JOINT INNOVATION
What Is and What Could Be

Todd P. Moulton
Joshua A. Pusillo

Adversarial uses of new technologies are increasing across the world, rapidly changing the nature of warfighting. Such threats currently exceed the capacity of DOD organizations that expedite military innovation. To maintain its crucial military advantage, the United States must focus on producing leaders who can promote rapid innovation across the joint force. This article proposes the establishment of a joint office to promote a new corps of innovation leaders and a joint design thinking school to train and mentor them in advancing cultures of innovation within their respective teams. These organizations would encourage leaders to refine existing service innovation efforts and construct unique approaches to addressing the near- and long-term threats facing the United States.

In May 2023, former Deputy Secretary of Defense Kathleen Hicks explained the collective aim of past DOD initiatives to foster innovation, efforts which "all shared a simple and compelling proposition: to create and exploit change as a military opportunity." Regardless of their origins in government or commercial industry and of their nature as a new technology or capability, such innovation efforts worked to ensure US military superiority in confronting peer and near-peer adversaries, a dilemma which she perceived as one of great urgency: "Today, in the face of our pacing challenge, our task is to adapt and integrate innovations wherever they can add the most military value."[1]

Indeed, adversarial use of new technologies in innovative ways continues to lead to an array of threats eroding relative US military superiority across the world. The expected rate of change in the number and sophistication of such threats currently exceeds the capacity of organizations within the Department of Defense that expedite military innovation.

Commander Todd Moulton, USN, deputy director within the N35 Division, Office of Naval Intelligence, holds a master of arts in diplomacy and international relations from Seton Hall University, a master of science in strategic intelligence from the National Intelligence University, and a master of military operational art and science from Air University.

Lieutenant Colonel Joshua Pusillo, USA, special forces proponent director at the Special Warfare Center of US Army Special Operations Command, holds a master of science in defense analysis from the Naval Postgraduate School.

1. Kathleen Hicks, keynote address, Ash Carter Exchange on Innovation and National Security, Washington, DC, 9 May 2023, transcript, https://www.defense.gov/.

To resolve this disparity, the Department must address the substantial need for leaders who can promote rapid innovation. To do so, it should establish a program to identify, train, and mentor joint personnel to lead teams through the design-thinking process—a process that would help develop ways to refine existing service innovation efforts and construct unique approaches to address the near- and long-term threats facing the United States. The joint force can achieve the leap ahead by training a cohort of enterprising leaders who can facilitate a revolution in military thinking and collaboration across all services and at each level of warfare.

This article argues that the joint force must invest in developing such leaders early in their careers. The US military, already adept at instructing junior leaders on tactics, techniques, and procedures (TTPs) to counter conventional battlefield threats unilaterally, must train some of those same leaders on how to collaborate to achieve rapid, decentralized, tactical innovation that ensures US military advantage. It must also identify and develop the leaders best suited for future assignment to service innovation organizations.

In reviewing key government strategic documents on innovation in the military and examining DOD innovation initiatives, this article provides an overview of how the services embarked on developing innovation, what impediments are engrained within the military, and what challenges exist at the DOD level. To meet such challenges, the article underlines practical guidance on how the joint force can innovate to address future threats by establishing a joint program to promote a new corps of innovation officers and a joint design thinking school to train and incentivize these officers on track for command or key billet assignments to advance cultures of innovation within their respective teams.

Innovation as Strategic Guidance

Strategic guidance from the first Trump administration reveals the significance of fostering innovation to maintain the United States' competitive edge, an initiative that is sustained through the present day. Acknowledging the need for reform in meeting the challenges of a rapidly changing global strategic environment, the 2017 *National Security Strategy* directed that the "United States must regain the element of surprise and field new technologies at the pace of modern industry," emphasizing that all governmental agencies shift from research and development to "an approach that rewards rapid fielding and risk taking."[2]

Additionally, the 2018 *National Defense Strategy* (NDS) identified the rationale for applying this concept across the Defense Department, directing the Department and the joint force "to out-think, out-maneuver, and out-partner revisionist powers, rogue regimes, terrorists and other threat actors."[3] The 2018 NDS moved the services away

2. Donald J. Trump, *National Security Strategy* (The White House, 2017), 21, https://trumpwhitehouse.archives.gov/.

3. *Summary of the National Defense Strategy of the United States of America* (Department of Defense, January 2018), 5, https://media.defense.gov/.

from the Global War on Terrorism mindset and realigned the military on potential conflict with near-peer competitors. Furthermore, it redefined success as no longer attributed to the state that developed new technology but rather to one that better integrated such technology and adapted it to its warfighting. As both strategic documents demonstrated, rapid innovation using current capabilities would be key to securing battlefield success.

