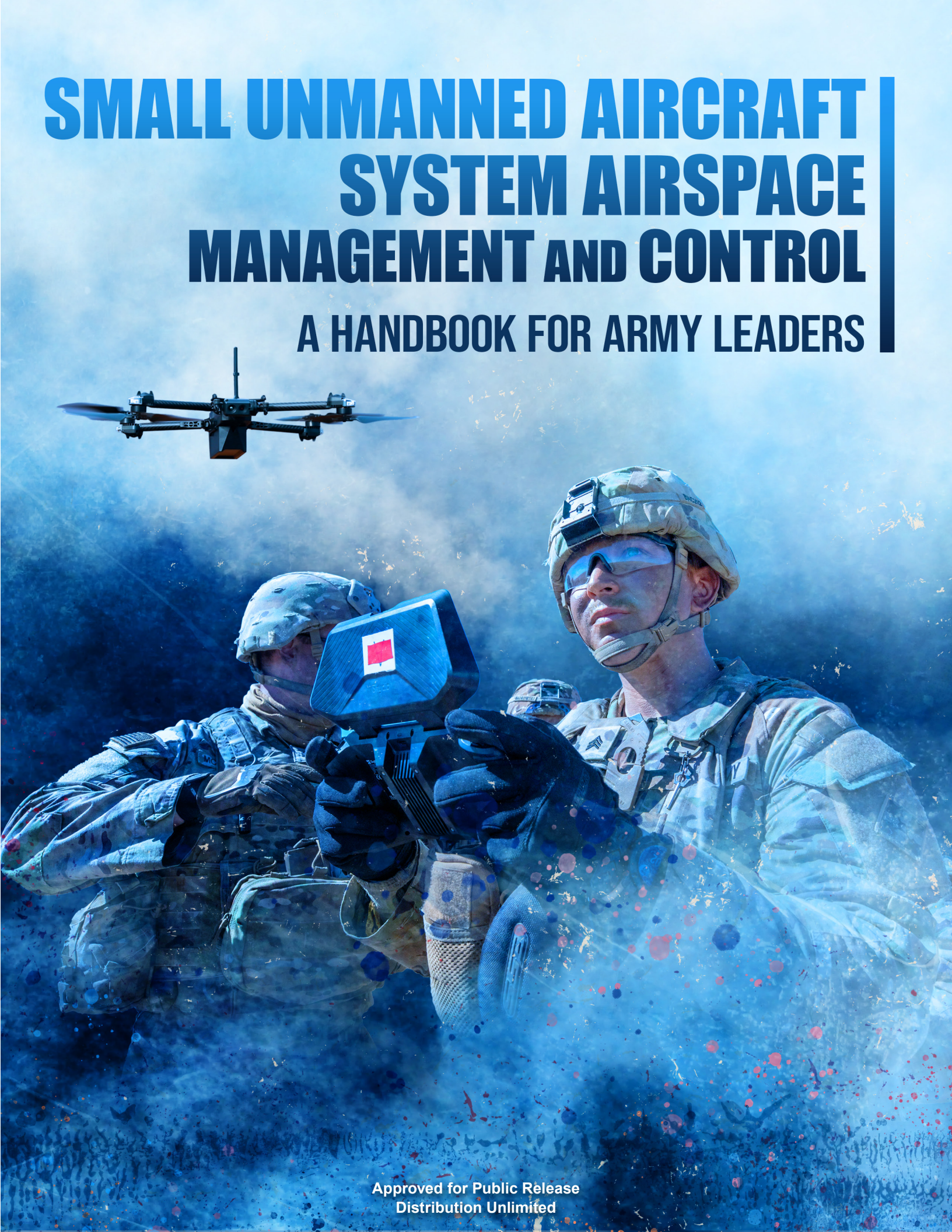
SMALL UNMANNED AIRCRAFT SYSTEM AIRSPACE MANAGEMENT AND CONTROL

A HANDBOOK FOR ARMY LEADERS



Center for Army Lessons Learned

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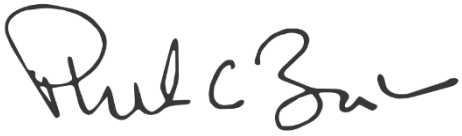
Foreword

June 2005 saw the release of Center for Army Lessons Learned (CALL) Handbook 05-25, *Leader's Guide to A2C2 at Brigade and Below*. This document updates the 2005 handbook and is informed by changes in technology and the increasing importance of aerial robotics on today's battlefield. Since the original publication, unmanned aircraft system (UAS) capabilities have advanced at an unprecedented rate. In like manner, the use of UAS has become ubiquitous with maneuver as evidenced by ongoing worldwide conflicts. Soon, each maneuver brigade will employ hundreds of UAS, but with the increased capability provided by aerial robotics comes added complexity and challenges in integrating increased airspace users.

