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Navigating the Valley of Death: Lessons for Defense Acquisition from Transitioning Electric Vertical Takeoff and Landing Technologies in the United States Air Force

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Navigating the Valley of Death: Lessons for Defense Acquisition from Transitioning Electric Vertical Takeoff and Landing Technologies in the United States Air Force

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Abstract

The Department of Defense faces persistent challenges in transitioning emerging commercial technologies into military applications, often stalling in the "valley of death" between research and development and full-scale acquisition. This paper examines these transition barriers through the case of electric vertical takeoff and landing (eVTOL) technologies within the United States Air Force. Using a conceptual model, the study identifies four primary entry points—sponsored capability, small-scale purchase, prototyping, and experimentation—and six waypoints that facilitate transition. Analysis highlights common obstacles, including the "chicken and egg" problem of securing capability sponsorship, and emphasizes the role of flexible acquisition mechanisms such as Other Transactions, Commercial Solutions Openings, and procurement for experimental purposes. The case study of eVTOL technology demonstrates that small-scale purchases and iterative experimentation can serve as viable transition routes, even when immediate alignment with a defined capability gap is lacking. The paper concludes by outlining potential applications to support broader defense technology transitions and suggesting future research directions to extend the analysis. Findings derive from the RAND Project AIR FORCE report, Amping Airpower—Electric Vertical Takeoff and Landing for the U.S. Air Force.

Keywords: defense acquisition, technology transition, eVTOL, valley of death, Other Transactions (OTs), Commercial Solutions Opening (CSO), prototyping, experimentation, emerging technologies

Introduction

The Department of Defense (DoD) has long faced challenges in transitioning emerging technologies from research and development to a program of record. This transition gap, often known as the defense "valley of death," represents the period when promising technologies struggle to secure sustained funding, programmatic sponsorship, or integration into a formal acquisition pathway. The challenge is particularly acute for emerging commercial technologies that have potential military applications but lack clear alignment with an existing capability gap. Such applications often fail to progress beyond early-stage prototyping or limited operational experimentation, preventing the military from fully leveraging commercial innovation.

The problem is not new. Over the past two decades, numerous defense acquisition reform efforts have sought to accelerate technology transition, tailor risk tolerance, and create flexible mechanisms to onboard new commercial technologies. Provisions for Other

Transactions (OTs), Commercial Solutions Openings (CSOs), and procurement for experimental purposes have aimed to address these challenges. However, structural and institutional barriers—ranging from budgetary constraints to fragmented acquisition authorities—continue to impede the transition of emerging commercially developed technologies into deployment.

Research Problem: Transitioning Commercial Electric Vertical Takeoff and Landing Technologies

Electric vertical takeoff and landing (eVTOL) technologies offer a compelling case study of the valley of death in defense acquisition. Originally designed for commercial uses such as urban air mobility and logistics, eVTOL aircraft have potential to support a range of military missions, including personnel transport, logistics resupply, and medical evacuation.

While there is growing interest from the U.S. Air Force (USAF)—reflected in early experimentation efforts—no clear acquisition pathway currently exists for procuring these platforms for use in standard operations.[1] The primary acquisition challenges for integrating eVTOLs into USAF operations include:

- eVTOL technology does not align neatly with an existing operational capability gap, making it difficult to secure traditional programmatic sponsorship.
- Limited options without sponsorship, as traditional acquisition pathways are aligned with sponsored capabilities.
- Disincentives to sponsorship, including fixed budgets that prioritize current mission needs over emerging capabilities and the resource-intensive nature of pursuing capability sponsorship.
- Uncertainty in transitioning from experimentation to acquisition, even when early experimentation demonstrates operational potential, due to the absence of formal mechanisms supporting nontraditional acquisition paths.
- Limited influence on commercial design because the USAF is likely to remain a relatively small customer in the global eVTOL market and thus cannot easily shape platform development to meet defense-specific requirements (e.g., survivability, secure communications).
- Risks to supply chain security and reliability, as the eVTOL industry globalizes and production may shift outside the United States.

Purpose and Significance of the Paper

This paper examines the structural, policy, and acquisition challenges associated with transitioning eVTOL technology into the USAF. By analyzing existing transition routes—such as direct commercial purchases, prototyping, and operational experimentation—this paper develops a conceptual model for how emerging commercial technologies can navigate the valley of death. The findings are particularly relevant for defense policymakers, acquisition professionals, and industry stakeholders seeking to improve the military adoption of commercially developed innovations.