The 2018 *National Military Strategy* provided a roadmap for integrating innovation efforts into the joint environment. Specifically, it states that military exercises should "facilitate near-term experimentation in an effort to rapidly incorporate innovative ideas and disruptive technologies that promote competitive advantage." Such exercises are crucial to safely integrating innovation in an environment with little room for error, "building readiness, interoperability, and the mutual trust required for a joint combined arms approach."[4]

In May 2025, the Trump administration mandated the initiative to "spur innovation" to "ensure that the United States military possesses the most lethal warfighting capabilities in the world."[5] Additionally, in June 2025, General Dan Caine, chairman of the Joint Chiefs of Staff, placed greater emphasis on innovation, encouraging technology entrepreneurs to assist the military. In aiming to "bridge the gap between the Pentagon and Silicon Valley," Caine addressed a largely civilian audience at the Ash Carter Exchange and AI+ Expo, stating, "Your nation needs you with a sense of urgency. We need your creative, innovative, patriotic, and diabolical minds, 24/7/365."[6]

Militaries and Innovation

A historical review of how militaries introduce and implement innovative thought and technologies reveals the inherent challenges to integrating revolutionary TTPs and technologies into everyday practices. The UK Royal Air Force's (RAF) evolution of air defense exemplifies one of the most consequential adoptions of innovative TTPs and emerging technologies ever witnessed by Western militaries. While radar and the modern fighter's advent were key components in saving the UK from Germany, the linchpin in air defense development was several high-ranking RAF officers who understood the concept's importance in the coming war(s). The episode also exhibits the broad and far-reaching impact a few individuals can have on the course of history when they can foresee a shift in the theory of war and realize the necessary elements to defeat their enemy.

As research has suggested, military organizations often struggle with incorporating innovation into its processes. Military organizational structure has been recognized as the primary driving force as well as the main obstacle to service and joint innovation, as

4. Office of the Chairman of the Joint Chiefs of Staff Public Affairs, "Description of the 2018 National Military Strategy Released," Joint Chiefs of Staff [website], 12 July 2019, https://www.jcs.mil/.

5. Exec. Order No. 14,265, 90 F.R. 15,621 (2025).

6. Sydney J. Freeburg Jr., " 'We Need Your Creative, Innovative, Patriotic, and Diabolical Minds': Joint Chiefs Chairman Caine," *Breaking Defense*, 4 June 2025, https://breakingdefense.com/.

the military is a complex ecosystem with several subcomponents that vie for priority for their respective roles and missions.[7] The primary hurdle to incorporating innovation transcends from the services' mechanistic or bureaucratic nature and entrenched culture that favors stability over revolutionary change.[8] Mechanistic organizations anchor themselves in routine and formalized processes to overcome common problems.[9]

The military tends to enjoy already assessed ideas and TTPs and to shun innovations.[10] Innovation's introduction into the military system represents a structural disruption where fresh methodologies, if they work, could replace standing organizational approaches and force the system to fundamentally change. The system thus resists change as it threatens what is orderly and familiar.[11] Innovation does not fit well into preexisting military culture, which has developed over generations and makes basic assumptions that have repetitively worked to remedy existing problems. Conventions are taught as norms representing the "correct" ways to conduct operations.[12] Militaries also value a common history and values, generally viewing past knowledge as the most efficient teacher of war during peacetime, precluding more forward thinking.[13]

As historical patterns reveal, the positive integration of novel military technologies, companion doctrine, and the associated supply chains is enacted when four underlying factors are present. First, to inspire innovation, the military needs an ideological struggle that redefines the organization's values.[14] The primary principle that catalyzes military innovation is a new theory of war that entails how war will look and how a nation-state will win that war.[15] Second, the emerging war theory must ensconce unique daily tasks into a military's peace and wartime repertoire. That is, the force must define new critical missions to ensure personnel understand how the force will evaluate them and either reward or penalize their performance. Without the establishment and evolution of new essential tasks, innovative ideas and technologies may fall to the wayside.

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7. Stephen Peter Rosen, "New Ways of War: Understanding Military Innovation," *International Security* 13, no.1 (1988), https://doi.org/.

8. Tom Burns and G. M. Stalker, *The Management of Innovation* (Oxford University Press, 1961); and Williamson Murray, "Innovation Past and Future," in *Military Innovation in the Interwar Period*, ed. Willamson R. Murray and Allan Millett (Cambridge University Press, 1996).

9. Andrew Hill, "Military Innovation and Military Culture," *The US Army War College Quarterly: Parameters* 45, no. 1 (2015), https://press.armywarcollege.edu/.

10. Murray, "Innovation."

11. Hill, "Military Innovation"; and Elting Morison, "A Case Study of Innovation," *Engineering and Science* 13, no.7 (1950): 8.

12. Edgar Schein, *Organizational Culture and Leadership*, 4th ed. (Jossey Bass, 2010).

13. Samuel P. Huntington, *The Soldier and the State: The Theory and Politics of Civil-Military Relations* (Belknap Press,1957), 79.

14. Rosen, "New Ways."

15. Emile Simpson, "Clausewitz's Theory of War and Victory in Contemporary Conflict," *Parameters* 47, no. 4 (2017), https://press.armywarcollege.edu/.

Next, such a theory must influence a shift in the people reaching the senior command level. Innovation will usually forge a new and unique avenue to the senior ranks, so that the military does not sideline those practicing newly-developed war methods. Lastly, reigning senior military officers must establish the path for "maverick" junior officers to reach flag and continue reformulating the supplanting war theory.[16] The level at which these ranking military officers believe in inventive technologies and TTPs will drive the innovations' speed and intensity.[17]

RAF's adoption of radar prior to World War II is a military innovation that likely saved the UK from German occupation. The radar story revolves around RAF senior members who took lessons from World War I.[18] The leaders in air defense theory foresaw a shift in the theory of war and the reverberating effects the change would have on the RAF and its critical tasks, comprehending that the evolving nature of air warfare necessitated that the UK have an aerial capability to protect itself.[19]

