Research Report

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Small Uncrewed Aircraft Systems (SUAS) in Divisional Brigades

Options to Improve Acquisition and Accountability

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About This Report

This report documents research and analysis conducted as part of a project entitled *Unmanned Aircraft Systems (UAS) to Support Fires at Division, Brigade Combat Team (BCT), and Battalion*, sponsored by XVIII Airborne Corps. The project assessed the implications of integrating additional Group 1 and 2 uncrewed aircraft systems (UASs) for reconnaissance, fires and other purposes below the division echelon. It derived implications for institutional and unit training and training support, as well as other institutional functions needed for success, such as how small UASs (SUASs) are acquired and accounted for, and support functions needed for large scale combat operations (LSCO) with a peer competitor.

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Summary

The Commanding General of XVIII Airborne Corps wants units in the Corps to be able to dramatically expand their use of UASs and especially SUASs. To make this happen, the Army will need to overcome a number of barriers in Joint and Army regulations, policies, and practices that govern the acquisition of SUASs, and the management of their accountability in Army inventories and property books. This report summarizes what we have learned about these issues in our discussions of options to expand Army use of SUASs. It gives special attention to potential use of SUASs by XVIII Airborne Corps but imagines expanded use throughout the Army. The following key findings emerged from our analysis.

- The U.S. Army is likely to use and to lose many SUASs in multiple echelons in future dynamic, unpredictable military engagements. The Army will need to prepare its soldiers with broad and deep unit training on how to use SUASs effectively and adaptively in such circumstances.
- In such a future, the Army will need an ability to mix and match the components and payloads of SUAS to meet mission requirements and to replace them quickly when they are lost.
- To prepare for such a future, the Army will need to tolerate higher levels of loss and damage of its SUASs in training to motivate full-spectrum unit training in their effective use. An important part of this increased tolerance is likely to be a change in the application of its Financial Liability Investigations of Property Loss (FLIPL) program to recognize the high value to the Army of such training relative to the cost of loss or damage of SUASs during training.
- To prepare for such a future, the Army should, where possible, acquire SUASs by using the agile pathways offered by the Adaptive Acquisition Framework (AAF) and agile methods like those used in the Army's Rapid Capabilities and Critical Technologies Office, other transaction authority (OTA) acquisitions, and commercial solutions openings (CSOs).
- In this setting, commercial SUAS systems and components offer the Army many advantages relative to their government-developed counterparts.

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It focuses on Group 1 and 2 UASs (small UAS, or SUAS). Group 1 SUASs have a maximum gross takeoff weight of less than 21 pounds, normally operate at less than 1200 feet above ground level and have an airspeed of less than 200 knots. Group 2 SUASs have a gross takeoff weight of 21 to 50 pounds, normally operate at less than 3,500 feet above ground level and have an airspeed of less than 250 knots (U.S. Army UAS Center of Excellence, 2009, p. 12). It considers SUASs currently in the fleet (for example, the RQ-11B Raven) and other aircraft developed by the Government or by commercial sources.

The research team used two main methods: interviews and review of applicable literature. Interviews focused on experts from XVIII Airborne Corps divisions and experts in the acquisition process and property accountability. The literature review focused on lessons from the Russo-Ukrainian War, recent changes to the acquisition process, and Army policy on property accountability.

The report begins with brief background material on issues salient to rapid expansion in Army use of SUASs. It then reviews the configuration of SUASs and its relationship to the operational missions where the Army might use SUASs in the future. SUASs can potentially be acquired and managed as a system of subassemblies that come from different traditional defense contractors or commercial sources. It then addresses the challenge of accountability for SUAS systems and subassemblies in the Army inventory as they are used in unit training and in active military operations. Finally, given how the Army chooses to manage these items in its inventory, it addresses challenges associated with the acquisition of SUAS systems and subassemblies.

Background

The following background items are germane to defining and implementing policies that could help units in the XVIII Airborne Corps and the rest of the Army train on and operate SUASs in a manner that will make them the best in the world at it.

Intelligence and reporting from the Russo-Ukrainian war clearly indicate that both the Russians and the Ukrainians are using large numbers of SUASs and daily losing large numbers of those used in the normal course of combat. Both sides are rapidly adapting how they use their SUASs as they learn from their enemy's responses to their own tactics, techniques, and procedures. In the future, the U.S. Army can expect to use and lose a large number of SUASs in combat, to use them routinely as part of their operations at multiple echelons, and to change their demands for SUAS capabilities frequently as a combat engagement continues. Such high-usage and agile operations will require routine and wide-spread use of SUASs in unit training at home stations, at brigade training centers, and during rotational deployments.

Interviews with commanders and other leaders across the Corps have indicated that the loss of or damage to SUASs during unit training can often provoke investigations that consume unit leadership time and potentially impose significant financial penalties on soldiers training to use SUASs (Army Regulation [AR] 735-5, 2024; AR 15-6, 2016) and those who are accountable for them. According to many soldiers interviewed for this project, the threat of an AR 15-6 investigation and resulting FLIPL action if an SUAS is lost has become an effective deterrent to their extensive use in unit training. This administrative response to SUAS losses during training will likely need to change to allow the depth and breadth of training that Army units will need to prepare for expanding use of SUASs in combat.

The recently released *Capability Development Document* (CDD) *for the Family of Joint Small Unmanned Aircraft Systems* documents predictable tension between the goals of, on the one hand, uniform standards applied to SUASs across DoD and the forces of our allies and, on the other, an ability to innovate rapidly as the threats that the Army faces change, particularly in active deployments (Joint Requirements Oversight Council, 2023). The CDD calls for a Joint Reference Architecture (JRA), a Joint Management Office (JMO), and Joint Governance Board (JGB), all designed to sustain joint standards for Joint SUAS interoperability; system integration; government standards for artificial intelligence (AI) and machine learning (ML) algorithms; open payload architecture; zero trust cyber security protocols; interoperability for networked human-machine collaboration, communication, and command and control; and the logical electrical and mechanical interfaces among systems, controllers, and mission payloads. (p. iii). Simultaneously, the CDD characterizes itself as a "base CDD" that the Army (and other components) will add to with annexes "to provide maximum flexibility in the pursuit of both Joint and individual Service requirements" (Joint Requirements Oversight Council, 2023, p. iii). As the application of this CDD proceeds, the Army leadership will need to remain alert to the importance of not allowing perfection in interoperability to get in the way of agility and innovation in SUAS systems and tactics, techniques, and procedures, especially as the threat naturally evolves during active deployments.

Choosing Configurations of SUASs

An SUAS can be viewed as a modular system of components that include a basic aircraft vehicle; a power source (electric or fuel); utility electronic systems that facilitate communication, navigation, targeting, etc.; sensor, explosive, or other payloads; and a ground control system. Users can mix and match components to customize UAS systems to specific missions in either of two ways. First, they can order systems with different mixes of components installed at the factory. Second, if they buy systems and components designed to work in an open architecture, they can trade components in and out of systems in the field to assemble SUASs customized to specific missions. The system as a whole or each of its component parts can come from government-developed or commercial sources. Elements of the Army can in principle acquire them in either configuration. The best approach will depend on the anticipated mission for a particular SUAS and will involve an assessment of tradeoffs among competing priorities.

Currently there are two ways SUAS can come into the force structure:

1. Directly purchased with Operations and Maintenance, Army (OMA) funds either through a commercial vendor or, more desirable, using a program like Blue UAS.[1]
2. Through a government-developed program of record (POR).

An SUAS system coming through a POR would be part of a unit's modified table of organization and equipment (MTOE) document and would be considered a Class VII inventory item and carried on the property book for an Army organization.[2] By comparison, direct purchases using OMA funds could be a nonexpendable field level repairable Class II item. These also would be carried on the property book but would not be part of the MTOE. In either case, the SUAS system, particularly if commercial, could be defined as made up of rather inexpensive, expendable Class IX components that can be maintained at the field level (i.e., without depot maintenance).[3] And, of course, any lethal payloads would be Class V and managed accordingly.

Among the components in an SUAS system, the ground control station is the least likely to be lost or damaged and so it should carry the serial number that is maintained on the property book. By comparison, the aircraft vehicle and associated components (to include modular payloads) are the components most likely to sustain loss or damage (e.g., due to a rough landing or a complete loss or failure to return). The SUAS may be acquired in a standard configuration of aircraft vehicle, communication system, and power source. Modular pay loads would show much more variability mission to mission and could be purchased separately (e.g., 4K video camera).