More broadly, this paper contributes to ongoing discussions about modernizing defense acquisition to better leverage the speed and innovation of the commercial sector. The case of eVTOL technology offers insights that may apply to other emerging capabilities.

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[1] RAND research to date does not recommend large-scale procurement of eVTOLs by the USAF at this time, given ongoing uncertainties regarding operational utility, defense-specific adaptation, infrastructure requirements, supply chain security, and long-term integration feasibility. See Mayer et al. (2023).

This paper derives from research commissioned by the Air Force Research Laboratory and was conducted within the Force Modernization and Employment Program of RAND Project AIR FORCE as part of a fiscal year 2021 project, “Leveraging Advanced Air Mobility for the Department of the Air Force.” The resulting report, *Amping Airpower—Electric Vertical Takeoff and Landing for the U.S. Air Force: Military Utility, Market Dynamics, and Warfighter Adoption*, is available online at: https://www.rand.org/pubs/research_reports/RRA1524-2.html.

Overview of the Paper

The remainder of this paper is structured as follows. The Policy Context section briefly presents prior research on technology transition challenges, relevant DoD policies, and historical case studies of commercial-military integration. The Conceptual Model of Transition Routes section presents a conceptual model for understanding different routes emerging commercial technologies can take to transition to operational deployment. The Application to eVTOL Technology section analyzes the application of this conceptual model to eVTOL, identifying key barriers and opportunities. The Extending the Analysis Beyond eVTOLs section 5 proposes potential applications to support broader defense technology transition and suggests avenues for future research to extend the analysis.

Policy Context

Unique Acquisition Challenges in Adapting Commercial Technologies

The DoD largely develops new military capabilities through a structured, multi-phase acquisition process. This traditional model emphasizes requirements-driven development, rigorous testing, layers of oversight, and long-term sustainment planning. While effective for major defense programs, this approach often struggles to integrate commercially developed technologies that evolve more rapidly and are driven by private-sector investment (Goldfeld et al., 2024).

Commercial technologies follow a different innovation pathway. Instead of being designed to meet military requirements from the outset, commercial innovations are developed to satisfy existing or anticipated market demand. The differences continue as idea becomes reality: defense acquisition tends to follow a relatively linear path from research and development to fielding with largely predictable but inflexible resourcing, while leading commercial practices feature iteration and more flexible resourcing that is often tied to progress (GAO, 2022).

Moreover, retrofitting commercial technologies to meet defense-specific requirements (e.g., survivability, secure communications) can be costly and time-consuming. These adaptation challenges are compounded by the fact that most government acquisitions are governed by statutes and regulations, such as the Federal Acquisition Regulation, that companies are not required to follow when developing for commercial markets. As a result, traditional acquisition processes often impose compliance burdens and procedural delays that many commercial developers, particularly nontraditional firms, are neither structured to meet nor incentivized to navigate (Mayer et al., 2020, pp. 5–8). The challenge for the DoD is determining how to effectively integrate these technologies without requiring full-scale, long-term acquisition commitments upfront.

Comparing eVTOL technology transition with other emerging defense technologies, such as hypersonics and autonomy, reveals distinct challenges and strategies. For example, hypersonic technology development has predominantly followed a government-driven model, with significant DoD investments directed toward research laboratories and defense contractors. This approach contrasts with the commercial market-driven development of eVTOLs, which necessitates different transition strategies. Similarly, autonomy applications tend to blend commercial innovation and defense interest, leading to initiatives that aim to bridge commercial solutions with military needs, such as those managed by the Defense Innovation Unit (DIU).[2] Understanding these varied pathways underscores the importance of tailoring acquisition strategies to the specific development and market contexts of each technology.

Key Statutory Mechanisms and Related Initiatives

Recognizing the challenges of transitioning commercial technology, Congress and the DoD have provided several mechanisms to support greater acquisition flexibility. Among the most significant are Other Transactions (OTs), the Commercial Solutions Opening (CSO) process, and procurement for experimental purposes, all of which can help bridge the gap between innovation and fielded capability by streamlining processes and enabling rapid experimentation and prototyping.