While the RAF flag officers did not try to fundamentally shift the service from a bomber- to a fighter-centric force, they began laying the groundwork to build a capable air defense network in the 1920s.[20] These officers realized that there was a requirement for a not-yet-invented technology to fortify the UK's defense.[21] They positioned capable RAF service members whom the service did not see as mavericks into key roles and believed the RAF would allow them to make incremental changes.[22] The chosen personnel continued developing the air defense doctrine and established supply chains that would assist with fighter production, a key component to air defense.[23]

In 1935, the RAF demonstrated an experimental radar and realized it had the technology the service required to integrate with RAF fighters to create a venerable air defense.[24] This discovery coincided with the German Luftwaffe's rapid growth and the RAF's determination that radar stations needed to be operational by 1940 to direct fighter aircraft to incoming enemy planes.[25] Even though the technology was still unproven, senior leaders further grasped radar's decisiveness and commenced operator training in 1936, mandating the building of five operating stations by 1938 versus

16. Rosen, "New Ways."

17. Ola Modig and Kent Andersson, "Military Innovation as the Result of Mental Models of Technology," *Scandinavian Journal of Military Studies* 5, no. 1 (2022), https://doi.org/.

18. E. B. Ashmore, *Air Defence* (Longmans, Green, 1929), 39.

19. Rosen, "New Ways."

20. Committee on Imperial Defence (CID), "Continental Air Menace: Anti-Aircraft Defence," Home Defence Subcommittee Report 118A, May 1923, microfilm, 4, CAB 3, Harvard University Microfilm Collection.

21. Ashmore, *Air Defence*.

22. Franci K. Mason, *Battle over Britain* (McWhirter Twins, 1969), 80.

23. Rosen, "New Ways"; and Derek Wood and Derek Dempster, *The Narrow Margin* (McGraw-Hill, 1961), 462.

24. Rosen, "New Ways."

25. Reorientation Subcommittee, CID, "Reorientation of the Air Defence System of Great Britain," Home Defence Subcommittee Report 205A, April 1935, microfilm, 6, CAB 3, Harvard University Microfilm Collection.

1940.[26] The officers' foresight laid the foundation for radar's integration into the RAF, which relied almost exclusively on this technology to fend off the German blitzkrieg.

Even though RAF flag officers realized the requirement for air defense after World War I, it still took two decades to produce the innovative technology to bring this dream to fruition. The time required to develop radar from concept to reality demonstrates that US services need the individuals who will conceptualize, create, and generate the next "radar" to deter and defeat the country's potential enemies. Such innovation offers an example of how military joint officers could play a determining role in preparing for the rapidly changing nature of war. Much like those who saw air defense as a game-changing doctrinal transition, joint innovation officers could work with operators to devise unique TTPs to maintain the military's edge over its peer competitors and foster novel technological requirements.

Yet the military has not defined a path to cultivate "out-of-the-box" military leaders to produce innovative TTPs and technologies for the joint force. A review of the Defense Department's innovation efforts demonstrates how the kind of innovative thinking that is needed for joint success is yet to be developed.

DOD and Service Innovation Efforts

Throughout the past 10 years, the Defense Department and the services have established innovation centers that focus on the creation of innovative ideas and technologies at the micro-level, with the goal that they will eventually assist the Department and services en masse. Yet these innovation efforts have focused on manufacturing platforms and then retroactively fabricating TTPs to adjust to these newfound capabilities. While some fascinating and futuristic equipment has emerged, inventive service members and their ability to outthink their competition are often what prevail in warfare.

In 2015, then-Secretary of Defense Ash Carter created the Defense Innovation Unit Experimental (DIUx) to cultivate military innovation and overcome bureaucratic inertia. Secretary Carter's goal was to quickly integrate existing commercial technologies into the armed forces. His thought revolved around the idea that as the Defense Department's associations with technology firms matured, the burgeoning interactions would enable it further access to new ideas and concepts applicable for military use.[27] In 2018, DIUx's record of innovation secured it a permanent place within the Department, becoming the DIU of today.[28]

From 2015 to 2020, DIU invested $406 million dollars into 109 projects. The organization has a roughly 23 percent success rate in moving innovative technologies and

26. Basil Collier, *The Defence of the United Kingdom* (Her Majesty's Stationery Office, 1957), 68; and Rosen, "New Ways."

27. Fred Kaplan, "Procuring Innovation: The U.S. Department of Defense Founded a Kind of Startup in Silicon Valley to Accelerate the Development and Acquisition of New Technologies Useful to the Military. But Will It Survive President Trump?," *MIT Technology Review* 120, no. 1 (2017).

28. Scott Maucione, "SPECIAL REPORT: Failure Is an Option for DOD's Experimental Agency, But How Much?," Federal News Network, 30 October 2019, https://federalnewsnetwork.com/.

TTPs to military members in the field. Although this rate falls below the industry standard of 33 percent, those platforms and methods—which transitioned into the services' hands—saved lives and money and provided additional security. Moreover, DIU developed relationships with 45 vendors who had never worked with the Defense Department, bringing in new ideas and perspectives to defense innovation. The DIU also established the National Security Innovation Capital and the National Security Innovation Network, which resulted in Department contacts with 2,500 members of academia to speed up research and development of platforms and methodologies.[29] The DIU, a model of innovative thinking, spurred the services to launch their respective equivalents.