To fight on the modern battlefield, the Army must be able to integrate manned, unmanned, and fired systems to allow for dynamic airspace planning and usage to dominate in the air ground littoral. This document will help our Army address this challenge by capturing lessons learned and providing a guide for tactical leaders to integrate emerging UAS capabilities.

This document establishes a framework to address both the opportunities and challenges with UAS operations and airspace management. This body of knowledge is based on emerging lessons learned from Transformation in Contact (TiC) exercises, ongoing small unmanned aircraft system (SUAS) fielding, experts in the UAS field, and rotations at the combat training centers. It lays out a path for building capability in a formation through training, planning and mission coordination, and identifying potential friction points in UAS operations at brigade and below echelons. UAS operations are a critical aspect of all arms maneuver, and this handbook reflects that holistic approach. It leverages expertise from across the Army Enterprise. Approach this handbook as a living document. As you continue to learn within your own formation, I challenge you to share those lessons with CALL to inform emerging doctrine and lessons learned publications, and for the next generation of leaders.

To all leaders, use this handbook as you plan UAS operations. Learn from others' successes and mistakes and build on their progress. Our Soldiers remain one of the U.S. Army's asymmetric advantages because of our collective ability to adapt, learn, and innovate. Continue to apply this philosophy to UAS operations—they will be a critical component in how we fight now and in the future. Forge the future!



BG Cain Baker
Director, Future Vertical Lift CFT

Chapter 1
Army Airspace Operational Context

The Center for Army Lessons Learned (CALL) Small Unmanned Aircraft System (SUAS) Airspace Management and Control handbook was written to give Army leaders, planners, and SUAS team members a relevant, up-to-date guide on managing and controlling the Army's increasingly complex and congested airspace. See figure 1-1.

Unmanned Aircraft Categorization Chart

Category	MGTW (lbs.)	Normal Operating Altitude (ft)	Speed (KIAS)
Group 1	0 - 20	< 1200 AGL	100
Group 2	21 - 55	< 3500 AGL	< 250
Group 3	< 1320	< 18,000 MSL	
Group 4	> 1320		Any Speed
Group 5		> 18,000 MSL	

Legend

AGL	above ground level	lbs	pounds
ft	feet	MGTW	maximum gross takeoff weight
KIAS	knots indicated airspeed	MSL	mean sea level

Figure 1-1. Unmanned aircraft categories[1]

For the purposes of this handbook, SUAS are defined as systems in Department of Defense (DOD) UAS groups 1 and 2—those that have a maximum takeoff weight of less than 55 pounds and operate at altitudes up to 3,500 feet above ground level (AGL). These systems are concentrated at brigade-level-and-below echelons and are increasingly heavily represented in maneuver units of all types. Though the term SUAS is not yet doctrinal, it is widely recognized across the Army and joint communities.

[1] Joint Publication (JP) 3-30, *Joint Air Operations*, 28 April 2025. III-30. Figure III-14.

AIRSPACE OPERATIONAL ENVIRONMENT

Understanding the airspace operational environment (OE) is a critical first step to successful SUAS (see figure 1-2) planning and operations at brigade-level-and-below echelons. The Army's multi-domain concept demands an unprecedented level of cooperation and synchronization between Army, joint, and multinational organizations—a complex and challenging task that will only increase in importance.

Figure 1-2. 2nd Battalion, 77th Field Artillery Regiment Soldiers prepare their SUAS to observe artillery fire[2]

Over the last decade, OEs worldwide experienced a remarkable surge in the number, capability, and significance of SUAS supporting ground combat formations. Although an increase in general unmanned aircraft system use was widely anticipated, actual growth—especially of SUAS—far exceeded even the wildest predictions. SUAS are now employed in huge numbers and a wide range of roles, fundamentally altering the conduct of military ground operations. The enormity of this shift emphasizes the importance of managing and controlling the airspace in which SUAS operate.