OT agreements allow the DoD to fund research, prototyping, and certain follow-on production efforts outside the traditional Federal Acquisition Regulation framework, enabling faster development cycles and closer collaboration with commercial firms that might otherwise be hesitant to engage in standard government contracting (DAU, n.d.-b). The CSO streamlines the process for DoD components to solicit and evaluate innovative commercial solutions (DAU, n.d.-a). This mechanism is particularly useful for identifying and testing emerging technologies before committing to large-scale acquisition. The DoD also has special authority to procure certain commercial technologies for experimental use, allowing operational units to test new capabilities in real-world conditions (DAU, n.d.-c).

The DoD has increasingly relied on these flexible funding mechanisms to accelerate the adoption of innovative technologies. For example, the DIU pioneered the use of CSOs to engage non-traditional vendors and has awarded 450 prototype OT agreements totaling $5.5 billion since its inception, with an average award time of just a few months (DIU, 2024, p. 14). Over 50% of DIU projects have transitioned to fielded technologies, demonstrating the efficacy of the CSO-OT combination in rapidly integrating commercial innovations into military applications (DIU, 2024, p. 14). The DoD (2023, p. 3) reports that from fiscal year 2017 to fiscal year 2022, the number of OTs awarded for prototype projects increased from 496 to 4,391, with total obligations increasing from more than $2.2 billion to nearly $10.7 billion. The report found that 92% of these transactions involved non-traditional contractors—companies that typically did not do business with the DoD—indicating success in attracting innovative commercial entities (DoD, 2023, p. 7).[3]

Within the Department of the Air Force, the Air Force Research Laboratory launched AFWERX to help integrate emerging commercial technologies into USAF and U.S. Space Force operations. AFWERX leverages partnerships with industry, academia, and government to accelerate innovation and streamline the transition of commercial solutions into military applications. Within AFWERX, the Agility Prime initiative focuses on advancing military applications of commercial advanced air mobility vehicles, including eVTOLs, by collaborating with industry to assess the technology and facilitating access to funding (AFWERX, n.d.).

Still, transitioning emerging commercial technologies remains challenging. This is particularly true in the case of eVTOLs, where barriers include misalignment with defined operational capability gaps, uncertainty in securing long-term programmatic support, hurdles in meeting both civilian and military certification requirements, and financial uncertainty among firms reliant on venture capital investment.

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[2] For further information about the DIU and its work related to autonomy, see DIU (n.d.).
[3] Mayer et al. (2020) provides an extensive review of the uses and challenges of OTs for prototype projects.

Lessons Learned from Prior Cases

Several prior cases illustrate that successfully integrating emerging commercial technologies into military applications requires a tailored approach that acknowledges the distinct origins and dominant markets of the technology. Programs such as Blue sUAS and Falcon 9 Spacelift, which originated in the commercial sector, face unique challenges when adapted to defense needs, such as aligning civilian certification standards with military requirements. By contrast, initiatives such as Palletized Munitions and the MQ-1 Predator, developed primarily within the defense community, have leveraged established military processes and warfighter input to iterate quickly and field effectively.

Across these examples, key takeaways include the importance of early operational experimentation, prototyping, and flexible funding mechanisms that enable iterative learning and adjustment. These insights provide valuable guidance for integrating other commercial technologies, such as eVTOLs, into the defense portfolio.[4]

Conceptual Model of Transition Routes

As part of its evaluation of eVTOL technologies for the USAF, RAND examined broader pathways for integrating emerging commercial technologies into military applications. Through discussions with DoD and USAF stakeholders, as well as an analysis of relevant policies and statutes, we developed a conceptual model that maps the prevailing routes available to the USAF for transitioning emerging commercial technologies to the warfighter (see Figure 1).

This model identifies four entry points to transition, represented by large arrows, with gray rectangular waypoints denoting specific actions that the acquisition system can take to mature and adapt technologies for military use. The model illustrates how these routes can be sequenced and iterated in different ways, depending on the alignment of the technology with an operational capability gap. Dotted lines indicate portions of routes where alignment with a defined capability gap has been established, while solid lines represent pathways that do not require such alignment but remain open to it. Ultimately, all routes culminate in deploying the technology to the warfighter, underscoring the model's focus on operational relevance and military utility.