AFWERX

The Air Force created AFWERX, the first DIU-like organization in 2017, with the intent to establish relationships between the service and small business owners and entrepreneurs for future innovative development processes.[30] Since then, AFWERX has refined and grown the unit's structure and increased the number of Spark Cells throughout the country from 2 to 100.[31] The Spark Cell concept aligns with Air Force doctrine of enabling Airmen to perform decentralized execution from higher-level guidance. Airmen throughout the country meet with businesses, schools, and others to generate ideas and projects locally.[32]

Spark Cells have three goals: further a culture of innovation within the Air Force, provide Airmen with the pathways and resources to solve tactical-level pain points, and create a robust network of experts from industry, academia, and the government.[33] Some of AFWERX's successes include 3D-printed dental implants; a color-coded, flashlight-like tool for MC-130J loadmasters; and drones used for counter-unmanned systems training.[34]

Army Futures Command

Following the Air Force's and DIU's examples, in June 2018, the Army instituted a start-up-like organization on a larger scale, the US Army Futures Command (AFC), which reached full operational capability a year later. Viewed as the Army's "most significant reorganization since 1973," the AFC has the primary goal of guiding overall modernization efforts through identifying and developing requirements and technol-

29. Maucione, "Failure."

30. Secretary of the Air Force Public Affairs, "Air Force Opens Doors to Universities, Small Businesses and Entrepreneurs to Boost Innovation," US Air Force [USAF, website], 21 July 2017, https://www.af.mil/.

31. Rachel Coates, "AFWERX Spark Lab Encourages Innovation," Defense Visual Information Distribution Service (DVIDS), 21 July 2023, https://www.dvidshub.net/.

32. Rachel Cohen, "AFWERX Beyond the Buzzword," *Air & Space Forces Magazine*, 1 October 2019, https://www.airforcemag.com/.

33. "Operational Cells," AFWERX [website], accessed 2025 May 25, https://afwerx.com/.

34. Cohen, "AFWERX."

ogy. The Army designed AFC, headquartered in Austin, Texas, similar to its three other major commands—Army Training and Doctrine Command, Army Forces Command, and Army Materiel Command—as small, flexible, collaborative entities that promote innovation through speed, experimentation, and demonstration.[35]

Yet the command has not enjoyed many successes in the organization's history.[36] Although AFC can award contracts more quickly than general Army units, Congress has questioned the command's lack of tangible results.[37] Its dearth of additional capacity or capabilities may be a reflection of the command's infancy, and much like DIU, innovation at AFC may grow over time; however, unlike DIU and AFWERX, AFC is structured as a typical military command, which likely inhibits its agility and adaptability. The command also recently underwent some turmoil and reorganization along with a shift in its role as the leader of the Army's modernization efforts. Going forward, the AFC has established its goal as one of "continual transformation."[38]

NavalX

In March 2019, the US Navy established its innovation unit, the Naval Expeditions (NavalX) agility office. NavalX was intended to transform the Naval workforce through refining and discovering unique TTPs rather than designing and developing new technologies. The unit began with a sole office in Alexandria, Virginia, and has since expanded to various locations throughout the United States, including San Diego, California; Orlando, Florida; Newport, Rhode Island; Keyport, Washington; and Crane, Indiana.[39] The office's primary focus is pioneering novel methods to enable an agile Naval workforce to adapt to the constantly changing global environment. Furthermore, NavalX distributes its original methodologies to foster even more advanced practices.[40]

NavalX utilizes Intellipedia, which mimics Wikipedia and allows users to update websites as they build and mature grow-breaking TTPs. Its accomplishments include the production of the first chapter of a cloud migration handbook, which is hoped to help the Naval workforce as individuals and units foster innovative TTPs. NavalX also developed Intellipedia sites for agile scrum development, building analytics teams using

35. Army Futures Command (AFC) Task Force, "Army Futures Command," US Army [website], 28 March 2018, https://www.army.mil/.

36. Stew Magnuson, "JUST IN: Pressure Will Mount on Army Futures Command to Produce Results," *National Defense*, 3 March 2020, https://www.nationaldefensemagazine.org/.

37. Stew Magnuson, "AUSA NEWS: Army Futures Command Breaking Down Barriers," *National Defense*, 16 October 2020, https://www.nationaldefensemagazine.org/.

38. Jed Judson, "Beyond 2030: How Army Futures Command Is Adapting Its Approach," *Defense News*, 10 October 2023, https://www.defensenews.com/; and Judson, "In New Directive, US Army Reins in Army Futures Command," *Defense News*, 4 May 2022, https://www.defensenews.com/.

39. Aaron Boyd, "NavalX Innovation Office Really Wants the Navy to Be More Agile," *Nextgov/FCW* [*Federal Computer Week*], 19 October 2019, https://www.nextgov.com/; and Megan Eckstein, "NavalX Innovation Support Office Opening 5 Regional 'Tech Bridge' Hubs," *USNI News*, 3 September 2019, https://news.usni.org/.