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[1] The Blue UAS effort, started in 2020, "rapidly vets and scales commercial uncrewed aircraft system (UAS) technology for the Department of Defense (DoD). This program … maintain[s] … a robust roster of policy approved commercial UAS to meet the diverse needs of DoD users." - Defense Innovation Unit, undated.

[2] Class VII of supply covers "major end items such as launchers, tanks, mobile machine shops, some parachute systems and vehicles" (ATP 4-42, 2020, Appendix A).

[3] Class IX of supply covers repair parts and components to include kits, assemblies, and subassemblies (repairable and non-repairable) required for maintenance support of all equipment" (ATP 4-42, 2020, Appendix A).

Beyond the ground control station and initial UAS system purchased, additional components and modular payloads could be maintained with inventory levels (e.g., a reorder point) in the supply system (versus the property book). The inventory levels would be set to support the ability of the unit to generate missions and reflect expected loss rates during the initial stages of a deployment. Inventory levels for SUAS components and modular payloads could be maintained in either the supply support activity (SSA) or in unit shop stock. The SSA inventory is a central source for the brigade combat team (BCT) and is owned by the Army working capital fund (AWCF). By comparison, inventory in unit shop stock is OMA funded.[4] The Army's inventory management system would generate purchase requests for additional components and modular payloads as SUAS missions generate losses. The approach of tracking the SUAS system via the ground control stations and making all other SUAS components and modular payloads Class IX parts would be easier for commanders to implement for less expensive commercial systems (e.g., Blue UAS). To increase the feasibility of this approach for more expensive or sensitive modular payloads, a less expensive training version could be developed with similar weight and flight characteristics. This would likely be essential for training with lethal payloads.

The potential for field level repairs to better meet a surge in demand for missions in a high intensity training event, rotational deployment, or combat deployment would be desirable. Field level repairs would likely be limited to snap-off/snap-on and battle damage assessments and repair (BDAR) performed at either the forward unit (include the operator or forward support company [FSC]) or brigade support battalion (BSB) field maintenance company in a BCT. The latter is equipped with the metal working and machine shop set type 2 (MWMSS-2) which includes two 3D polymer printers among other capabilities which could be leveraged to keep aircraft vehicles operational by printing simple components of the aircraft vehicle (e.g., a truss, wing, or propeller). The 3D polymer printers could also allow soldiers to design and then quickly produce prototype components to test new applications of SUASs in the field. However, the high loss and damage rates of SUAS-related components/payloads suggests sustaining SUAS missions will also require appropriate inventory levels supported by larger-scale production capabilities maintained and operated outside the battle space.

The requirements defined for Group 1 and 2 SUASs in the recently issued Joint SUAS CDD by definition focus on government-developed systems. The CDD sets demanding requirements that are likely to increase the cost of new units and delay the date at which they will become available (Joint Requirements Oversight Council, 2023). The requirements are also likely to increase the importance of controlled inventory items (CIIs)[5] among the components on an

[4] Unit shop stock would be the location for sUAS components for sUAS purchased with OMA funds (e.g., commercial sUAS or Blue sUAS purchased off the U.S. General Services Administration [GSA] schedule).

[5] These include items that are classified, sensitive, controlled by statute or regulation, high-value, highly technical, hazardous, or pilferable. For example, some modular payloads may be Class IX, but not expendable because they incorporate signals intelligence (SIGINT), military intelligence (MILINT), Global Positioning System (GPS), or

SUAS. These factors suggest considering alternatives to new government-developed SUASs, especially when commercially developed SUASs are readily available to support an anticipated mission.

Commercial systems and components are likely to be lowest cost and likely to be available most quickly.[6] They should be vetted by the Defense Innovation Unit (DIU) or some other technical agency to verify that they are compatible with DoD policies and standards and added to the Blue UAS list.[7] If many mission options are likely, the modularity of an SUAS should be assessed to verify that it can swap out components to support relevant missions. Also, the Blue UAS list should be expanded to include qualified components and modular payloads needed to support high volume mission generation.

It is desirable to choose a ground control station that is compatible with many different types of SUASs to limit the cost of training and the cost of procuring inventory for the control station. The choice of a ground control station would be driven more by such commonality across systems than by concerns about its loss or damage.[8]

Managing SUASs in the Force with High Attrition Rates

Suppose that an SUAS-related item is lost or damaged during training or deployment. The Army wants to know how it happened. Was a specific individual negligent? Did the individual commit willful misconduct? Did that behavior lead directly to the loss or damage? That is, was it the proximate cause of the loss or damage? If someone acted negligently and his action led to a loss or damage, the Army can find that person accountable for the loss or damage. The Army can ask for reimbursement, at least up to some fraction of the individual's Army pay. In addition, the Army can take other administrative actions that could affect the individual's current status and future in the Army.

The Army has tools in place to oversee soldiers who cause materiel losses and damage. Army Regulation (AR) 735-5 (2024) requires the Army to "initiate and process a financial liability investigation of property loss (FLIPL) to account for lost, damaged, or destroyed Government property." This includes the SUASs at company-level in the Army (RA-11 Ravens) and for many soldiers may include the smaller SUASs that are being fielded to platoons (the Skydio X2D in late 2023). When such losses occur, a FLIPL starts a multistep administrative process

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other sensitive technologies. Commanders would have to manage the FLIPL process if there is attrition of these modular components, as accountability would require these sensitive payloads to be returned to the supply system, if only to be demilitarized. For details, see AR 735-5, p. 181.

[6] Putney and Ellinger (2025) provides a market survey of commercial systems available in the market today. The apparent prices for these systems tend to be significantly lower than those that the U.S. government pays for UASs with similar capabilities.

[7] DIU charges for their vetting of platforms and the Army would not control its schedule or priorities. As a result, it may want to establish the ability to perform similar vetting to facilitate the rapid fielding of new sUAS.

[8] The Army is now pursuing a common ground controller for all sUASs.

that takes up to 15 days to set up, 30 days to investigate, 10 days to get legal review and senior-level approval, and 30 days to notify an individual that she or he has been found responsible for a loss and then pass the case to finance and accounting to get this individual to pay for the loss. More time is required if the individual appeals such a finding. The process consumes the time of senior Army personnel and disrupts any efforts required to repair a damaged item and return it to service. It also deters units from training on SUAS for fear of a finding that would make unit commanders and operators financially liable.

AR 735-5 addresses the calculation of the dollar value of a materiel loss or damage and provides a procedure for assessing negligence and proximate cause associated with losses. The Army uses an official DD Form 200 to track the progress of an AR-735-5 investigation and record its findings, recommendations, and the final decision of an "authorizing authority."[9] AR 15-6 (2016) offers broader guidance on administrative procedures that can lead to additional adverse outcomes for an individual found to be negligent. Both regulations operate outside the formal bounds of the Uniform Code of Military Justice. They are less formal than strictly law-based procedures. But both rely on lawyers and legal-like rules and proceedings.

Army administrative proceedings can occur under either regulation without the other, but they often become entangled. For example, AR 735-5 requires the application of AR 15-6 arrangements when certain types of critical or high-cost items are lost or damaged. These include explosives, cryptographic devices, and electronic navigation devices that might be used in conjunction with an SUAS (AR 735-5, Sec. 5-3). An AR 15-6 proceeding can morph into an AR 735-5 investigation when a loss comes to light and the Army needs to determine whether an individual should reimburse the Army for that loss (AR 735-5, Sec. 6-3). Elements of both can proceed together as the Army works through the implications of a single situation associated with the use of an SUAS in training or combat.

