the Army has been unable to ensure that requirements for new capabilities are feasible due, in part, to a declining workforce for requirements development. In June 2017, we reported that the Army had prioritized combat readiness over resourcing its requirements development process to meet future readiness needs.[5] We recommended that the Army assess the resources, particularly personnel, necessary for requirements development. The Army concurred with the recommendation, and has stated it would implement this recommendation once Army Futures Command is fully operational. As Army Futures Command centralizes and takes responsibility for requirements development, this recommendation is even more pertinent. Therefore, we recently elevated the status of the recommendation to a priority recommendation for the Secretary of the Army, as we believe it warrants greater attention from the Department of the Army.[6]

Army Futures Command Has Not Developed Formal Policies and Procedures for Coordination with Other Army Acquisition Entities

As Army Futures Command approaches full operating status, it is important to define not only how the command functions, but how it works with other organizations. In our January 2019 report, we found that Army Futures Command had not yet established policies and procedures detailing how it will execute its responsibilities in coordination with other Army organizations that do not directly report to it. One such organization is the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology—the civilian authority responsible for the overall supervision of Army acquisition matters—and the acquisition

[5]GAO-17-568

[6]GAO, *Priority Open Recommendations: Department of Defense*, GAO-19-366SP (Washington, D.C.: March 28, 2019).

offices it oversees. To mitigate concerns about coordination, the Army issued a directive in August 2018, signed by the Secretary of the Army, designating the military deputy to the Assistant Secretary as an advisor to Army Futures Command, and Army Futures Command officials have stated that the Assistant Secretary will retain full acquisition authorities as required by law. The command expects to continue to refine its coordination with the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology.

The Army Is Funding Modernization Priorities, but Further Steps Can be Taken to Manage Risk

Army Modernization Has Prioritized Near-Term Capability Gaps while Identifying and Beginning to Fund Long-Term Needs

Since announcing the modernization efforts in 2017, the Army has directed more funding toward closing near-term capability gaps, focused on fiscal years 2019 through 2023. For example, as part of the planning for the fiscal year 2019 budget process, the Army identified 67 high-priority programs, such as the M-1 Abrams tank and the AH-64 Apache helicopter, which require further investment. To support these priorities, the Army identified a need for $16 billion in increased funding in fiscal years 2019 through 2023. The 2018 Army Modernization Strategy report identified the need for additional resources for near-term efforts, including plans to spend billions of dollars for acquisition of maneuverable short range air defense capabilities in fiscal years 2020 through 2024.

In addition to the near-term capabilities the Army is pursuing, it has identified a number of long-term needs—those focused after fiscal year 2024—and begun to align research and development efforts with these needs. The Army identified long-term capabilities for all of the modernization priorities, as well as dates that science and technology efforts should transition to programs of record. As part of this overall effort, the Army has evaluated its science and technology portfolio to realign funding toward its six modernization priorities.

In an October 2017 Army review, the eight cross-functional teams examined science and technology investments to identify which efforts

contributed to the priorities and which did not. The review was performed for the Office of the Deputy Under Secretary of the Army. Based on that work, as of our January 2019 report, the Army had taken steps to realign over $1 billion from previous priorities and toward the new priorities for fiscal years 2019 through 2023. Army officials stated that they expect to undertake similar reviews annually.

Tracking Near-Term Modernization Efforts and Costs Could Address Management Challenges

The Army is executing near-term modernization programs, but could better manage how it evaluates them and estimate their costs. In September 2018, we reported that the Army used its six priority capabilities to identify key mission areas—such as long-range artillery, air and missile defense, brigade combat teams, and cyber and electronic warfare—that require near-term modernization investments.[7] Based on its assessments, the Army prioritized and proposed several near-term solutions to address its critical capability gaps. These solutions included adding personnel—and different types of personnel—to combat forces, updating existing weapon systems, and investments in research and development. However, the Army had not established processes for evaluating whether its modernization efforts allow it to deter or defeat potential adversaries during a major conflict.