40. Boyd, "NavalX."

other transaction authorities for procurement and crowdsourcing.[41] The Navy took a further step in 2022 by creating the Navy Innovation Unit to speed up innovation solutions to pressing issues in the maritime environment.[42]

Marine Innovation Unit

In June 2022, the Marine Corps established the Marine Innovation Unit (MIU) in Newburgh, New York. Run by Marine reservists, the MIU is intended to connect the Marine Corps with industry, academia, special operations program managers, AFC, and federally funded research centers. Reservists are selected based on their civilian expertise and immersion in high-technology sectors.[43]

The MIU has focused on developing computer software to drive innovation within the Marine Corps. Together with the Marine Corps Software Factory (MCSF), which aims to demonstrate a service member-led scalable software development capability, it has emphasized fabricating computer programs and applications to assist Marines on the battlefield.[44] In March 2025, MIU supported MCSF in maturing the Augmented Reconnaissance and Estimate of the Situation (ARES) application, intended to aid tactical-level units planning for casualty evacuation or to infiltrate or exfiltrate an area.[45] During the two-week sprint, the Marines successfully used ARES to construct level and obstacle-free helicopter landing zones, based on topographic data. ARES was also shown to perform in non-conducive communications environments, which would likely occur in remote locations or against a peer competitor.[46]

Such efforts among the services following the Defense Department's lead demonstrate their alignment with strategic guidance on innovation. Yet single-service teams are insufficient to achieve the level of innovation required to defeat near- and peer-competitors. AFWERX, AFC, NavalX, and the MIU need a joint environment for innovative facilitators to train together and mentor each other. Furthermore, the optimum time for the joint force to innovate is in the wake of such component efforts. Taking lessons learned by these pioneers, the joint force should organically develop innovative thinkers to make the units and commands even more effective and connected while focusing on joint matters.

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41. Boyd, "NavalX."

42. Megan Eckstein, "US Navy Creates Innovation Center, Advisory Board to Focus Investments," *Defense News*, 9 December 2022, www.defensenews.com/.

43. "Marine Innovation Unit," US Marines [website], accessed 4 June 2025, https://www.marforres.marines.mil/.

44. Thomas Kleiber, "For Warfighters, by Warfighters: Marine Innovation Unit and Marine Corps Software Factory Develop Tools for the Modern Battlefield," DVIDS, 28 March 2025, https://www.dvidshub.net/.

45. Jon Harper, "Marine Corps Could Expand Software Factor, Create New MOS," *DefenseScoop*, 1 May 2025, https://defensescoop.com/.

46. Kleiber, "For Warfighters."

Impediments to Innovation

The establishment of a conduit to foster a group of joint service members dedicated to operationalizing innovation will almost certainly assist in making a more agile Department capable of defeating any contemporary or future adversary. Before realizing this vision, it is important to address the most common impediments to an innovative mindset across the joint force.

Although the services have enjoyed some innovation achievements, many of these accomplishments have not translated into the joint realm. The reasons behind parochial innovation are multifaceted but primarily rest with the conceptual ambiguities within the Joint Warfighting Concept (JWC) and the services' respective views of their threat environments, which thwarts joint innovation.

In 2020, then-Secretary of Defense Mark Esper enacted the JWC as a remedy to recommendations laid out in the 2018 NDS, which called for original concepts to confront Russia and China.[47] The JWC was Secretary Esper's attempt to align personnel, organizations, training, and doctrine against a China-level threat.[48] Yet, there was no exact leadership guidance on whether the JWC should focus on deterring versus winning a conflict; whether it should emphasize continuous competition with potential adversaries or warfighting alone, or converge on a single campaign, antagonist, and region; or whether it should try to address all potential military threats.[49] Fragmentary and contradicting senior direction led the services to plan, develop, and build service-specific TTPs and platforms against different peer adversaries.[50] While the Navy and Marine Corps viewed China as the United States' primary peer competitor due to the services' emphasis on a potential conflict in the Indo-Pacific region, the Army and Air Force did not highlight any single adversary.[51] The combination of the JWC's opaque and non-directive guidance and the services' threat perception biases drive service innovation at the cost of promoting solutions to joint force vulnerabilities.

The joint force is an emblematic mechanistic society which prides itself on standardized TTPs and a static acquisition process. The individual services want to remain entrenched in TTPs, systems, and promotion paths that have worked for an era or more, because these feel comfortable and expected. When they begin to move away from foundational period elements—such as manned aircraft, carrier operations, or the heavy fight—the military structure as a whole begins to shutter as this shift repre-

47. Mark T. Esper, *Implementing the National Defense Strategy: A Year of Successes* (Department of Defense, 2020), 3, https://media.defense.gov/.

48. Kris Osborn, "Pentagon Crafts New 'Joint Warfighting' Concept," Warrior Maven, 22 August 2021, https://warriormaven.com/.

49. Thomas Mahnken et al., *Innovating for Great Power Competition: An Examination of Service and Joint Innovation Efforts* (Center for Strategic and Budgetary Assessments, 11 January 2023), https://csbaonline.org/.

50. Mahnken et al., *Innovating*.

51. Todd South, "Goodbye, Tanks: How the Marine Corps Will Change, and What It Will Lose, by Ditching Its Armor," *Marine Corps Times*, 22 March 2021, https://www.marinecorpstimes.com/.

sents a headwind to the organization's inertia.[52] Not only does innovation cause disorder to the prevailing theory of war, but it also changes military society, fomenting interactions between the joint force and its members. Moreover, leaders who desire to innovate within the edifice face subcomponents which will further constrain their want to move from a mechanistic to an organic system.[53]

Joint innovation officers would likely need to overcome the difficulties of replicating warlike conditions in peacetime and innovating within these parameters, wrestling a modicum of control over innovation away from senior military officials and ensuring they forge a path for themselves and their protégés for continued professional development and promotion.[54] War more often than not creates opportunities for innovation as enemy forces are able to find and exploit weaknesses, thus forcing friendly units to find novel approaches to seal these vulnerabilities. Yet, joint innovation officers would mostly innovate in peacetime during a significant portion of their career but would have to discover avenues to generate marshal-like events to construct new ideas and platforms. The officers could help design joint exercises or modules within the exercise to build a realistic war scenario. The intended result from the findings would culminate in innovative TTPs or requirements for newfound paraphernalia. Joint innovation officers would serve not only as purveyors of joint TTPs and equipment but also as the vanguard of joint leadership challenging the status quo.