As noted above, our interviews indicate that, because company, battery, and other troop commanders do not want to face an AR 15-6 investigation and then be found liable for financial losses during unit training under AR 735-5, some units in XVIII Airborne Corps have been reluctant to use SUASs in training. Experience from the Russo-Ukrainian war indicates that SUASs can generate high value in combat by limiting friendly casualties and by increasing accuracy of targeting, providing valuable intelligence, or engaging a target. For example, at the beginning of this study in October 2022, XVIII Airborne Corps soldiers estimated that UASs identified eighty percent of the indirect fire targets identified by Ukrainian forces in their conflict with Russia. The value is high enough to justify employment of SUAS in ways that lead to high loss and damage rates. This approach is justified in part by the low cost of the SUASs used in Ukraine. But the high value of the benefits of SUASs would justify the employment tactics even if the SUASs cost more. To encourage realistic training, XVIII Airborne Corps will need to anticipate and accept loss and damage to SUASs during training missions. The current FLIPL

[9] For a list of its contents, see App. C-3 in AR 735-5.

process will need to be adjusted to account for the high value in future combat operations when considering the liabilities associated with loss and damage.[10] The Army should also work to reduce the unit cost of SUAS and SUAS components, thus making FLIPL actions uncalled for in some cases. It is also important to note that adjusting FLIPL processes does not imply that XVIII Airborne Corps should not properly account for SUASs. Rather, these processes should balance the risk of training losses with the high benefit of proficiency in combat that can only come through realistic training.[11]

If XVIII Airborne Corps chooses to use SUASs in a way that leads to high attrition rates, it should, to the full extent possible, treat the components of SUASs as expendables when creating policies for managing SUAS components. Moving toward SUASs composed of low-cost, Class IX components, as described in the prior section, can limit the need to initiate FLIPLs when systems or components are lost, are damaged, or destroyed unless "negligence or willful misconduct is suspected as the cause" (AR735-5, Sec. 5-3 (1)). As only the SUAS system tied to the ground control station is carried on the property book, the Class IX components that are not depot-level reparable can be treated as expendables. This should include all the components for a commercial SUAS system. If they are not too costly, their loss or damage during training or military operations need not initiate a FLIPL investigation unless they are Controlled Inventory Items (CIIs). Also, training versions of some payloads (particularly CII and lethal) would assist in reducing the need for FLIPLs and increase the use of SUAS in more realistic training.

AR 735-5 and AR 5-6 investigations are designed to proceed in tandem as follows. Citations in this discussion are all from AR 735-5.

"A DD Form 200 documents the circumstances concerning the loss or damage of Government property and serves as, or supports a voucher for adjusting the property from accountable records. It also documents a charge of financial liability assessed against an individual or entity or provides for the relief from financial liability." (Sec. 5-2)

A "responsible officer or reviewing authority"—normally, the relevant "organization commander/activity supervisor, the APO [accountable property officer], or the individual with the most knowledge of the incident"—initiates a DD Form 200 and makes "the determination if negligence or willful mis-conduct [sic] is suspected." (Secs. 5-6, 5-10) He or she makes "recommendations to assess or relieve from liability and whether further investigation is required or the provided exhibits are sufficient for the approving authority to make a decision." (Sec. 5-10)

[10] The proponent agency for AR 15-6, the Office of the Judge Advocate General, has the authority to change this regulation. Headquarters, Department of the Army (DAJA-AL), Washington, D.C.

11 A detailed effort to balance risk would require estimates of the potential costs from training losses with the gains to be made through realistic training. Since realistic, rigorous training using sUAS is currently very difficult to plan and do as outlined in the training volume of this series of reports (see Phillips et al., 2025), good estimates of costs will need to be developed as training becomes more realistic.

The "responsible officer or reviewing authority forwards the FLIPL to the … approving authority." (Sec. 5-12). The approving authority determines whether "sufficient information exists to provide a clear understanding of the circumstances surrounding the loss or damage of government property (GP) and to determine the proximate cause … [and whether] the expense of performing an investigation by a financial liability officer is worth the significant expenditure of time and effort' of doing so." (Sec. 5-20). The approving authority may delegate these responsibilities to an appointing authority. (Sec. 5-19). If additional investigation is required, an AR 15-6 investigation begins. If financial liability is recommended, a financial liability officer may be assigned. (Sec. 5-17)

AR 15-6 is deliberately written in more general terms than AR 735-5 so that it can address a much wider range of misconduct. In addition to "unit property losses," examples include "adultery," "hostile work environment," and "equal opportunity complaints" (Jordan, 2021). And AR 735-5 gives more attention to how the Army might find that an individual acted negligently and became the proximate cause of the loss of or damage to an SUAS. By applying the logic that AR 735-5 describes to the circumstances in which a soldier uses an SUAS in training or deployment, XVIII Airborne Corps could clarify when the Army's use of an SUAS in pursuit of its mission is consistent with finding an individual soldier responsible for a loss or damage to the SUAS. Greater clarity could increase the Army's tolerance for loss and damage to SUASs in training and deployment and thereby make it easier for its personnel to feel free to use SUASs in training and deployment. It could also help the Army clarify its tactics, techniques, and procedures (TTP) for SUASs in ways that better balance its mission goals with legitimate concerns about the loss and damage to SUASs in training and deployment.

To understand how this might occur, let us examine more closely how AR 735-5 defines the basis for liability. It states that the official with greatest responsibility for establishing liability, the financial liability officer, "must have an understanding of the terms "responsibility," "culpability," "proximate cause," and "loss." "Each term impacts upon a determination of financial liability. Individuals may be held financially liable for the loss or damage of GP [government property] if they were negligent or committed willful misconduct and their negligence or willful misconduct is the proximate cause of that loss or damage." (AR 735-5, Sec. 6-7.) The regulation then spells out how each of these words contributes to an individual's potential liability. Consider each word in turn.

On "responsibility," the regulation states that

> "all Servicemembers and DA Civilian employees are responsible for the *proper* use, care, and physical protection of government-owned property entrusted to their possession, command, or supervision. This responsibility includes using GP for official business only, complying with all *applicable regulations*, and contacting the appropriate authority if property is subjected to undue *risk*." (AR 735-5, Sec. (6-7(a)(4), emphasis added.)

What is the *proper* use of an SUAS or SUAS component during training and deployment? What *risks* are involved in this use and given the Army's mission, what is the *proper* balance between this *risk* and the *benefits* of using an SUAS in training or deployment? What *regulations* specifically address any of these questions? XVIII Airborne Corps probably has as good a grasp of the training and deployment environments relevant to using SUASs as anyone in the Army. It is well suited to document this understanding for the benefit of the financial liability officers, who have much less well informed insights into these questions, even though AR 735-5 explicitly calls upon them to make such judgments when specific instances of loss or damage come to light.

Given the size and diversity of XVIII Airborne Corps, a good case can be made that it should produce such documentation for its own use. Such documentation would likely be helpful across the Army wherever the Army expects to use SUASs in the future. Given how dynamic best practice in the applications of SUASs is likely to be as experienced accumulates, it makes sense to keep responsibility for that documentation close to where the experience is accumulating.

On "culpability," AR 735-5 (Sec. 6-6(f)-(h)) states that:

> - *Simple negligence* [is] the failure to act as a reasonably prudent person would have acted under simi-lar circumstances.
> - *Gross negligence* [is] an extreme departure from the course of action to be expected of a reasonably prudent person, all circumstances being considered. The act is characterized by a reckless, deliberate, or wanton disregard of the foreseeable consequences.
> - *Willful misconduct* [is] any intentional wrongful or unlawful act or omission relating to Government property, to include misappropriation of Government property.

The degree of culpability increases as we move from simple negligence to gross negligence to willful misconduct. AR 735-5(c) defines culpability as:

> A determination of fault. Before a person can be held financially liable, the findings must show that they, through negligence or willful misconduct, violated a particular duty involving the care for the property. Whether the person's actions or omissions constitute negligence depends on the circumstances of each case. Negligence under some circumstances may not reflect negligence under other circumstances. Therefore, all facts must be fully considered when determining the reasonableness of a person's conduct:
>
> 1. The person's age, experience, physical condition, and special qualifications.
> 2. The type of responsibility the person had toward the property.
> 3. The type and nature of the property.
> 4. The nature, complexity, level of danger, or urgency of the ongoing activity at the time of the loss.
> 5. The adequacy of supervisory measures or guidance for property control.

What are the circumstances relevant to a soldier's use of an SUAS in training or during deployment? Again, XVIII Airborne Corps understands this much better than any likely financial

liability officer. XVIII Airborne Corps can document this in terms that directly inform any financial liability officer on how best to address the use of SUASs during training or deployment.

On "proximate cause," AR 735-5 states that:

> *proximate cause* [is] the cause, which in a natural and continuous sequence of events unbroken by a new cause produced the loss or damage. Without this cause, the loss or damage would not have occurred. It is further defined as the primary moving cause, or the predominate cause, from which the loss or damage followed as a natural, direct, and immediate consequence. There may be more than one proximate cause for a specific loss or damage (for example, a vehicle accident where both drivers were negligent).