[4] For detailed examinations of each case, see Goldfeld et al. (2024, pp. 131–138).

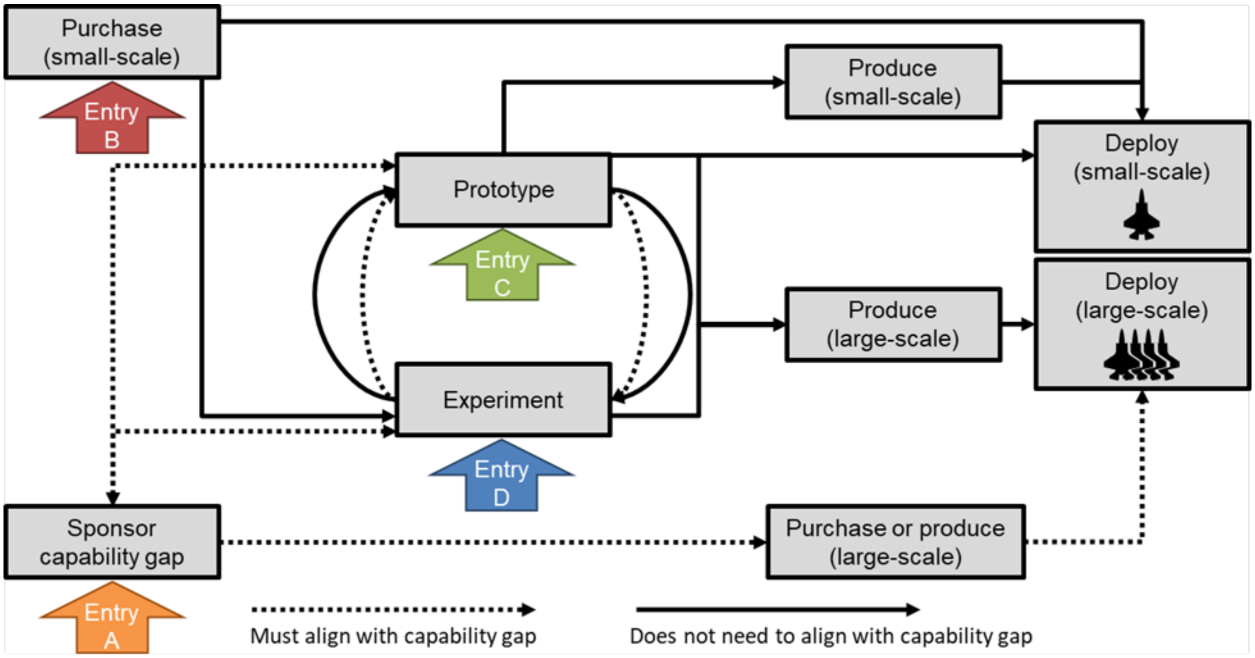

Figure 1. Possible Transition Routes for Emerging Commercial Technologies
(Goldfeld et al., 2024, p. 81).

Figure 1 illustrates that technologies can follow different transition routes and that these routes can be iterated based on feedback or real-world observation. For example, a technology entering via small-scale purchase (Entry B) might first be tested in a limited operational setting. If successful, it could then loop back to secure capability sponsorship or move forward to production and deployment.

Entry Points

Four entry points represent the main starting points from where emerging commercial technologies can begin their transition into military use. Each entry point offers distinct advantages depending on the technology's maturity, alignment with operational needs, and acquisition processes.

A major command (MAJCOM) or USAF organization with equivalent acquisition authority can pursue any route shown in the figure. USAF organizations subordinate to a MAJCOM (e.g., a USAF base) are limited to starting at Entry B, Entry C, or Entry D.

Sponsored Capability Gap (Entry A)

This entry point is used when a technology directly aligns with an existing or potential capability gap. A USAF MAJCOM or organization with equivalent acquisition authority sponsors the technology, enabling its progression through established acquisition pathways.

Small-Scale Purchase (Entry B)

A technology entering at this point is acquired through a limited commercial purchase. This allows for initial operational testing or limited deployment, particularly when the technology has not yet been tied to a validated capability requirement.

Prototyping (Entry C)

The technology is developed into a preliminary model with defense-specific modifications. Prototyping serves as a means to validate technical feasibility and operational potential before committing to larger scale production.