The military tends to plan innovation and as shown has units devoted to this end. Yet these groups germinate innovation within existing military culture, which propagates solutions to requests using standing requirements and vulnerabilities.[55] Joint innovation officers would work to incrementally change this philosophy.

To guarantee joint innovation officers remain as independent as possible, the military must form a joint office that would change the military's perception of innovation. During his tenure as chairman of the Joint Chiefs of Staff, now-retired General Mark Milley, who understood the services' cultural resistance to innovation, envisioned such an office as an enforcement mechanism to develop joint innovation capabilities and integrate these capabilities into joint concepts.[56]

The services' concentration on the perpetuation of sustaining circumstances where leaders make only small adjustments to existing TTPs and platforms does not bode well for innovative thought.[57] The military's intent for this organization should concentrate on allowing the joint innovation officers free reign to examine the dominant joint concepts and gravitate to producing unique TTPs and platforms for potential

52. Hill, "Military Innovation."

53. Burns and Stalker, *Management*.

54. Hill, "Military Innovation."

55. Thomas Kuhn, *The Structure of Scientific Revolution*, 50th Anniversary ed. (University of Chicago Press, 2012); and Hill, "Military Innovation."

56. Joe Gould, "US Military May Need Innovation Overhaul to Fight Future Wars, Milley Says," *Defense News*, 1 June 2022, https://www.defensenews.com/.

57. C. M. Christensen and M. E. Raynor, *The Innovator's Solution: Creating and Sustaining Successful Growth* (Harvard Business School, 2003).

future conflicts. An independent program would also allow these officers to address senior military officers who may be more resistant to change, focusing on latent liabilities external to contemporary military conditions to discover solutions to prevent catastrophes in prospective hostilities.

Finally, joint innovation officers will likely face promotion resistance because the reigning leadership will view them as mavericks and an assault on the path that leads sitting flag officers and senior enlisted to the leadership pantheon. The modern military promotion system chooses officers who have a set of characteristics which mirror the prevailing notions that underpin military society: honorable war, the delegation of authority, and uniformity. Senior leaders tend to select officers and senior enlisted who most reflect themselves as admirals and generals. This presents a paradox: although residing senior officers have the capacity to enable innovative TTPs and leaders, they are the least likely to identify uncharted paths or empower those who could change the culture. Selecting a trailblazer means turning away from the enshrined strategic culture they built their careers on.[58]

For joint innovation officers to succeed, they will need senior leaders who believe in their mission to keep the military ahead of its peer competitors by cultivating novel methodologies to contemporary problems. Leadership buy-in may take a generation or two, during which constant feedback from the joint innovation officer command to the joint force will be critical to ensure the services understand what these officers are doing and how their TTP and platform development will assist the armed forces.

Joint innovation officers face an uphill battle to create wartime scenarios in peacetime. Yet the right cohort can build marshal environments for operators that allow for the greatest extent of innovation and shift authorities from resting military leadership to foster unique ideas and technologies external to current TTPs and acquisition strategies. Finally, as the RAF example of innovation demonstrates, although a generation or more of leaders may promote a culture antithetical to innovation, even a small contingent of senior officers can promote a radical notion and fundamentally rewrite doctrine and platform requirements.

Training and Mentoring for Innovative Culture: The Joint Design Thinking School

In addition to identifying leaders to instigate a culture of innovation, the US military needs to train and mentor junior leaders who will form the corps of innovation teams and eventually become tomorrow's leaders. Along with a joint office focused on promoting such leaders, the military should support a joint education center that fosters relevant junior officer talents and skills early in their careers.

Currently, the outsourcing of innovation denies junior leaders the opportunity to develop skills critical to countering threats. Innovation does not come from requirements and entails more than a formal process, demanding that leaders balance the

58. Hill, "Military Innovation."

conditions necessary for everyone in the organization to be creative and experiment with autonomy weighed against the risks associated with decentralization. Skills essential to an innovative mindset must be honed early in one's military service, before conventional thought takes root.

The first step in building junior military leaders capable of innovation is selecting members whose services view them as operational experts, leaders, and people of character. After selection, the military would consign these candidates to a one-year school, which the authors propose as the Joint Design Thinking School (JDTS). Here, experts would teach them an array of innovation methodologies including design thinking, which is a method of human-centered innovation that produces near-term innovation through cyclical phases of discovery: an increased understanding of the problem, ideation to consider possible solutions, and prototyping to test those solutions for desirability, feasibility, and suitability.[59]

Military graduates would attend advanced exercises to observe the units performing TTPs and lead design sessions to develop their joint operational approaches, feeding the innovative solutions back into the exercises and potentially to the joint force. The services should choose joint innovation officers in a manner akin to their processes for selecting individuals to their development centers and advanced weapons schools, which produce experts—often called *patch wearers*—in their respective fields at the tactical level in operational and support environments.