The issues raised here require even more subtle understanding of the circumstances present during training or deployment relevant to a soldier's use of an UAS. This requirement, which the Army places on the financial liability officer, begs for documentation of how competent soldiers use SUASs in practice. Again, XVIII Airborne Corps is a likely source of such documentation to ensure appropriate application of AR 735-5 to activities relevant to the use of SUASs in XVIII Airborne Corps.

AR 735-5 provides extensive discussion of how to assess "loss" in monetary terms. It should be adjusted to reflect a point that normally does not come up in traditional financial accounting. When *training* leads to losses of SUAS components that require property accountability beyond those for inexpensive, Class IX expendables, their cost should be compared with the benefits of ensuring effective use of SUASs *during combat*. XVIII Airborne Corps should consider developing local FLIPL policies for SUASs that reflect this insight when considering when to initiate an investigation, how to assess negligence or willful misconduct, and how to value losses or damage when an investigation occurs. The FLIPL policies XVIII Airborne Corps puts in place will affect the configuration of SUASs it prefers.

Effective documentation of how to address "responsibility" and "culpability" and "proximate cause" and "loss" when deciding where, how, and when to use SUASs during training and deployment would likely have a stepwise effect on the willingness of commanders and soldiers to use SUAS during training and deployment. First, it would reduce a commander's uncertainty about whether a soldier would face liability following a loss or damage. Soldiers would understand better what is expected when they use SUASs, presumably reducing misuse. And all participants would have a better ability to predict the outcome of a loss or damage when it occurred. This reduction in uncertainty should make commanders and soldiers less averse to the use of SUASs. Both considerations would improve soldier behavior when using an SUAS and increase the soldier's willingness to use an SUAS when it was in the Army's interest.

Second, these changes would simplify the financial liability officer's job when losses and damage occurred. Investigations should become simpler and occur more quickly, reducing their administrative cost and the diversion of the commander's attention when they occurred. With significantly greater clarity about the likely outcome when a loss or damage occurs, decisions about whether even to appoint a financial liability officer should be simpler. A financial liability

officer would be appointed less often. Approving or appointing authorities would have more confidence that they could complete loss investigations on their own without specialized support from a financial liability officer.

Third, as the responsible officers or reviewing authorities responsible for initiating investigations gained confidence in their abilities to predict the outcomes of investigations, they could legitimately conclude that negligence or willful misconduct had not contributed to an observed loss or damage, limiting their need to initiate an investigation in the first place. The authorities would still have to conduct investigations requiring the use of AR 15-6, but the incidence of investigations focused on financial liability should decline. The willingness of commanders and soldiers to use SUASs in training and deployment should rise as the incidence of investigations fell.

In the end, all of this would contribute to the Army's mission by making it clearer to everyone where the benefits of using SUASs in training and deployment were likely to exceed the risks. AR 735-5-motivated FLIPLs would not go away. But they should, quite appropriately, fall in number.

In anticipation of high attrition rates during deployed operations, the Army should maintain suitably high levels of inventories of Class IX expendable modular SUAS components. It should also seek to ensure that the supply chains for SUAS components, down through the vendors, are flexible and able to surge production during deployed operations. The more the Army can rely on flexible production lines during deployed operations, the less it will have to budget for the inventories of expendables that the Army must maintain while it is not deployed.

Acquiring Additional SUASs and SUAS Components

This section proceeds in three subsections. The first addresses the procurement of existing models of SUASs, primarily commercial, that have capabilities that the Army can use immediately. The second addresses the use of government-funded development programs to create new versions of SUASs that have capabilities not available in SUASs currently available on the market. The third subsection describes three initiatives underway in DoD today to develop, produce, and procure new designs of UASs on short timelines. These descriptions offer insights into how the Army can use current DoD mechanisms available to acquire SUASs quickly.

Procuring Commercial SUAS Systems and Components

The quickest way to acquire additional SUASs is to identify existing systems that meet DoD's needs and use available DoD policies to procure them. The vast majority of SUASs that exist today are commercial designs that DoD can in principle access directly in the commercial market—see the second volume of this effort, which surveys SUAS markets (Putney and Ellinger, 2025). Given the urgent need to integrate SUAS into Army formations, the Army

should use the commercial market, treating SUASs as *commercial items,* if these commercial items have the capabilities that the Army needs immediately. If the Army chooses this path, it should be aware that heavy reliance on commercial systems poses important challenges for DoD. We discuss all this below.

If SUAS systems or components exist today in a form that is readily available on the commercial market or can be derived with minor adjustments from products readily available on the commercial market, and it meets DoD requirements for purchase, the XVIII Airborne Corps can work with an appropriate contracting officer to procure these systems or components. The contracting officer will have to use market research to verify that any item to be procured matches the Federal Acquisition Regulation's (FAR's) definition of a "commercial item." *Federal Acquisition Regulation*, undated, explains what items qualify to be treated as commercial and then explains how to procure them though traditional federal processes.

Regular dependence on commercial sources raises two major challenges for personnel most familiar and comfortable with traditional defense acquisition. The first challenge is that commercial markets move rapidly and fluidly by allowing products from different sources to interact without much formal coordination. These markets constantly evolve as new technologies become available and entrepreneurial firms develop them into viable products. By any standard, the current commercial market for SUASs is dynamic. As noted above, SUASs are also inherently modular. Aircraft, controllers, power sources, communications, sensors and other payloads can potentially be mixed and matched. The commercial markets for these component subsystems are also dynamic. When depending on such markets, DoD must be prepared to surrender much of the control emphasized in defense acquisition and adapt its acquisition to the opportunities that arise in commercial markets as they arise.

The second major challenge of depending on commercial sources is to learn which specific commercial companies the Army should do business with and what specific arrangements it should use to do business with them. On both scores, effective market research is critical to successful exploitation of commercial markets. In a DoD setting, the natural homes of market research are formal program offices and laboratories. Program offices offer the complementary core capability of managing relationships with commercial companies that can be transformed into formal contractual and partnership arrangements as needed. But to maintain a successful market research activity in the commercial sector, an Army program office must be prepared to meet commercial firms on their own turf and speak to them in their own language. For example, commercial firms typically do not go to sam.gov (formerly fbo.gov) to identify marketing opportunities. They do not understand the terms of the FAR. They do not participate in DoD's Small Business Innovation Research or Small Business Technology Transfer programs. They maintain their own contracting standards and partnering venues. They put a premium on protecting their intellectual property so that they can continue to exploit it in nondefense settings (Camm, et al., 2011; Camm, et al., 2021; Mayer, et al., 2020).

If enough new development effort is required to transform an existing commercial item into something that the Army can use in military operations, the Army can potentially procure the item as a commercial item and then sign an agreement with a company—not necessarily the original equipment manufacturer, unless intellectual property considerations require that company's constructive participation—to pursue development through one of the mechanisms described next.

Developing New SUAS Systems and Subsystems

If commercial systems do not meet DoD's specific needs, some development is required. DoD's Adaptive Acquisition Framework (AAF) offers a variety of ways to develop new systems. The *Urgent Capability Pathway* of the AAF allows the Army to develop and field new SUASs within two years of identifying a need. The *Mid-Tier Pathway* offers access to new SUASs within two to five years of identifying a need, accommodating development efforts that may require more than two years to complete and begin fielding. If the Army needs to develop SUAS capabilities within these planning horizons, it should use the urgent capability or middle tier pathways. These pathways can employ a number of tools to speed up development, testing, and fielding. For example, the Army should consider placing an SUAS program under the Rapid Capabilities and Critical Technologies Office (RCCTO) to leverage its capabilities to support rapid, adaptive capability acquisition. Other transaction (OT) authority (OTA) can complement the pathways described in the AAF with new contracting vehicles. The commercial solutions opening (CSO) procedure accelerates the rate at which the Army can access innovative commercial products.

DoD has been learning how to adapt or develop weapon systems more quickly in an increasingly dynamic technological and threat environment. As a result, the approaches that have been introduced in recent years are especially helpful to improving DoD's development of SUASs. This section starts by explaining DoD's AAF, which prescribes several pathways for acquiring different goods and services. Three of these pathways are relevant to acquiring SUASs. It then looks at tools that the Army can apply within these pathways to make them more effective, especially when acquiring commercial SUAS technology.