Experimentation (Entry D)

This entry point involves testing the technology under operational conditions without an immediate commitment to full-scale procurement. Experimentation, often carried out through partnership agreements, can be instrumental in demonstrating value and refining requirements.

Six Key Waypoints

The model also identifies six types of waypoints that represent sequential or iterative actions a technology can pass through as it transitions to the warfighter. Several of these waypoints can also serve as entry points, described above.

- **Prototype.** The technology is designed and built as a physical or digital working model. This waypoint tests basic functionality and potential for adaptation to military needs and full scale production.
- **Experiment.** The technology is subjected to operational testing in controlled or real-world environments. This helps determine if the technology meets performance expectations and operational requirements.
- **Sponsor Capability.** At this waypoint, the technology is presented to a sponsoring organization (e.g., a MAJCOM) to secure programmatic support. This step is critical for ultimate integration into the defense acquisition system.
- **Purchase.** The technology is acquired by buying, leasing, or contracting for it as a service. Small-scale purchases provide an initial testbed for further evaluation. Large-scale purchases must align with a capability gap.
- **Produce.** This waypoint involves engaging with the vendor(s) to scale up production with defense-specific modifications. It can follow successful prototyping or experimentation. Successful prototype OT projects, in particular, can use a streamlined follow-on production process authorized at 10 U.S. Code § 4022(f).
- **Deploy.** The technology is fielded for operational use. Deployment can occur at a small scale, with potential for large-scale adoption once operational value is clearly demonstrated.

Analysis of Routes and Barriers to Transition

This model reveals several useful insights. First, emerging commercial technologies face many barriers to successful transition. USAF acquisitions traditionally begin with a sponsored capability (Entry A). However, as in the case of eVTOL, some commercial innovations do not (yet) align with a capability gap, creating numerous disincentives to MAJCOM or equivalent sponsorship. This can create a “chicken and egg” problem; it can be difficult to obtain capability sponsorship without having first demonstrated value through experimentation, but it can also be difficult for emerging commercial technologies to access experimentation without alignment to a sponsored capability. Second, lacking a sponsored capability closes off several routes (i.e., all of the dotted lines in the figure). Absent a sponsored capability, remaining transition routes begin with a small-scale commercial purchase (Entry B), prototyping (Entry C), or experimentation (Entry D). In addition to MAJCOMs, subordinate organizations (e.g., USAF bases, wings) can use these routes, likely concluding with small-scale deployment (e.g., fielding a commercial technology at one base).

Another important insight involves how prototyping and experimentation are critical waypoints in a number of transition routes. They are central gateways that can unlock additional resources to bridge the defense valley of death, especially in cases that do not align with a sponsored capability. They are also versatile activities that—among many other virtues—can demonstrate operational relevance, validate a technology's scalability, and accommodate the speed and culture of innovation enterprises.

Working through this model also illuminates the value of mechanisms such as OTs, CSOs, and procurement for experimental purposes. Prototype OTs are the only such mechanism for large-scale production that do not require capability sponsorship (i.e., through a follow-on production OT). As a result, the routes and mechanisms available to achieve large-scale deployment are significantly limited for emerging commercial technologies that cannot garner capability sponsorship.

Application to eVTOL Technology

Current State of the eVTOL Market and Military Relevance

The eVTOL market is rapidly evolving, driven by advances in distributed electric propulsion and improved battery technologies. Commercially, eVTOL aircraft are positioned to transform urban mobility and logistics by offering faster, more efficient transportation solutions. The technology has attracted significant investment and has moved from early-stage prototypes to companies nearing commercial production.[5]

For the military, eVTOLs offer potential advantages such as rapid personnel transport, agile logistics support, and emergency medical evacuation in austere environments. While current publicly available data on eVTOL performance in military contexts is still emerging, preliminary figures indicate promising cost and performance metrics. Early estimates provided by Goldfeld et al. (2024, p. 95) indicate that operating costs for eVTOL aircraft could range between $8.50 and $13.51 per nautical mile—substantially lower than conventional aircraft such as C-130s ($20.90 per nautical mile) and C-17s ($39.20 per nautical mile). Independent analyses and projections from eVTOL manufacturers also suggest that, when produced at scale, these aircraft could be significantly cheaper to acquire and operate than traditional helicopters (Goldfeld et al., 2024, p. 15). Initial flight test data indicate that eVTOLs can achieve competitive endurance and payload capacities for short-range missions. However, comprehensive operational testing at military facilities is needed to validate these figures and assess factors such as maintenance turnaround times, reliability, and real-world mission adaptability. Furthermore, the technology's commercial origins mean that eVTOL systems are not natively designed for military operations and might need to incorporate defense-specific adaptations.