The selection process and curriculum development of the Navy's and Air Force's advanced schools—namely, the Navy's Strike Fighter Tactics Instructor Course, or TOPGUN, and the Air Force's Weapons School (WS)—offer the JDTS an outstanding template to build on. The military services should concentrate on recruiting weapons tactics instructors and WS graduates who completed their O-4 department head or milestone tours to become joint innovation officers. These service members demonstrated the capacity to finish arduous coursework, attain expertise in a field, display operational acumen, and hold a level of approachability associated with TOPGUN and WS alumni. Yet the officer selection process would mimic the service schools' application procedures and choose the candidates on a whole-of-person concept while not excluding non-TOPGUN/WS individuals who exhibited extraordinary talent. The immediate post-department head/milestone time frame is an opportune career period to conduct a tour to attain full joint credit, which is key for promotion.

The year-long JDTS would award a master's degree in adaptive strategic innovation and execution along with joint professional military education phase two credit and incur a follow-on three-year joint tour. The four-year period should not interfere with career progression and would familiarize the O-4s with the joint force, thus expanding their understanding of the resources available to them as they return to their respective services.

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59. Austin M. Jackson et al., "Designing Collaboration: How to Prepare SOF Augmentation Teams for Assignment to a U.S. Embassy Country Team" (Capstone paper, Naval Postgraduate School, 2014), 21, https://hdl.handle.net/.

The authors propose that JDTS would mimic the internationally recognized Stanford Design School, or d.school, which teaches innovation to Stanford University undergraduate and graduate students from various disciplines and executives with myriad backgrounds through experiential design thinking training and mentorship. Facilitators and mentors are provided with experiences to lead teams through the nonlinear design-thinking process. Such facilitators are crucial in encouraging divergent thinking and helping a team build on shared ideas.[60]

The JDTS, in close relationship with DIU, would train and mentor joint personnel to lead their teams through various innovative methodologies. This will produce unique ways to address close-in operational challenges while teaching problem-solving methodologies to promising junior leaders from all services. The benefit of focusing on near-term innovation is that the leader can facilitate the innovation effort, from inception to implementation, within one assignment cycle.

The JDTS would develop the baseline skills of design-thinking facilitators through experiential training and mentorship using near-term operational challenges relevant to the design group. The leaders trained to facilitate this process will be some of the most highly sought after leaders when they return to their operational units of action. Their development will lead to a profound understanding of trends, morphing threats, and opportunities that enable them to positively influence outcomes, not only adding value to the joint force but also potentially improving interoperability among departments and agencies.

Proposed Curriculum: Four Approaches to Innovation

The following discussion provides a practical overview of the main approaches the JDTS would focus on in training and mentoring its officers. The JDTS would incorporate the leading innovation theories into its curriculum: design thinking; designerly thinking; systems thinking; and lean start-up.[61] The Defense Department could contract the principal academic and operational experts in the fields to teach students' classes in a quarter or semester format. The officers' direct interaction with these key individuals would foster near instantaneous feedback, refinement, and progress on military-specific innovation issues. The combination of these theories would allow students to take the best features from each methodology, mitigate the limitations inherent in each, and incorporate the outcomes into their innovation processes.

60. Jackson et al., "Designing."

61. Linda Nhu Laursen and Louise Moller Haase, "The Shortcomings of Design Thinking When Compared to Designerly Thinking," *The Design Journal* 22, no. 6 (2019), https://doi.org/; Adeline Hvidsten et al., "Design(erly) Thinking: Supporting Organizational Change and Leadership," *Journal of Change Management* 23, no. 1 (2023), https://doi.org/; Daniel H. Kim, *Introduction to Systems Thinking* (Pegasus Communications, 1999), https://thesystemsthinker.com/; and Steve Blank, "Why the Lean Start-Up Changes Everything," *Harvard Business Review*, May 2013, https://hbr.org/.

Design Thinking

In a quarter configuration, each quarter would concentrate on one approach with four associated classes, beginning with design thinking. Centering on the repetitive innovation cycle of proposal generation, prediction, testing, and generalizing, the theory aims to design and produce superior products to attain a competitive advantage over rivals.[62] This approach dovetails with a joint officer's goal of constantly developing, testing, and refining TTPs and/or platforms to deter or defeat an adversary. One drawback to design thinking is that there is insufficient guidance from the business community for non-designers in selecting, adapting, and using design tools and techniques to solve design challenges at hand; however, Defense Department contractors who would be the foremost experts on the subject could help the students overcome this obstacle.[63]

Officers could begin with small-scale military-centric problems and work with their professors to utilize design thinking to devise ways to resolve the challenge. Dilemmas would increase in difficulty as the quarter continues, culminating with an advanced exercise that requires officers to apply design thinking and work with operators to manufacture unique capabilities. Periodic feedback would be essential to note strengths and weaknesses and to understand how it will integrate with the other innovation theories.

Designerly Thinking

A close relative to design thinking, designerly thinking involves many of the same tenets but provides a well-defined framework to help decode enigmas. It is a theoretical structure that centers on wicked problems, abductive reasoning, and contextual meaning-making.[64] Designerly thinking attempts to make sense of wicked problems through a practice-based approach that results in new knowledge.[65] Furthermore, it attempts to understand why a problem emerged and what previous failed attempts to solve it can teach designers. The thought process also brings in multidisciplinary teams to draw on their experiences with design theory and practical application. Designerly thinking welcomes inputs from customers, users, and stakeholders to assist designers as a way to make the design process more efficient. As designers attempt to

62. David Dunne and Roger Martin, "Design Thinking and How It Will Change Management Education: An Interview and Discussion," *Academy of Management Learning & Education* 5, no. 4 (2006); and Roger Martin, "The Design of Business," *Rotman Management Magazine* 3 (2004).