DoD's Adaptive Acquisition Framework

If the SUAS systems or components that XVIII Airborne Corps wants require development or testing before the Army procures them, the Army can use one of three acquisition pathways available in DoD's AAF to acquire these SUAS systems and components. (DoDI 5000.02, 2022). These processes are deliberative and even the quickest takes more time than may be desired in combat; however, they also have positive characteristics that may be important for the Army.

Urgent Capability Pathway

The *Urgent Capability Pathway* offers access to new SUASs within two years of identifying a need. For a need that the Joint Capabilities Integration and Development System ([JCIDS]—see CJCSI 5123.011, 2021) has already assigned to the Army for fulfillment, an Army operational commander can create an operational needs statement (ONS) to "correct a high-risk deficiency to accomplish the mission and reduce the risk of catastrophic loss of life" (AR 71-9, 2021, p. 41). Headquarters Department of the Army (HQDA) G-3/5/7 oversees the process to have this document transformed into an approved, Army-specific urgent operational need (UON). If JCIDS has not assigned such a responsibility to the Army, such a need can be validated as a joint urgent operational need (JUON), associated with an on-going contingency, or a joint emergent operational need (JEON), associated with an anticipated contingency. A Combatant Command can submit a proposed JUON or JEON to the Joint Staff for rapid review and validation.[12]

If so designated, this pathway allows XVIII Airborne Corps to work with a program manager to establish a requirement; find funding within existing budgets to meet that requirement; and develop and test, procure, and deliver SUAS systems or components within two years of when the need is validated. Relevant SUAS systems and components must be relatively simple and mature to allow such accelerated acquisition. Any need for less mature SUAS systems or components, or a need to authorize additional funding to pay for them, will require use of the Mid-Tier Pathway described immediately below (DoDI 5000.81, 2019).

Mid-Tier Pathway

The *Mid-Tier Pathway* offers access to new SUASs within five years of identifying a need. This pathway allows rapid demonstration of new capabilities or fielding of production quantities of systems with proven technologies that require minimal development. A program manager works closely with XVIII Airborne Corps to tailor these activities to the unique characteristics and risks of acquiring the systems or components that XVIII Airborne Corps wants. The acquisition is not subject to JCIDS or most of the procedures outlined in the Defense Acquisition System including, especially, the FAR (DoD Directive [DoDD] 5000.01, 2022). The Army can use this approach as long as the program for SUASs that it creates does not become too large (DoDI 5000.80, 2019).

[12] DoD Directive 5000.71, 2022. HQDA, Office of the Deputy Chief of Staff (DCS), G-3/5/7 oversees an Army-specific operational needs statement (ONS) process that can generate capability documents to use to access the Urgent Capability Pathway. Once authorized by the JCIDS Gatekeeper, this process can proceed within Army channels, but must regularly report to the JCIDS process to maintain joint visibility. The ONS process must renew any capabilities authorized annually. See AR 71-9, 2021.

Major Capability Pathway

The *Major Capability Pathway* addresses larger programs that are expected to take at least five years to field new SUAS systems or components on the way to creating an "enduring capability" for the Department of Defense. Such acquisitions typically follow a closely structured approach that analyzes, designs, develops, integrates, tests, evaluates, produces, and then supports SUAS systems. The programs that manage such systems are subject to the full requirements of JCIDS and the Defense Acquisition System, but can "tailor-in" processes, reviews, and documentation to reflect program size, complexity, risk, urgency, and other factors (DoDI 5000.85, 2021).

Because the AAF is relatively new, we have only limited experience that we can use to assess how it currently works in practice. Below, we briefly review three on-going Army efforts to develop new SUASs, including their use of the AAF to date. The AAF is designed to promote an integrated approach to acquisition in which XVIII Airborne Corps works closely with the program that manages whichever pathway they select to acquire SUASs. The framework anticipates that programs will often start in the Urgent Capability Pathway and then transition to the Mid-Tier Pathway and then the Major Capability Pathway as a program matures. Ideally, XVIII Airborne Corps and the acquisition specialists it works with will try to anticipate such transitions and plan for them from the beginning to make the transitions as seamless as possible when they occur.[13]

Improved Tools for Acquiring Commercial SUASs

The new pathways explicitly recognize how rapidly commercial products change. Their efforts to work outside the bounds of the FAR or to tailor-in commercial-like practices in the context of the FAR often seek to leverage the dynamism of innovation in the commercial sector to help defense acquisition become more agile. That said, as it is normally applied in government contracting, the FAR still has difficulty operating in such dynamic markets. Experienced defense contract officers understand how to make the FAR operate responsively in such environments, but the majority of defense contracting personnel do not understand how to do this well and are managed in risk-averse ways that discourage the flexibility required to take full advantage of the dynamic partnerships that create the most value in commercial settings.[14]

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[13] It is worth noting two situations that arguably fall outside these three pathways. First, as the conflict in Ukraine shows, during combat operations sUAS acquisition and fielding may need to happen at very large scale and far more quickly than these pathways envision. Second, large unit commanders are currently using their operations and maintenance (O&M) funding to buy commercial sUASs for their units to experiment with. For example, the 25th Infantry Division took this approach and briefed their results at the FY24 UAS Symposium at Fort Novosel in February 2024 (Jones, 2024). In addition to the O&M purchased items, the Army purchased Skydio X10 drones, designated them the RQ-28A, as an interim solution to the short range sUAS requirement at the company level.

[14] This belief is broadly held by senior DoD acquisition personnel deeply versed in the FAR. See, for example, Anderson, 1999; Camm, 2006; Camm, et al., 2021; Mayer, et al., 2020.

Rapid Capabilities and Critical Technologies Office

New tools are helping the Army overcome this problem. For example, the Army Rapid Capabilities and Critical Technologies Office (RCCTO), at Redstone Arsenal, AL, "expedites critical capabilities to the field to meet Combatant Commanders' needs. The Office enables the Army to experiment, evolve and deliver technologies in real time to address both urgent and emerging threats."[15] It has performed this role since it was established in 2016. To accelerate decisionmaking, it reports to a Board of Directors led by the Secretary of the Army, and including the Chief of Staff of the Army, Under Secretary of the Army, Vice Chief of Staff of the Army, Army Acquisition Executive, and the Commander of Army Futures Command. Enduring capabilities resulting from these efforts are transitioned over to a Program Executive Office for continued production, modification, sustainment, and support." Its current portfolio includes an initiative to develop counter-SUAS capabilities.

The RCCTO builds on the experience of the Army's Rapid Equipping Force (REF), which operated from 2002 to 2021 under the direct oversight of the Vice Chief of Staff of the Army to get urgently needed capabilities into the field in 180 days or less (Camm, et al., 2007; Judson, 2020, and Tubbs, 2005). The mission of REF was to "provide operational commanders with rapidly employable solutions to enhance lethality, survivability, and force protection through insertion of COTS [commercial off the shelf]-GOTS [government off the shelf] ('equip') and Future Force technologies ('insert') while informing relevant Army stakeholders ('assess') to remain ahead of an adaptive enemy[:]" (Tubbs, 2005)

> EQUIP operational commanders with off-the-shelf (government or commercial) solutions or near-term developmental items that can be researched, developed, and acquired quickly.
>
> INSERT future force technology solutions that our engaged and deploying forces require. It does this by developing, testing, and evaluating key technologies and systems under operational conditions.
>
> ASSESS capabilities and advise Army stakeholders of findings that will enable our forces to rapidly confront an adaptive enemy.

This program used senior leadership oversight to accelerate requirements determination and budgeting decisions to achieve short timelines. It focused on rapidly developing material solutions and getting them into a deployed force. It did not address sustainment of a system after it was fielded.

In 2019, the REF reportedly "addressed 400 requirements sent from combatant commanders to address operational capability gaps" (Judson, 2020; cf. Camm et al., 200). Among the capabilities that REF addressed have been counter-UAS technology, deployable 3D printing, and up-armored commercial vehicles.

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[15] This description is drawn from material at U.S. Army Rapid Capabilities and Critical Technologies Office, undated, on 22 Aug 2023.

"To ensure the value of the organization's work … is not lost, all lessons learned will be maintained by the U.S. Army Combined Arms Center, via the Center for Army Lessons Learned, Centers of Excellence and other [Training and Doctrine Command] enterprise stakeholders" (Army statement quoted in Judson, 2020).