Massed proliferation of SUAS within Army formations will continue. Successful integration of these systems demands Army leaders and planners who have a proficient working knowledge of basic airspace processes and who properly prioritize developing and implementing unit airspace plans (UAPs) within their formations.

[2] Photo by SPC Doniel Kennedy. 4th Combat Aviation Brigade, 4th Infantry Division Public Affairs. https://www.dvidshub.net/image/8898218/exercise-steel-avalanche.

ARMY AIRSPACE CONTROL AND MANAGEMENT OVERVIEW

> Airspace control is the exercise of delegated authority over designated airspace and users through control procedures and coordination measures to maximize operational effectiveness.[3]

Army operations of all types are inherently linked to the air domain. The authority to control and manage airspace and airspace users within that volume, however, is not automatically granted to the ground commander. Although Army commanders "own" the ground within their area of operations (AO), they do not own the airspace above it. The airspace control authority (ACA), normally the joint force air component commander (JFACC), may allocate a volume of airspace to Army commanders that request it, and who meet certain criteria. This allocation delegates certain authorities and responsibilities to Army and joint airspace elements for local control and management as a part of the theater airspace control system (ACS).

Joint doctrine describes airspace as a shared resource used by joint air operations, air and missile defense, and joint fires.[4] SUAS operations must integrate with these other airspace users. This integration begins during planning. Army operations of all types, including SUAS operations, require awareness of the broader joint operations area (JOA) and potential conflicts with concurrent joint activities. These conflicts may involve both physical airspace and electromagnetic spectrum (EMS).

> Airspace management is the planning, coordination, integration, and regulation of airspace and users by airspace control elements in support of airspace control.[5]

Although Army air assets are generally kept organic and not taskable by the JFACC, compliance with JFACC and ACA orders is a requirement for Army operations. The JFACC develops and publishes the theater airspace control plan (ACP), daily airspace control orders (ACOs), air tasking orders (ATOs), and special instructions (SPINS). In addition, as the area air defense commander (AADC), the JFACC publishes the area air defense plan (AADP). These documents are the "playbook" for joint air operations across the AOR. Army planners must use their understanding of the ACP, ACO, ATO, airspace coordinating measures (ACMs) and other coordination measures to synchronize and integrate SUAS operations with Army and joint operations.

ARMY AIRSPACE ELEMENTS AND ENTITIES

This section provides a description of Army airspace elements and entities at echelon.

Theater Army

The theater army implements theater-level airspace policy as issued by the ACA, coordinates with the joint force and other services, distributes ACPs and SPINS, and manages airspace, as required.[6] The theater army also operates or contributes to these airspace elements:

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[3] JP 3-52, *Joint Airspace Control*, 22 October 2022. I-2.
[4] Ibid. I-4.
[5] JP 3-52, *Joint Airspace Control*, 22 October 2022. GL-4.
[6] Field Manual (FM) 3-52, *Airspace Control*, 20 October 2016. 2-4.

- **Army Air and Missile Defense Command (AAMDC):** Plans, coordinates, and executes Army air defense operations.
- **Theater Fires Element:** Plans and synchronizes multi-domain fires, including field artillery, air defense artillery, and other fire support assets.
- **Air Traffic Service (ATS):** Provides air traffic control services for Army airfields and landing zones.
- **Battlefield Coordination Detachment (BCD):** Serves as the primary Army liaison to the air operations center (AOC), integrating Army airspace requirements into joint air operations. **Note:** The BCD's airspace management section processes the Army's UAP and airspace coordinating measures requests (ACMREQs) for adjudication and integration into the ACO.

Corps and Division

The corps airspace element contributes to airspace control policy, standardization of procedures, and integration with joint airspace plans. It provides airspace expertise to the corps commander and coordinates with subordinate divisions but does not actively control airspace.[7]

The division actively manages and controls airspace in its AO through a mix of Army and joint airspace elements.[8] These include—

- **Fire Support Element (FSE):** Coordinates fires and fire support coordination measures (FSCMs) across the division AO.
- **Joint Air-Ground Integration Center (JAGIC):** Coordinates fires and fire support coordination measures (FSCMs) across the division AO.
- **Air and Missile Defense (AMD) Element:** Integrates air track data from various sources and contributes to the joint air picture, providing situational awareness of aerial threats and friendly aircraft.
- **Air Defense Coordinator (ADCOORD):** Serves as the corps/division commander's senior air defender and coordinates all air and missile defense activities in the unit.
- **Air Support Operations Center (ASOC):** Responsible for the direction and control of air operations directly supporting the ground combat element. Processes and coordinates requests for immediate air support and coordinates air missions requiring integration with ground forces.
- **Tactical Air Control Party (TACP):** A team of specially trained personnel aligned with ground combat units to advise ground commanders on the capabilities and limitations of air power and assist in planning, requesting, coordinating, and controlling air effects.