Why eVTOLs Do Not Fit Neatly into a Sponsored Capability Approach

Despite interest from the USAF—as exhibited by the Agility Prime effort—no clear acquisition pathway exists for fully integrating these eVTOL platforms into operations. The primary challenge is that eVTOL technology does not align neatly with an existing operational capability gap, making it difficult to secure long-term programmatic backing. Critically, Goldfeld et al. (2024, p. 44) finds no MAJCOM that "appeared willing to sponsor a capability requirement that could lead to the development or acquisition of eVTOL aircraft." While some expressed interest in the technology's long-term potential, they expressed a desire to wait for improvements in range, payload, and maturity before considering formal sponsorship.

[5] For examples and current news, see Vertical Flight Society (2025).

Several structural factors complicate this challenge. Although Agility Prime has enabled early experimentation with eVTOLs, transitioning from experimentation to a formal program of record remains uncertain due to the absence of a sponsoring organization. Without formal sponsorships, access to traditional acquisition pathways is severely limited. Furthermore, the USAF's ability to shape these platforms to meet defense-specific needs is also constrained by its relatively small share of the commercial-dominated market. As predominantly commercial technologies, eVTOL platforms must simultaneously meet civilian airworthiness standards and defense-specific performance standards, adding cost and complexity. Finally, many eVTOL firms rely on venture capital investment and anticipate globalization of the industry, which introduces risks related to long-term financial stability and the resilience and security of future supply chains.

These factors collectively underscore the difficulty in applying a sponsored capability approach to eVTOL technology, highlighting the need for alternative, flexible transition routes.

Feasible Routes for Transitioning eVTOL Technology

Given the barriers to transitioning eVTOLs through a sponsored capability, alternative transition routes become more attractive. Our conceptual model readily identifies two such alternative routes as particularly feasible and useful for eVTOL technology. Neither route requires immediate alignment with an existing capability gap.

The first begins with Entry B, in which a MAJCOM or subordinate USAF organization could buy, lease, or acquire as a service a modest number of eVTOLs for operational testing, which occurs at the "Deploy (small-scale)" waypoint. This route allows the USAF to evaluate the technology's performance in real-world conditions without committing to large-scale production. By purchasing a few units, the USAF can gather valuable operational data, assess the aircraft's suitability for various missions (e.g., base security, intra-base transport), and determine what modifications might be needed for broader deployment. The test results could then be used to inform next steps including resuming at Entry A, C, or D with the intent to deploy at large scale.

Alternatively, Entry D could be used, in which a MAJCOM or subordinate USAF organization could begin by partnering with industry to conduct experimentation without initially purchasing any platforms. Through partnership agreements, the USAF can conduct operational tests and simulations using eVTOLs. This method allows for iterative learning, where feedback from live exercises and controlled tests can inform subsequent decisions. Experimentation provides a low-risk environment to validate the technology's potential benefits and understand its limitations. Such approaches have been successfully used in other cases where emerging commercial technologies were evaluated before full-scale adoption. The results could unlock additional waypoints including capability sponsorship, defense-unique prototyping, and production for large-scale deployment.

By leveraging either of these two transition routes—small-scale purchase or experimentation—the USAF could build a practical evidence base to support future capability sponsorship and large-scale deployment. These approaches allow for incremental investment, reducing the risk associated with adopting unproven commercial technologies, while also providing flexibility to adapt as the eVTOL market and technology mature.

Extending the Analysis Beyond eVTOLs

A more detailed comparison of successful and unsuccessful commercial technology transitions using these mechanisms could further strengthen the analysis and potentially support generalization beyond eVTOL technologies. Additional empirical evidence is needed to evaluate the record of using routes involving small-scale purchase, prototyping, and experimentation to bridge the valley of death. Such comparative and empirical analyses could provide valuable guideposts and underscore the potential for eVTOL technologies, as well as other commercial innovations, to follow similar transition routes.

