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Army Modernization in the 21st Century

Michael E. Lynch

ABSTRACT: Harsh lessons from the failure of the US Army's future combat system a decade ago continue to haunt Army modernization efforts today. The advent of Army Futures Command and changes to the modernization and acquisitions process signal progress toward exorcising these ghosts of the past, enabling the Army to work with rather than against industry as it formulates its future combat systems requirements.

The failure of the US Army's future combat systems (FCS) program destroyed the public's confidence in the Army's modernization processes. The Army's latest modernization strategy, however, reflects a unity of purpose and structure unseen since World War II. The creation of Army Futures Command in 2018 provided an opportunity to reform and improve modernization processes that had been plaguing Army combat developments for decades. Inculcating hard lessons from the failure of FCS to sufficiently reform modernization and acquisition processes, Futures Command has labored to improve these modernization programs. But as it looks to the future, as its name demands, it should examine the causes of previous failures with an eye toward preventing them. An examination of the recent request for proposals for the optionally manned fighting vehicle (OMFV) in 2019 and again in early 2020 provides compelling lessons learned that can promulgate future success.¹

Ghost of Systems Past and Concepts Future

The ghost of FCS haunts Army modernization and provides a cautionary tale for innovators and futurists. The FCS program, the largest planned modernization program in Army history, planned 18 separate systems integrated by a wireless network in a brigade structure and operating under emerging doctrine. The program aimed to provide weapons, individual computer systems, manned and unmanned vehicles, and a sensor suite. All vehicles would be transportable by C-130 and would be "more lethal, survivable, deployable, and sustainable than existing heavy combat systems."² After nine years and \$87 billion, the Department of Defense canceled the FCS program in 2009.³

The FCS was haunted by the ghost of systems past—the so-called *Big 5*: M1 Abrams, M2/3 Bradley, UH-60 Black Hawk, AH-64 Apache,

1. Headquarters, Department of the Army (HQDA), *Cross-Functional Team Pilot In Support Of Materiel Development*, Army Directive 2017-14 (Washington, DC: HQDA, October 6, 2017).

2. US Government Accountability Office (GAO), *Issues Facing the Army's Future Combat Systems Program*, GAO-03-1010R (Washington, DC: GAO, 2003), 2; and Christopher G. Pernin et al., *Lessons from the Army's Future Combat Systems Program* (Santa Monica, CA: RAND Corporation, 2012), 55.

3. Mark L. Bradley, *Department of the Army Historical Summary: Fiscal Year 2009* (Washington, DC: Center of Military History, 2015), 42–43.

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and the Patriot.⁴ Modernization enthusiasts often incorrectly assume the Big 5 were developed together. Though the systems were called the Big 5 as early as 1972 for acquisition purposes, they remained five separate modernization programs, four of which began as product improvements to systems being replaced. Each spent an average of 17 years in development, and the changes they brought were evolutionary rather than revolutionary.⁵ The final products fielded in the 1980s were all tremendous improvements over the original designs in the 1960s, and the improved versions that have seen combat from Desert Storm to the present were orders of magnitude better than their predecessors. The AirLand Battle Doctrine, developed as a result of the Yom Kippur War and using the capabilities of these new systems, really made them successful as the Big 5.⁶

The FCS program was also haunted by the ghost of concept future, the Army After Next, which envisioned development of systems over a period of decades using technologies as yet unknown. The program hoped to marry the idea of simultaneous acquisition with modernization using leap-ahead technology. But an ambitious yet unfeasible operational concept, immature technology, and an overly aggressive timeline doomed the program to failure. Current modernization programs must avoid these ghosts within the machine in order to succeed where other programs failed.