[7] Ibid. 2-7.
[8] Ibid.

Brigade/Brigade Combat Team

Brigades are not typically delegated full control of airspace but are responsible for managing airspace users in their AO.[9] The brigade is the lowest echelon required to submit a UAP and publish an appendix 10 (airspace). Increasingly, this echelon will be the primary touchpoint for SUAS operations across the Army. Airspace elements in the brigade include—

- **Air Defense Airspace Management (ADAM)/Brigade Aviation Element (BAE):** Manages airspace within the brigade AO, develops the UAP, coordinates with the division JAGIC, and deconflicts airspace for fires and aviation. **Note:** ADAM/BAE will be renamed the air defense support element (ADSE)/air ground integration element (AGIE) in an upcoming doctrinal update.
- **FSE**: Coordinates fires and ACMs within the brigade AO, ensuring synchronization and deconfliction of indirect fires.
- **TACP:** See previous description.
- **ATS:** See previous description.

Battalion and Company

Battalion operations sections are a key link between the ADAM/BAE and SUAS operations. They provide input to their brigades' airspace working group to help shape brigades' UAPs while supporting subordinate units with planning and operating their organic SUAS. Battalions collects airspace requests from companies, consolidates them, and submits them to the ADAM/BAE, then monitors certain high-profile SUAS missions. See figure 1-3. Company commanders are responsible for ensuring all company-level airspace requirements are communicated to the battalion, including those supporting SUAS operations. Key airspace contributors at the battalion and company include the following:

- **Battalion S-3:** Serves as a liaison between subordinate companies and the ADAM/BAE. Consolidates airspace requests from companies and submits them for deconfliction while also assisting as needed with planning and operation of organic SUAS and monitoring higher-echelon missions.
- **Company Commander:** Integrates SUAS into company operations and supervises communication and implementation of airspace requirements.
- **SUAS Operators:** Assists the company commander by providing advice on SUAS operations, preparing requirements for approval, and implementing plans and control measures.

[9] Ibid. 2-9.