Role of Flexible Mechanisms and Iterative Feedback in Overcoming Transition Barriers

While the valley of death is littered with transition failures, the conceptual model presented in this paper suggests that emerging commercial technologies do have a number of routes for safe passage. Choosing the right one may not be sufficient, but it greatly increases the prospects for success. Key strategies for defense organizations to help navigate transition include:

- **Small-Scale Purchase and Incremental Acquisition:** Defense organizations can initially acquire a limited number of commercial innovations to conduct operational testing and gather real-world data. This approach allows for technology assessment and potential modifications without initially committing to a full-scale program of record.
- **Leveraging Flexible Acquisition Mechanisms:** Utilizing OTs and CSOs enables a more adaptive and streamlined acquisition process. These mechanisms support faster prototyping and experimentation and, under certain conditions, can facilitate large-scale production without necessitating capability sponsorship.
- **Partnership Agreements for Experimentation:** Collaborating with commercial providers through partnership agreements allows for iterative testing and continuous feedback. This minimizes upfront costs and supports defense-specific modifications as the technology evolves.
- **Iterative Experimentation:** Defense organizations can validate technology performance through small-scale experimentation, refining both the technology and operational concepts. This can also build an evidence base for future capability sponsorship.
- **Adaptive Prototyping:** Supported by flexible mechanisms such as OTs, adaptive prototyping develops defense-specific versions of commercial technologies. Real-world feedback during each iteration helps reduce risks associated with transitioning technologies into operational use.
- **Flexible Funding and Contracting Approaches:** Incremental funding based on demonstrated milestones manages the risks of adopting unproven technologies. This approach aligns resource allocation with the technology’s maturity and performance.
- **Pilot Programs:** Implementing pilot programs to test commercial technologies in operational environments provides important data on performance and integration. These pilots can serve as a steppingstone to larger-scale acquisition once value is demonstrated and necessary modifications are identified.

Future Research Directions

While flexible acquisition mechanisms such as OTs and CSOs have gained traction, defense organizations will face increasing pressure to ensure that such tools are effectively used to transition emerging commercial technologies. As commercial innovation continues to outpace defense-led development, the DoD will increasingly need to find agile, risk-tolerant routes and mechanisms for integrating capabilities that are not initially designed with military use in mind. The failure to identify workable routes and mechanisms for transition—particularly for technologies such as eVTOLs that originate in fast-moving commercial markets—poses a significant risk to maintaining operational advantage.

The conceptual model presented here, while preliminary, offers a starting point for understanding how such transitions might be structured. Further research is needed to validate and refine this framework, identify additional enabling mechanisms, and anticipate the pitfalls that may arise when adapting informal or nontraditional pathways. If the DoD is to remain competitive in the face of evolving threats and technological disruption, acquisition organizations must develop and test new approaches for bringing commercial innovation into the defense enterprise, including potentially revolutionary technologies that will only materialize if institutions are willing to experiment and accept higher levels of risk. Specific research areas include:

- Examining the long-term benefits and challenges of small-scale purchases and experimentation can inform technology transition decisions and potential reforms to acquisition frameworks.
- Analyzing the application of OTs and CSOs across various technologies could reveal best practices and enhance transition performance.
- Identifying practices and processes to support deeper collaboration in technology transition between interested defense organizations, their DoD counterparts, and industry stakeholders.
- Exploring different possible transition routes and supporting mechanisms for emerging commercial technologies could further refine the conceptual model and provide a more complete decisionmaking picture.
- Tailoring transition routes and supporting mechanisms to different defense organizations' specific objectives, internal processes, and external relations might provide more value to individual decisionmakers while identifying more universal conclusions.
- Investigating approaches the Office of the Secretary of Defense or the Department of the Air Force could develop (e.g., new mechanisms, organizational changes) to mitigate barriers that existing pathways and approaches do not address.

Bridging the valley of death for eVTOL and similar technologies can necessitate a shift from traditional acquisition processes to more flexible, adaptive strategies. Illustrating how these strategies can be implemented in various ways, such as through the conceptual model presented in this paper, raises awareness among defense organizations about the many routes available to harness the potential of emerging commercial technologies.

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