Unfeasible Operational Concepts

General Eric Shinseki's vision of the Army unveiled in October 1999, required the capability to deploy a brigade anywhere in the world in 96 hours with a full division on the ground in 120 hours, and five divisions in 30 days.⁷ This flawed operational concept required a C-130 sortie for each of the two-to-three-hundred light armored vehicles in an FCS brigade combat team. Large operations would require hundreds of C-130s, likely making the plan unfeasible. The C-130 requirement came from a notional vertical takeoff and landing aircraft designed to support futuristic forces during Army After Next war games. This theoretical aircraft used the internal cube of the C-130, so the mission needs statement defined C-130 deployability as critical to achieving both "rapid tactical and strategic air deployment" and therefore "the only 'non-tradable requirement.'"⁸

The FCS concept supposedly eliminated the need for heavily armored vehicles by replacing mass with superior information allowing the soldier to see and hit the enemy first. The FCS brigade combat team would have the capability to "see first, understand first, act first, and to

4. David C. Trybula, *"Big 5" Lessons for Today and Tomorrow* (Carlisle Barracks, PA: US Army War College, 2012), 3.

5. Trybula, *Big 5*, 11, 26, 41, 51, 58.

6. Pernin, *Future Combat Systems*, 9.

7. Pernin, *Future Combat Systems*, 9.

8. Pernin, *Future Combat Systems*, 16, 55–57.

finish decisively.”⁹ The system survivability depended upon “its ability to detect and kill the enemy beyond direct combat range,” while avoiding detection itself and surviving the enemy’s first shot.¹⁰

The challenge with ground vehicles has always been the balance between weight and armor. Initial planning for C-130 transportability imposed a 20-ton limit on the vehicle assuming perfect conditions operating at sea level, while the add-on armor and reserve fuel for the C-130 (normal for combat missions) further reduced the maximum payload to 17 tons. Additionally, assault landings enabling the operational scheme overly stressed the airframes, which resulted in the requirement for an even lower payload. To reduce the vehicle weight, developers repeatedly decreased mandatory deployment configurations, but these conflicted with the operational concept requiring the FCS to be combat ready upon deployment. The military’s experience in Iraq and Afghanistan, moreover, proved no amount of tactical intelligence could replace physical force protection from improvised explosive devices, refuting the operational concept’s reliance on intelligence to overcome the need for protective armor. This fact drove an operational need for more heavily armored vehicles such as mine-resistant, ambush-protected (MRAP) vehicles.

Immature Technology

As the pace of technological change has accelerated, the Army has sought to take advantage of new, emergent, and possible technology, always looking for the “leap ahead.” The FCS project manager identified 31 critical technology elements whose readiness determined the system’s effectiveness. A technology readiness assessment in 2003 found significant problems, neither new nor unexpected.¹¹ A 2003 Government Accountability Office (GAO) report warned, “many critical technologies will not be mature at Milestone B [acquisition program start], thus technology development and product development will occur concurrently.”¹² Congress ordered an investigation of the FCS program in 2009 and determined few things had changed with the program in the intervening six years.¹³ These warnings went unheeded.

A RAND Corporation study of FCS in 2012 determined, “technical development must be rooted in exploratory basic science and advanced development programs validated by early and realistic field experimentation with real products, and not in SDD [Systems Development and Demonstration] phases of major acquisition programs.”¹⁴ The FCS program proved the danger of attempting to leap too far ahead.

9. GAO, *Defense Acquisitions: Decisions Needed to Shape Army’s Combat Systems for the Future*, GAO-09-288 (Washington, DC: GAO, 2009), 3.

10. GAO, *Future Combat Systems Program*, 30.

11. GAO, *Future Combat Systems Program*, 24–25.

12. GAO, *Future Combat Systems Program*, 41.

13. GAO, *Defense Acquisitions*, 10.

14. Pernin, *Future Combat Systems*, xxvii, 242.

Rush to Failure

An artificially accelerated timeline driven by the desire to jump-start transformation became a primary cause of the FCS system failure. In 2001, Secretary of Defense Donald Rumsfeld pressured the Army to modernize and adapt to emerging threats, reduce the logistics infrastructure, increase lethality, and speed deployment time. The term *revolution in military affairs* distinguished the effort from previous evolutionary changes of the 1990s.¹⁵ Despite the immature technology, Army senior leaders accelerated the timeline for Milestone B from 2006 to 2003, effectively dooming the program by eliminating time to correct deficiencies as they appeared.¹⁶

Army Modernization Strategy

The Army seems to be in a golden period now with the wars in Iraq and Afghanistan winding down and no new near-term threats. The 2018 *National Defense Strategy* articulates, “long-term strategic competitions with China and Russia are the principal priorities . . . because of the magnitude of the threats” and the potential for them to increase in the future.¹⁷ While the United States competes below the level of armed conflict, the Army is using the time to modernize decades-old equipment quickly to avoid facing the next war with inferior weapons. The 2019 *Army Modernization Strategy* is based on four key assumptions:

- The US Army’s budget remains flat with reduced spending power over time.
- Demand for Army forces remains relatively constant.
- Research and development matures in time to make significant improvements in Army capabilities by 2035.
- Adversary modernization programs stay on their currently estimated trajectories in terms of capability levels and timelines.¹⁸

The strategy also outlines a 15-year plan to build an Army for a new doctrine, multidomain operations (MDO).