Accelerate the Procurement and Fielding of Innovative Technologies (APFIT)

The National Defense Authorization Act for Fiscal Year 2022 established a pilot program to accelerate fielding of technologies from small businesses and contractors from outside the traditional defense industrial base. The Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) manages the program, called Accelerate the Procurement and Fielding of Innovative Technologies (APFIT). It seeks to transition technologies from pilot programs, prototype projects, and research projects into production and fielding. This program is motivated by a desire to (1) cut one to two years from the time required to field new technologies and (2) strengthen the nontraditional industrial base that can produce relevant technologies. "To be eligible for APFIT funding, these [companies] must have received less than $500 million in cumulative revenue from DoD" (Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)), 2022).

OUSD(R&E) has used three primary criteria to select projects to fund under APFIT:

a. Impact on warfighter performance.
b. Innovativeness of a project.
c. Whether a contract vehicle is already in place.[16]

The APFIT program has sped up funding by shortening bureaucratic reporting relationships within DoD. OUSD(R&E) Heidi Shyu has been personally involved in selecting winners (Lofgren, 2022).

The APFIT program is small but growing. At the start in FY 2022, OUSD(R&E) distributed a total of $100 million to ten program offices which, in turn, funded ten nontraditional contractor sources, each with $10 million. Congress appropriated $150 million for APFIT in FY23. Eleven DoD program offices received funding from this appropriation (Department of Defense, 2023a). Congress appropriated $300 million for APFIT for FY2024. OUSD(R&E) distributed this funding among 19 programs in amounts that ranged from $10 to $50 million (Petersen, 2024). The House Appropriations Committee proposed $400 million for the APFIT program in FY 2025. The final level has not yet been agreed upon (Harper, 2024; Keys, 2024).

It remains to be seen whether DoD can sustain funding for these accelerated initiatives as the initial APFIT funding is fully drawn down. If these APFIT initiatives "are supplanting existing programs with superior technology, you'll see the hard discussions happening. Getting new

[16] This third criterion has been used when little time was available to execute a project before the funding for it expired. It would be less relevant in a period with less turbulence in funding.

money for something small is one thing. Scaling that and killing inferior systems is quite another" (Harper, 2024).

Other Transaction Authority

Another effective tool is other transaction (OT) authority (OTA) (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2023).[17] OTs "give DoD the flexibility necessary to adopt and incorporate business practices that reflect commercial industry standards and best practices into its award instruments. (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2023). OTs are providing the Government with agile access to useful technology solutions from traditional and non-traditional defense contractors (Mayer et al., 2020). Broadly speaking, OTs provide new ways for DoD to develop prototypes quickly and then rapidly produce them for operational fielding. They could potentially offer an effective way to test commercial SUAS systems, components, and configurations with government-developed technologies to meet specific operation military requirements. The Contracting Office at Picatinny Arsenal, NJ, is a leading center for the design and management of successful OTs in the Army and the rest of DoD. It has become a good place for DoD personnel to learn the skills required to operate in a dynamic environment with commercial sources.[18]

The U.S. Space Force Space Development Agency (SDA) is currently using a creative application of the OT device to keep up with the kind of continuous change in technology we might expect from SUASs in the future. SDA has developed a two-year battle rhythm in which it holds a new competitive source selection for low-earth-orbit satellites every two years designed to introduce new capabilities as user needs change, the introduce new technologies as they develop, and to replace satellites lost for whatever reason. SDA uses an architecture that ensures that satellites can all work with one another and with ground stations once they are in orbit. The approach works on the spiral development principle of introducing new designs that are "good enough" to justify each new introduction and that mature over time to increase the cumulative capability of the total constellation as new capabilities are added. SDA signs new OTs with each new provider of satellites. The OTs are flexible enough to allow quick modifications as on-going prototyping identifies new capabilities to consider during each spiral. SDA believes that it is building and sustaining a nontraditional industrial base as it continues to diversify its supplier base in each competition.[19]

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[17] Technically speaking, the government began to use OTs in 1958. But interest in OTs has blossomed as legislative changes relevant to OTs have occurred since 2015.

[18] For a discussion of recent applications in the Air Force, see Mayer, et al., 2020.

[19] For details, see Erwin, 2023. Details on the form of the most recent OTs being proposed are available at SDA's website at www.sda.mil.

Many OTs operate in the context of a consortium of sources that give the OTs added flexibility as relevant technologies and threats change over time.[20] The consortium rules of engagement call for two forms of competition. The first occurs to qualify companies for participation as members of a consortium over its lifetime. The second allows rapid source selections in which the Government states a new requirement, receives offers, reviews them, and choses one or more sources from among the consortium members, all within weeks. OT use of consortia builds on a long DoD tradition of using consortia to acquire goods and services rapidly, so a solid consensus exists on how they operate, even when they are reacting to a dynamic environment.[21] Such consortia work best for their qualified members over the course of any consortium contract. Qualifying new members after the start of a consortium contract can be difficult.

Commercial Solutions Opening

In February 2022, the Office of the Under Secretary of Defense, Acquisition and Sustainment, issued a memorandum authorizing contracting officers to "acquire innovative commercial products, technologies, or services using a general solicitation, called a commercial solutions opening (CSO)."[22] A CSO uses streamlined procedures to rapidly acquire and deliver "innovative commercial items, technologies, or services that directly meet program requirements."[23] Among other things, the Army can use a CSO to acquire commercial products and services off the shelf, R&D studies for currently available commercial technology, and commercial technology maturation. For the purposes of a CSO, something is "innovative" if it or an application of it is "new as of the date of proposal submission."

A CSO is similar to a broad agency announcement (BAA) but is not restricted to acquiring basic and applied research. Like a BAA, a CSO uses scientific, technological, or other subject-matter expert peers to review proposals. To select proposals for award, these peer reviewers use as evaluation factors technical characteristics, importance to agency programs, and funds availability. Price should be considered to the extent appropriate, but at a minimum, to determine whether the price is fair and reasonable. Proposals need not be evaluated against each other, because they are not submitted in response to a common performance work statement or

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[20] For details on sources of flexibility in recent consortia, see Mayer et al., 2020.

[21] For descriptions of two very different consortia for acquiring acquisition-related services, the Army's Rapid Response to Critical Systems Requirements Program and the Air Force's Flexible Acquisition and Sustainment Tool Program, see Camm, et al., 2004. Mayer et al., 2020, reports similar findings on more recent Air Force consortia.

[22] This discussion draws on material from Defense Acquisition University, undated; and Tenaglia, 2022. The Defense CSO is based on a pilot program run by the General Services Administration. The CSO pilot program is authorized by section 880 of the National Defense Authorization Act for Fiscal Year 2017 (Pub. L. 114-328, 2016). Additional details on how a CSO works is available at Procurement Innovation Resource Center, 2018, and Procurement Innovation Resource Center, undated.

[23] The streamlining allows more rapid acquisition than that available through more traditional methods documented in FAR Part 12 for commercial acquisition.

statement of work. A CSO requires use of fixed-price or fixed-price-incentive contracting arrangements. Awards exceeding $100 million require prior approval by the Army Security Assistance Enterprise (SAE).

This description clearly fits new forms or applications of commercial SUASs. DIU is currently using a CSO to acquire a particular type of UAS. We discuss this in more detail below.

Navy Counter-Improvised Explosive Device Program – An Innovative Acquisition Success Example

Camm, et al., 2011, offers a useful overview of how the Navy Littoral and Mine Program Office has used market research to identify relevant commercial sources to support its counter-improvised explosive device (C-IED) activities. The Army has worked closely with the Navy program office in its C-IED mission. The near-real-time cat-and-mouse nature of C-IED activities in active combat is closely analogous to the dynamic Blue v. Red give and take currently occurring in the use of and defense against SUASs in the Russo-Ukrainian war.

Camm et al., 2011, explains a way to translate technology requirements into terms that companies unfamiliar with the FAR can understand. It explains how to integrate components developed by these companies into highly classified systems, even when the companies themselves lack relevant classified clearances. It explains the concerns of innovative commercial firms, particularly small ones, and relatively simple things that DoD can do to reduce barriers to their willingness to participate in government programs. The case studies covered in Mayer, et al., 2020, cover much of the same ground, identifying analogous challenges and alternative solutions that Air Force programs used to access relevant commercial firms.