63. Laursen and Haase, "Shortcomings."

64. Laursen and Haase, "Shortcomings"; Horst Rittel and Melvin Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4, no. 2 (1973); Lawson, *Designers*; and Nigel Cross, *Designerly Ways of Knowing* (Springer Verlag, 2006).

65. Richard Buchanan, "Wicked Problems in Design Thinking," *Design Issues* 8, no. 2 (1992); Bryan Lawson, *How Designers Think: The Design Process Demystified* (Architectural Press, 2006); and Klaus Krippendorff, *The Sematic Turn: A New Foundation for Design* (CRC Press/Taylor and Francis, 2006).

solve the problem through constant feedback, their responses to obstacles will often change to deliver positive results.[66]

The existing structure would likely offer students an easier starting point to fabricate answers to pressing military uncertainties more quickly. Officers could also take attributes from design thinking to inform their designerly thinking findings. The student's employment of the one would follow a similar path as the other, where they would start off small and eventually apply their learning in leading-edge training environments to offer recommendations to wicked problem sets.

Systems Thinking

Systems thinking enables people to see and talk about reality and better grasp how they can use everyday existing systems to improve the quality of life. Feedback is the bedrock of systems thinking as observations inform the system of how it is performing relative to the desired end state.[67] Such an approach would allow officers to take a different perspective and try to innovate within the residing military systems.

Within the systems thinking paradigm, a system's purpose is paramount. Students could choose a process that the military deems dysfunctional, such as acquisitions, and attempt to correct problems by dissecting the feedback loops to create "virtuous circles" which produce desirable results versus "vicious cycles" which seem to permeate many military processes. The students could also attend a vanguard exercise and deliberate with operators and support personnel on methods to increase novel efficiencies to promote quicker and more impactful feedback loops to generate better TTPs or platform utilization. Together with design thinking and designerly thinking, this approach offers a more holistic innovative structure for the students to construct distinct and effective operational lethality.

Lean Start-Up

Lean start-up is a methodology centering on nontraditional business models, foregoing in-depth planning in favor of experimentation. It does not rely on intuition but on customer feedback, and it pushes aside traditional "big design up front," to pursue iterative design. In lean start-up, individuals initially accept their process has various untested hypotheses. They then take their hypotheses and summarize them in a business model canvas, which graphically describes how a company creates value for itself and its customers. From there, they use customer development to test the company's hypotheses through asking potential clients for feedback on all elements of their proposed business model.

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66. Donald Schon, *The Reflective Practitioner: How Professionals Think in Action* (Basic Books, 1983); Lawson, *Designers*; Cross, *Designerly Ways*; Buchanan, "Wicked Problems"; and Pieter E. Vermaas and Udo Pesch, "Revisiting Rittel and Webber's Dilemmas: Designerly Thinking Against the Background of New Societal Distrust," *She Ji: The Journal of Design, Economics, and Innovation* 6, no. 4 (2020), https://doi.org/.

67. Kim, *Systems Thinking*.

Emphasizing dexterity and quickness, lean start-up uses Agile development and links this method up with customer development. The combination should help to eliminate wasted time and resources by seeking customer feedback, making iterative changes through an incremental process.[68] Lean start-up is an ideal method for joint innovation officers to use with commands in the earliest TTP and/or platform developmental stages. The officers could also apply lean start-up at exercises to discuss, analyze, and scrutinize operators' ideas.

All four approaches to innovation differ and complement each other enough to enable JDTS students an opportunity to take and leave the pros and cons from each and build their own hybrid methodology to foment innovation. Such methodology would then enable JDTS graduates to develop unique ways to spearhead innovation at the broader joint level.

Post-JDTS and the Joint Force

During JDTS and at their follow-on joint tour, joint innovation officers would attend and consult the most important exercises to drive TTP and platform evolution and revolution to remain militarily ahead of US peer competitors. The JDTS should situate the academic quarters to coincide with advanced joint military exercises to examine TTPs and capabilities. The students could hold design sessions with the participating units to dissect and refine these practices to discuss potential innovative methods to make their TTPs even more lethal.

After the students graduate and go to their payback tour, they could revisit these sessions to build on their previous years' efforts or choose a new direction to rectify emerging issues. Advanced military training exercises such as Red Flag, the Joint Interagency Field Experimentation, and Talisman Sabre are venues joint innovation officers could pursue to bring their design process to the forefront. The exercises operate in a joint and allied environment, which should drive the operators and support personnel away from the service-centric innovative TTPs and capabilities the joint force has witnessed since 2017.[69]

In the exhaustive debriefs after single training missions, joint innovation officers could collaborate with the operators and support personnel to walk through their various actions during the mission. In addition to ensuring the operators and support staff are focusing on utilizing joint innovative ideas, the officers could utilize their training to suggest unique improvements to the operators' TTPs in successive training missions. Their recommendations may also identify shortfalls in technology capabilities, thus enabling the services to pursue further requirements for more innovative platforms through the Joint Capabilities Integration and Development System.

68. Blank, "Lean Start-Up."

69. Kimberly Johnson, " 'Red Flag-Nellis' Intensive Fighter Training Underway in Nevada," *FLYING Magazine*, 16 January 2024, www.flyingmag.com/.

Working with units participating in the more complex and advanced exercises, joint innovation officers will further integrate the joint force for its fight against peer adversaries. By leading innovative small units and crews to change, these officers represent the key to the Defense Department innovating faster and cheaper to prepare for future wars, ensuring the US military retains its advantage wherever the joint force confronts US adversaries. Æ