Period of rapid change:

- Fiscal year (FY)2020 to FY2022: Begin initial fielding of the cross-functional teams’ signature efforts.
- FY2023 to FY2025: Adapt formations and organizational designs to incorporate the modernized equipment required for MDO.

15. Pernin, *Future Combat Systems*, 9.

16. Conrad C. Crane, Michael E. Lynch, and Shane Reilly, *A History of the Army’s Future: 1990–2018* (Carlisle, PA: US Army Heritage and Education Center, 2018), 7, 20.

17. James Mattis, *Summary of the 2018 National Defense Strategy of The United States of America: Sharpening the American Military’s Competitive Edge* (Washington, DC: Office of the Secretary of Defense, 2018), 4.

18. HQDA, *2019 Army Modernization Strategy: Investing in the Future* (Washington, DC: HQDA, 2019), 3.

Period of fundamental change:

- FY2026 to FY2028: Certify first MDO force package and begin building the second. Field optionally manned fighting vehicle and future attack reconnaissance aircraft.
- FY2029 to FY2035: Finish certifying next force package while continuing to innovate.¹⁹

Deus Ex Machina—Army Futures Command

The role of Army Futures Command as a modernization headquarters allows the Army to consolidate and focus modernization and acquisition efforts; its initial development has proceeded with an eye toward correcting past failures, merging all technological research, modernization, and capability development processes into one command to better focus those efforts. Six priorities drive the Army's equipment modernization strategy: long-range precision fires, next-generation combat vehicles, future vertical lift, networks, air and missile defense, and soldier lethality.²⁰

Eight new cross-functional teams (all the above, plus assured positioning and timing, and synthetic training environment) focus modernization programs. Each cross-functional team is led by a senior military or civilian leader and includes specialists in acquisition, requirements, science and technology, test and evaluation, resourcing, contracting, cost analysis, sustainment, and military operations. These cross-functional teams develop capabilities, leveraging industry, academia, and soldiers in an iterative process to inform materiel solutions, ensuring appropriate stakeholders are represented, empowered, and connected.²¹

Lack of coordination in the research and development area has plagued the modernization system, leading to fragmented efforts. Future Command's new Combat Capabilities Development Command aligned each of the Research, Development, and Engineering Centers as lead support to one or more of the cross-functional teams and as supporting efforts to others (see table 1).

With the failure of FCS still fresh in the Army's consciousness, Secretary of the Army Ryan McCarthy challenged the modernization community to "fail early, fail cheap."²² The January 2020 cancellation of the OMFV request for proposals provides an example of this dictum. The Army realized the project was on the wrong track and needed a course correction: "the most prudent means of ensuring long-term programmatic success is to get this multibillion-dollar effort correct."²³

19. HQDA, *Army Modernization Strategy*, 10–11.

20. HQDA, *Army Modernization Strategy*, 6.

21. Pernin, *Future Combat Systems*, 103; and HQDA, *Cross-Functional Team Pilot*.

22. John M. Donnelly, "The Army's Ryan McCarthy Pulls the Plug on Bad Acquisitions," *Roll Call*, January 18, 2020.

23. Sean Kimmons, "Vice Chief of Staff: Speed of Modernization No Longer at 'Glacial Pace,'" *Army News Service*, Feb. 7, 2020, https://www.army.mil/article/232408/vice_chief_of_staff_speed_of_modernization_no_longer_at_glacial_pace.

This cancellation also set off alarm bells throughout the defense media and Congress, both questioning whether this was not just the latest in a long string of Army modernization and acquisition failures—a valid question given the Army’s recent history.