Three Current Efforts to Acquire New Army UASs

A number of Army efforts are currently under way to acquire new UASs, though not all of them are necessarily SUASs. We offer publicly available information on three of them to illustrate how the Army is currently mixing and matching the variety of pathways, tools, and other mechanisms available to speed up and increase the agility of acquiring SUASs. We are less concerned here with the details of these specific efforts and more with the policy options that they demonstrate are currently available to the Army.

Broad Area Announcement Topic on Lethal Payloads for Small Uncrewed Aerial Systems

The Small Business Innovation Research (SBIR) Program of the Army Futures Command's Army Applications Laboratory added a new topic to its annual broad agency announcement (BAA), Release 11, on 11 May 2023. Topic A234-016 addresses the development of a "lethal payload capability that can be employed on a Small Uncrewed Aerial System (SUAS).[24] The capability should employ munitions (ammunition or explosives) that are currently in the U.S. inventory and attach to one or more SUAS platforms on the Defense Innovation Unit (DIU) Blue

[24] This description is based on information included in DoD SBIR 23.4 Program BAA, 2023; Sabala, 2023.

UAS Cleared List" of SUASs.[25] Such development seeks to expand a small unit's ability to employ SUASs beyond intelligence, surveillance, and reconnaissance (ISR) missions. The SBIR program accepted questions about the topic through 14 June 2023 and accepted proposals during 1-27 June 2023.

Government laboratories are currently developing lethal UAS capability. These efforts include U.S. Army Combat Capabilities Development Command (DEVCOM) Armament Center's latest payload for the short range reconnaissance (SRR) platform, referred to commercially as the Skydio X2D, which delivers an M67 fragmentation grenade as the munition. This new SBIR effort will develop modular lethal payloads that can be employed by the Skydio X2D and/or other platforms on the DIU Blue UAS Cleared List.

Among other things, payloads for this new system should:

- Be safely attachable or removable by Soldiers in the field
- Employ ammunition or explosives currently in the Government inventory
- Increase the lethal capability beyond that of the M67 fragmentation grenade-based solution currently in development at the Armament Center
- Integrate into the selected platform, including its controller.

This topic accepts proposals with a cost of up to $500,000 and a 9 month period of performance. Proposals follow a standard format designed to limit the cost and time required to prepare and review them. SBIR selects proposals determined to be the most advantageous to the Government, consistent with BAA instructions and evaluation criteria, the Army-specific instructions, the topic posting, and availability of funding. SBIR accepts multiple proposals if more than one shows sufficient promise. The SBIR judges each proposal on its own merits and notifies firms whose proposals have been selected within 90 days of the closing date of the topic. Once a proposal is selected, development proceeds in the three phases standard for an SBIR BAA:

1. Preliminary design "describ[ing] the selected SUAS platform(s) and munition(s) consist[s] of a concept for physical attachment and electrical and software integration, and a description of the method of fire control."
2. A refinement of the preliminary design "produce[s] and deliver[s] a prototype at Technology Readiness Level (TRL) 5 of a lethal payload for an SUAS platform. The system refinement … include[s] mechanical and electrical integration into the selected platform, fire control, and targeting."
3. The technology is transitioned to a DEVCOM laboratory for further development or to a program executive office (PEO) for pursuit through an appropriate acquisition pathway.

The development effort described here is currently well underway. This description illustrates how the Army can use a standard acquisition vehicle, a BAA, to accelerate

[25] Defense Innovation Unit, "Blue UAS Cleared List," webpage, 2023.

development of technology relevant to an SUAS and transition that technology into an appropriate AAF pathway when the technology is mature enough.

Low Altitude Stalking and Strike Ordnance (LASSO)

PEO Soldier assumed responsibility of the Lethal Unmanned Systems directed requirement on May 4, 2023, and initiated the low altitude stalking and strike ordnance (LASSO) program.[26] This anti-tank man-portable, tube-launched, lethal-payload-munition, uncrewed aircraft system seeks to "increase the lethality of the Army of 2030's IBCT and to maintain overmatch against near-peer threats" to the U.S. The one-way, or "suicide" drone is tailored for use in infantry brigade combat teams (IBCTs) (Demarest, 2023).

LASSO currently comprises three modules: a launch tube, an uncrewed aircraft system, and a fire control station. It includes an electrical optical/infrared sensor, precision flight control, and the ability to fly, track and engage non-line-of-sight targets and armored vehicles with precision lethal fires.

It is currently using the Urgent Capability Acquisition pathway of the AAF to rapidly deliver this capability to IBCTs. As noted above, this pathway uses a timeline of two years or less to field a capability. LASSO products are expected to be in soldiers' hands in 2024. Meanwhile, PEO Soldier's teammates at the Maneuver Capability Development and Integration Directorate (MCDID) at Fort Benning are actively developing the enduring requirement to support a future program of record.

The Army was still finalizing details related to contracts with the defense industry in August 2023. Assistant Secretary of the Army for Acquisition, Logistics and Technology Doug Bush saw "a lot of companies in this space, so we're going to leverage competition as well as maybe having more than one version so we can have more production capacity" (quoted in Harper, 2023). Initial versions will likely focus on currently available systems. The Army needs the ability to field the capabilities for U.S. forces and potentially for allies. For example, Bush expects some versions to go to Ukraine. The Army may buy some of the versions sent to Ukraine and buy other versions for itself.

DIU Initiative to Acquire an Enterprise Test Vehicle

DIU is seeking proposals in an "area of interest" (AOI) that includes "affordable, mass-produced open architecture, medium-range 'unmanned aerial delivery vehicles'" (Gill, 2023).[27]

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[26] This description closely paraphrases PEO Soldier's press release for LASSO (Amadi, 2023).

[27] Observers generally agree that DIU's request for proposals is a response to a 28 August 2023 announcement by Kathleen Hicks, Deputy Secretary of Defense, of DoD's new Replicator drone program. The Replicator program will field "thousands of attritable, autonomous systems across multiple domains within the next two years as part of a new initiative to better compete with China" (Robertson, 2023). Hicks seeks to "leverage platforms that are small, smart, cheap and many." Hicks says the Replicator program would make production "less expensive, put fewer people in the line of fire, and [they] can be changed, updated, or improved with substantially shorter lead times.

It seeks solutions to develop, demonstrate, and fly a modular, open-architecture vehicle that will accelerate capability development and fielding across all weapons programs by enabling the integration, testing, and qualification of different subsystems, capabilities, and materials. The objective is to demonstrate an aircraft platform that prioritizes affordability and distributed mass production.

The platform should have the following capabilities, among others (Gill, 2023):

- Capable of demonstrating an initial flight test no later than 7 months after agreement award
- Capable of delivering a kinetic payload
- Range of at least 500 nautical miles
- Minimum cruise speed of 100 knots
- System architecture that allows for timely integration of commercially available components and subsystems (e.g., modular payloads, sensors, software-defined radios).

DUI may select multiple vehicle types for prototyping. It may develop multiple variants following a successful initial flight test.

DIU is using its version of a streamlined CSO to conduct this development effort.[28] It seeks "proposals for innovative, commercial technologies." DIU's CSO moves toward these proposals in three phases:

1. Solution Briefs
2. Pitches
3. Proposals.

The Government will not pay companies for the costs associated with any of these submissions. All Solution Briefs, Pitches, and Proposals will be unclassified.

We'll counter the PLA's mass with mass of our own, but ours will be harder to plan for, harder to hit, harder to beat" (quoted in McFadden, 2023). Replicator's greatest challenge within its timeline will be scaling the production. "That's the area we're going after with Replicator…. As we looked at that innovation ecosystem, we think we've got some solutions in place … but the scaling piece is the one that still feels quite elusive—scaling for emerging technology." (quoted in Heckmann, 2023). Hicks says, "Replicator will use existing funding, existing programming lines, and existing authorities to accelerate production and delivery at scale—by exerting leadership focus and attention on a singular operational challenge and maturing solutions, because that's what ultimately delivers," (quoted in Edwards, 2023). Hicks and Vice Chairman of the Joint Chiefs of Staff Adm. Christopher Grady will oversee the program, with support from Doug Beck, director of the Defense Innovation Unit. House appropriators have backed that idea in their fiscal 2025 defense spending bill. The legislation would allocate $1 billion toward establishing a DIU-managed hedge portfolio made up of low-cost drones, agile communication and computing modes and AI capabilities.

[28] The description of DIU's version of a CSO that follows closely paraphrases relevant sections of Defense Innovation Unit, 2020. Details for the open solicitation relevant to DUI's AOI on sUASs come from Defense Innovation Unit, 2023.