We also found that the Army had not fully estimated the costs or sources of funding for its near-term modernization efforts. In particular, we found that the Army did not report in its modernization strategy the extent to which it relied on Overseas Contingency Operations appropriations. We recommended that the Army (1) develop a plan to finalize the processes for evaluating how its near-term investments contribute to the Army's ability to decisively defeat a major adversary, and (2) finalize its cost analysis of near-term investments and report those costs to Congress in its fiscal year 2020 budget request. Army officials told us in April 2019 that the Army has taken steps to implement these recommendations.

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[7]GAO-18-604SU

Addressing Past Challenges with Technology Development Could Help Address Long-Term Modernization Risks

The most recent efforts to modernize follow several past efforts. Unfortunately, the Army has a history of failed, costly weapon system procurements to replace older weapons systems. These failures are due, in part, to requirements that could not be met and the immaturity of key technologies. Many of these programs failed to provide any capability to the warfighter despite the considerable time and funding expended. Some examples of these cancelled programs are listed in table 4 below.

Table 4: Examples of Cancelled Army Modernization Programs

Name	Year cancelled	Cost of cancellation (dollars in billions)	Description	Reasons cancelled
Comanche	2004	10.1	Armed reconnaissance helicopter	Cost increases, schedule delays, performance shortfalls.
Future Combat Systems	2009	21.4	Family of light and mobile manned and unmanned vehicles	Over ambitious requirements, immaturity of key technologies, cost increases, schedule delays.
Ground Combat Vehicle	2014	1.5	Replacement for the Bradley Infantry Fighting Vehicle	Infeasible requirements.

Source: GAO review of Department of Defense documentation. I GAO-19-502T

Note: All dollars in fiscal year 2019 dollars.

Achieving Higher Levels of Technology Maturity Can Reduce Risks for Long-Term Modernization

While the Army has dedicated significant funding towards its long-term modernization priorities, other changes may also be needed. Among them, we recommended in our January 2019 report, that Army Futures Command take steps to follow our leading practices to mature technology to a sufficiently high level prior to system development, which can reduce risk.[8]

There are indications that, in some cases, the Army plans to mature technology to a sufficiently high level prior to system development. For example, officials from the Future Vertical Lift cross-functional team told

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[8]GAO-19-132

us they will complete technology demonstrations on two competitive prototypes before choosing to develop a design for the Future Attack Reconnaissance Aircraft. However, we found that the Army may continue its past practice of proceeding into system development with less mature technologies. In particular, we identified some plans to mature technologies in a relevant environment prior to authorizing the start of a new acquisition program, rather than the higher level of demonstrating them in an operational environment as recommended by our leading practices.[9] This increases risk that new capabilities will require further maturation in system development, which could raise costs and extend timelines for delivery of equipment to the warfighter.

We recommended in our January 2019 report that the Army should demonstrate technologies in an operational environment before starting a formal acquisition program. The Department of Defense concurred with the recommendation and stated that the Army Futures Command will execute a new development process that will include operational technology demonstrations. Pilot processes for this are expected to begin in 2019.

In summary, we recognize that the Army is early in its modernization efforts but could make changes now that would be helpful. Army Futures Command should implement not only the leading practices we describe as well as the lessons learned by its own cross-functional teams. The Army should also increase the transparency of its efforts by clarifying how it evaluates its progress towards modernization goals and clearly stating the full costs of pursuing those goals. Finally, the Army can reduce the risk to the long-term modernization of its capabilities by ensuring that the technologies it uses in future weapon systems are fully mature.

Chairman Norcross, Ranking Member Hartzler, and Members of the Subcommittee, this concludes my prepared statement. I would be pleased to answer any questions that you may have at this time.

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[9]While the Department of Defense has a policy, based in statute, that generally requires major defense acquisition programs to, at a minimum, demonstrate technologies in a relevant environment before system development, that policy does not preclude the cross-functional teams from pursuing a higher level of maturity.

GAO Contact and Staff Acknowledgment

If you or your staff have any questions about this testimony, please contact Jon Ludwigson, Acting Director, Contracting and National Security Acquisitions at (202) 512-4841, or ludwigsonj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony are J. Kristopher Keener (Assistant Director), Joe E. Hunter (Analyst-in-Charge), Emily Bond, Matthew T. Crosby, Cale Jones, Kevin O'Neill, John Pendleton, and Roxanna Sun.

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