Table 1. Army Research, Development, and Engineering Centers’ assignments to cross-functional teams²⁴

		Combat Capabilities Development Command (CCDC) Components (former name in parenthesis)						
		Armaments Center	Chemical Biological Center	C5ISR Center	Army Research Laboratory	Aviation & Missile Center	Ground Vehicle Systems Center	Soldier Center
	Army Priorities	(ARDEC)	(ECBC)	(CERDEC)	(unchanged)	(AMERDEC)	(TARDEC)	(NSSC)
1	LRPF	LEAD		support	support	support		
2	NGCV	support	support	support	support	support	LEAD	
3	FVL	support		support	support	LEAD		
4	Network			LEAD	support	support		support
5	AMD	support		support	support	LEAD		
6	SL	support		support	support			LEAD

Air & Missile Defense (AMD)
 Armament Research, Development, and Engineering Center (ARDEC)
 Aviation and Missile Research, Development, and Engineering Center (AMERDEC)
 Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance, and Reconnaissance (C5ISR)
 Communications-Electronics Research, Development, and Engineering Center (CERDEC)
 Edgewood Chemical and Biological Command (ECBC)
 Future Vertical Lift (FVL)
 Long Range Precision Fires (LRPF)
 Natick Soldier Systems Center (NSSC)
 Network (Network)
 Next Generation Combat Vehicle (NGCV)
 Soldier Lethality (SL)
 Tank Automotive Research, Development, and Engineering Center (TARDEC)

Despite the Army claiming to have learned from failures such as the FCS, the initial OMFV request for proposals in March 2019 began with some of the same traits as FCS—unreasonable expectations and an impossible timeline.²⁵ The Army intended to issue an ambitious draft requirement in order to push industry to provide the best solutions then get industry feedback and adjust as required.

In addition to the age-old vehicle weight problem, height became a challenge. Recent combat experience shows ground clearance enhances land mine survivability. Industry leaders warned the Army that some requirements

24. Table data from US Army in Sydney J. Freedberg Jr., “Army R&D Chief: ‘I Don’t Think We Went Far Enough’—But Futures Command Can,” *Breaking Defense*, February 8, 2019, fig. 1, <https://breakingdefense.com/2019/02/army-rd-chief-i-dont-think-we-went-far-enough-but-futures-command-can/>.

25. Ashley Tressel, “Army Releases Final RFP for OMFV,” *Inside Defense*, March 29, 2019.

were unattainable and requested modifications. The Army subsequently removed the requirement to transport a full nine-soldier infantry squad—the original purpose of the vehicle. The objective requirement called for a 50mm cannon with a 30mm acceptable as an interim. With an added Modular Active Protection System, the vehicle was required to defeat rocket-propelled grenades, missiles, and long-rod penetrators.²⁶

Army leaders argued soldier survivability was paramount yet sacrificed armor to remove weight. The Army remained just as focused on air transport as it had been during the FCS development, distorting OMFV development. The required protection was reduced making the vehicles light enough for two to fly on a C-17 as the Bradley does today.

Soldier survivability and vehicle reliability were compromised in order to achieve impossible standards. Part of this survivability lies in the potential to take soldiers out of it completely, hence optionally manned, but the vehicle would still be remotely controlled by soldiers. Bidders had roughly six months to produce a working prototype for testing.²⁷

Although Congress and the press criticized the Army's cancellation of the OMFV request for proposals in January 2020 to start over again, the restart was actually good news and indicates the Army's willingness and ability to learn from its own mistakes.²⁸ It is also visible evidence of the ability of Futures Command to change the landscape.

In April 2020, the Army unveiled a new and innovative approach to designing the OMFV. It began by soliciting ideas from industry, first on what vendors found difficult about the initial request for proposals, and then requested recommendations for how to revise OMFV development.²⁹ The Army released an *Industry Day Narrative* listing broad characteristics rather than specific requirements for the OMFV (see table 2).³⁰ It ranked survivability first among nine desired characteristics and also relaxed air transportability as a firm requirement for the first time since the FCS period, almost 10 years ago.