Solution Briefs

Companies could submit multiple Solution Briefs if each submission represented a separate and distinct concept (Gill, 2023). The period of performance for any Solution Brief or proposal submitted under this CSO should generally be no greater than 24 months; for this particular AOI, it is much shorter—seven months. Each Solution Brief should come with a full team in place; DIU did not intend to integrate several Solution Briefs received to generate a unified proposal. The Government evaluates each Solution Brief individually (that is, not relative to other Solution Briefs submitted in the same AOI) using the following criteria: (a) Relevance of the Solution Brief in addressing the AOI; (b) Whether a company's approach and/or underlying technology is unique, underutilized, and/or innovative to Government application; or whether the approach and/or underlying technology is a compelling solution to the AOI problem statement; (c) Technical merit and feasibility of the solution to address the Government's AOI problem statement. Based on the resources available, the Government could select some briefs to move to the next Pitch Session phase. Solution Briefs that were chosen for the Pitch Session phase were notified in writing as soon as practicable.

Pitch Session

A pitch provides an estimated price and schedule, data rights assertions, and specific information to supplement that provided on the technology concept in the Solution Brief phase. The Government uses the following factors to assess the pitch: (a) Relevance of the pitch in addressing the AOI; (b) Technical merit, match with Government need, and feasibility; (c) Evaluation of company viability; (d) Uniqueness and innovativeness of company's approach; (e) Cost estimate; (f) Notional schedule; and (g) Potential impact of data rights assertions. Pitch Sessions were scheduled to occur as early as the week of 23-27 October 2023.

Proposal

Based upon the evaluation detailed above, the Government may issue one or more companies a request for prototyping proposal (RPP). If the Government issues an RPP, the company develops and submits a full written proposal and negotiates appropriate terms and conditions governing the prototype project. Companies may discuss ideas and details of the proposal during the proposal writing process with the Government. Each proposal submitted includes a technical proposal and a price/cost/schedule. These proposals will be assessed by DIU subject matter experts. Companies may propose their own internal terms and conditions (e.g., service license agreements [SLA] and/or user license agreements [ULA]) to be considered during negotiations with the Government. Projects awarded through the CSO are flexible to adopt customary industry standards where it is otherwise legal and where it meets the Government's needs.

Successful proposals lead to OT prototypes. Prototype OTs awarded against this CSO will allow for an iterative prototyping process. An iterative prototyping process will allow the Government to modify, by mutual agreement, the work in a prototype project to allow the

adaptation and modification of the technology being prototyped to meet additional unique and discrete purposes or mission sets.

Upon successful completion of a prototype project under the OT, the Government and company may negotiate a follow-on production contract or agreement without further competition. Any concept/technology/solution successfully proven through a Prototype OT can be transitioned to production.

The development effort described here is on-going. In this effort, the Government starts with DIU's version of a competitive CSO to identify candidates for prototype developments and tests. Successful candidates then enter prototype OTs. The OTs are written so that successful prototypes can move directly to standard production contracts without further competition. Each step proceeds with a disciplined but flexible plan and accelerated schedule. This development expects to generate new versions of SUASs that can be fielded to operational units within seven months of when the Army awards a contract for a prototype OT. Each step is written so that, by mutual agreement, the Government and company can adjust the specific versions of SUASs that they are developing and testing.

The three examples above illustrate different approaches now being used to acquire UASs for the Army and other parts of DoD. Each uses a different acquisition organization. Each uses different sets of acquisition tools, some quite traditional and some created recently (and discussed above). Each organization matches appropriate, available tools to the kinds of UAS-related technologies and systems the organization seeks.

To acquire new fleets of SUAS-related systems and components, XVIII Airborne Corps can partner with these organizations or others, such as the contracting office at the Army Picatinny Arsenal, NJ, or a program office at the Army Unmanned Aerial Systems Center of Excellence at Ft. Novosel, AL, that have acquisition experience relevant to Army UASs. These offices have the expertise to guide XVIII Airborne Corps on how best to acquire any particular SUAS capability it seeks.

Conclusions and Recommendations

Use of SUASs has increased in recent and on-going military engagements around the world. Users are rapidly adjusting their applications. They and their opponents are rapidly adapting to these changes in the designs of SUASs that they employ and in how they employ them and defend against them on the battlefield. Users are experiencing high loss rates. Losses occur in part, because the SUASs are vulnerable to destruction by the enemy on the battlefield and users continue to employ them despite this. They also occur because users increasingly employ them as smart munitions.

The U.S. Army should expect to use SUASs in in these ways in its own future engagements. Effective use will require thorough integration of SUASs into a unit's tactical plans and execution. It will require adaptive operations to anticipate and react to constantly changing

applications of SUASs and defenses against them. Companies, battalions, brigades, and division will all employ a variety of SUASs in different ways. A unit in one echelon, may use an SUAS of Type A to identify enemy targets that units in another echelon attack kinetically using SUASs of Type B. A unit in a third echelon may supply components or munitions needed for such an attack to the units that will attack by using SUASs of Type 3 to transport those components to where they are needed. Such employment will likely involve high consumption rates of SUASs.

To prepare for this environment on the battlefield, the U.S. Army will need to thoroughly integrate use of SUASs into its individual and unit training. Training would not experience the same consumption rates as actual combat. But the U.S. Army seeks to train the way it fights. Effective training will result in losses, even if Soldiers and their commanders use their SUASs appropriately during training.

Current Army policy on accounting for SUASs does not anticipate such losses and appears to deter commanders from conducting SUAS-related training where losses could occur. A loss can trigger a financial liability investigations of property loss (FLIPL) investigation that at a minimum imposes a significant administrative burden on Army leaders. It can impose significant financial burdens on Soldiers and their commanders if an investigation concludes that the loss resulted from negligence. Because SUASs are in demand outside the Army, they get special attention to ensure they are not stolen.

- The U.S. Army is likely to use and to lose many SUASs in multiple echelons in future dynamic, unpredictable military engagements. It will need to prepare its soldiers with broad and deep unit training on how to use SUASs effectively and adaptively in such circumstances.
- In such a future, the Army will need an ability to mix and match the components and payloads of SUAS to meet mission requirements and to replace them quickly when they are lost.
- To prepare for such a future, the Army will need to tolerate higher levels of loss and damage of its SUASs to motivate full-spectrum unit training in their effective use. An important part of this increased tolerance is likely to be a change in the application of its FLIPL program to recognize the high value to the Army of such training relative to the cost of loss or damage of SUASs during training.
- To prepare for such a future, the Army should, where possible, acquire SUASs by using the agile pathways offered by the AAF and agile methods like those used in the Army's RCCTO and in Other Transaction Authority acquisitions.
- In this setting, commercial SUAS systems and components offer the Army many advantages relative to their government-developed counterparts.

Abbreviations

AAF	Adaptive Acquisition Framework
AI	artificial intelligence
AOI	area of interest
APFIT	Accelerate the Procurement and Fielding of Innovative Technologies
AR	Army Regulation
ATP	Army Techniques Publication
BAA	broad agency announcement
BCT	brigade combat team
CDD	capability development document
C-IED	counter-improvised explosive device
CII	controlled inventory item
CJCSI	Chief of the Joint Chiefs of Staff Instruction
CSO	commercial solutions opening
DEVCOM	U.S. Army Combat Capabilities Development Command
DIU	Defense Innovation Unit
DoD	Department of Defense
DoDI	Department of Defense Instruction
FAR	Federal Acquisition Regulation
FLIPL	financial liability investigations of property loss
GP	government property
JEON	joint emergent operational need
JCIDS	Joint Capabilities Integration and Development System
JUON	joint urgent operational need
LASSO	low altitude stalk and strike ordnance
ML	machine learning
MTOE	modified table of organization and equipment
OMA	Operations and Maintenance, Army
ONS	operational needs statement
OT	other transaction
OTA	other transaction authority
OUSD(R&E)	Office of the Under Secretary of Defense for Research and Engineering
PEO	program executive office
POR	program of record
R&D	research and development
RCCTO	Rapid Capabilities and Critical Technologies Office

REF	Rapid Equipping Force
RPP	request for prototyping proposal
SBIR	Small Business Innovation Research
SDA	U.S. Space Force Space Development Agency
SSA	supply support activity
SUAS	small uncrewed aircraft system(s)
UON	urgent operation need

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