Table 2. Nine desired characteristics

Survivability	Lethality	Transportability
Mobility	Weight	Manning
Growth	Logistics	Training

26. Freedberg Jr., "NGCV: Hard Choices in Bradley Replacement, RFP Out Friday," *Breaking Defense*, March 27, 2019.

27. Freedberg Jr., "NGCV: Hard Choices."

28. Freedberg Jr., "Can the Army Convince Congress It's Learned from FCS?" *Breaking Defense*, March 16, 2020.

29. HQDA, "Optionally Manned Fighting Vehicle (OMFV) Market Survey," SAM.gov, <https://beta.sam.gov/opp/37a6d32f8ef34272bd94c8340f05dd41/view>.

30. National Advanced Mobility Consortium (NAMC), *Industry Day Narrative for Optionally Manned Fighting Vehicle* (Ann Arbor, MI: NAMC, April 9, 2020), 6.

The timeline for the OMFV, with five specific phases, is much more realistic:

- Phase 1 (FY2020 to FY2021): Develop and refine OMFV acquisition and ontracting strategies
- Phase 2 (FY2022 to FY2023): Preliminary design
- Phase 3 (FY2023 to FY2024): Detailed design
- Phase 4 (FY2024 to FY2027): Prototype build and test
- Phase 5 (FY2027 to FY2030): Production and fielding³¹

Finally, the Army seemed to recognize the impossibility of transporting large numbers of armored vehicles by air. The *Industry Day Narrative* acknowledges units will still primarily deploy by water with the option to deploy by air. Not limiting deployability to one specific airframe allows more flexibility to continue to deploy primarily by water. The narrative also acknowledges the continued requirement for protective armor, but those requirements are more realistic—the OMFV must protect its crew from other infantry fighting vehicles, not from tanks. Elimination of tank main gun survivability makes the armor problem much easier.³²

Perhaps the most important part about the narrative, however, is the new approach to design. One sentence indicates the Army’s final rejection of the old FCS-type process—“the Army recognizes the importance of accurately defining the capabilities without over constraining the design.”³³ This approach encourages industry to use virtual reality and modeling and simulation in providing initial digital designs rather than demanding a prototype within six months, demonstrating the Army’s willingness to be much more open and sensible, listening to expert opinions from industry. This approach is an improvement—during the FCS program some contractors complained overzealous Army combat developers had vision but no practical knowledge. They reported that when they told developers certain things were impossible with existing technology, the developers replied, “work the problems harder.”³⁴

Trouble Ahead?

Despite evidence of good news, the original request for proposals process revealed a potential problem between the modernization and acquisition communities. GAO had previously identified a lack of formal coordination procedures between Futures Command and the Assistant Secretary of the Army (Acquisition, Logistics, and Technology), despite early attempts at aligning the processes.³⁵ In October 2019, defense

31. NAMC, *Industry Day Narrative*, 3–4.

32. NAMC, *Industry Day Narrative*, 3, 9.

33. NAMC, *Industry Day Narrative*, 4.

34. Pernin, *Future Combat Systems*, xx, 58n, 102.

35. *Army Should Take Steps to Reduce Risk: Hearing before the Subcommittee on Tactical Air and Land Forces, House Committee on Armed Services*, 116th Cong. (May 1, 2019) (statement of Jon Ludwigson, Acting Director, Contracting and National Security Acquisitions), 10.

media outlets reported that after Bradley manufacturer BAE Systems Land & Armaments dropped out of the OMFV competition, the Army disqualified Raytheon Rheinmetall Land Systems for not shipping the prototype shipped from Germany in time. Army Futures Command had insisted at the time that the process must stick to the schedule, but the acquisition community favored an extension. Restarting the process has reset the clock to zero but the Army needs better coordination between the modernization and acquisition communities.³⁶

Conclusion

Failure is the ghost in the Army modernization machine but one that can be exorcised. The new modernization strategy has changed the nature of the machine, and Army Futures Command is the *deus ex machina*, providing a unified infrastructure with which to conduct a new, coherent, reasonable modernization strategy. The Army frequently uses the phrase “lessons learned,” but very often the lessons are only gathered rather than learned. The recent restart of the OMFV indicates the Army might finally be learning the harsh lessons taught by the FCS experience. If those lessons truly have been learned and the experiences passed on to the rest of the modernization enterprise, the Army need no longer fear the ghosts in the machine.

36. Jen Judson, “Lynx 41 Disqualified from Bradley Replacement Competition,” *Breaking Defense*, October 4, 2019.