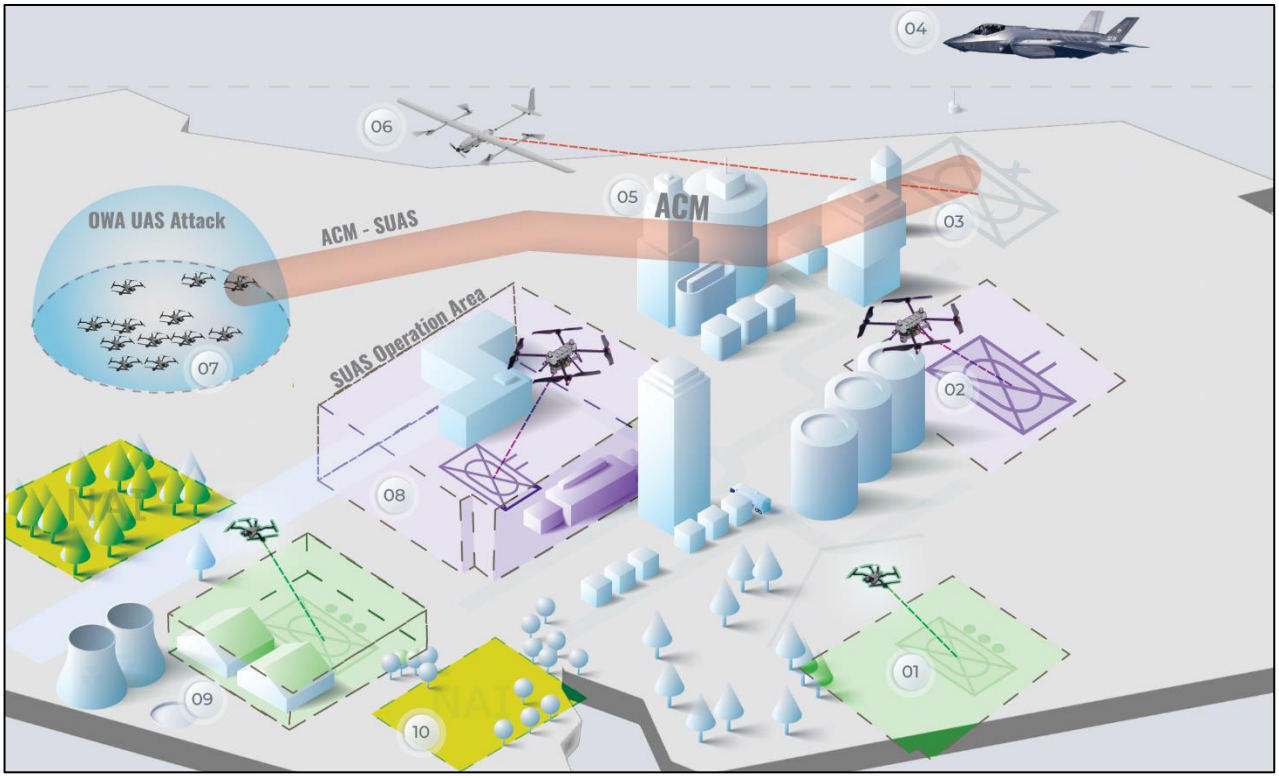

Figure 1-3. Reconnaissance platoons (01 and 09) operate short-range reconnaissance (SRR) intelligence, surveillance, and reconnaissance (ISR) unmanned aircraft systems (UASs) at the treetop level to assess enemy activity at named areas of interest (NAIs) (10). These systems do not typically require additional coordination past the brigade's SUAS standard operating procedures (SOPs).

Infantry battalions (02 and 08) operate medium-range reconnaissance (MRR) UASs to support their subordinate companies. These operate up to 500 feet above ground level (AGL) and require ACMREQs processed through the ADAM/BAE.

The infantry brigade (03), using intelligence provided by its long-range reconnaissance (LRR) UASs (06), executes a mass one-way attack (OWA) UAS attack on a high-value enemy target (07). This requires a special ACM (05) to ensure deconfliction from friendly fixed-wing aircraft (04) operating in the same vicinity, but above the coordination line.

Small Unmanned Aircraft System Responsibilities at the Brigade Level and Below

At the brigade level and below, an ADAM/BAE plays the most significant role supporting SUAS operations. The main tool for this effort is the UAP, which describes how airspace is managed and deconflicted within a brigade's AO.[10] An ADAM/BAE approves and integrates SUAS missions, coordinates ACMs to ensure safe operations, and disseminates critical airspace

[10] Ibid. 3-8.

information to subordinate units. Its ability to effectively manage airspace directly enables freedom of maneuver for SUAS teams.

An ADAM/BAE is the critical link between SUAS and joint air operations. A well-rehearsed brigade SUAS SOP is a key enabler of ADAM/BAE support to SUAS.

At the battalion and company levels, cooperation between the airspace element of the battalion's operations section and company commanders is crucial for successful SUAS operations. The operations section links ADAM/BAE and line companies, informing commanders and SUAS operators of airspace conditions and processing airspace requests to the brigade.

Company commanders, supported by their SUAS operators, integrate SUAS operations into the company's mission and higher-level UAPs. They must understand the capabilities and limitations of their organic SUAS assets and ensure company-level SUAS operations properly integrate with the battalion and ADAM/BAE. Effective communication and coordination between these elements are essential for safe and effective SUAS operations.

TACPs also has a role supporting SUAS operations, particularly if close air support (CAS) aircraft are operating in the same airspace as SUAS. They help deconflict airspace to ensure SUAS and CAS assets operate safely in the same vicinity.

METHODS OF AIRSPACE CONTROL AND TYPES OF SEPARATION

The Army uses a combination of positive control and procedural control methods to manage aircraft in its assigned airspace. While emphasizing procedural control for broader airspace management, the Army maintains the capability to implement positive control, as required, in specific areas.

Positive Control: This method relies on real-time identification, tracking, and continuous communication with aircraft.[11] Positive control is typically employed by ATS around airfields and other landing zones or in other areas with high concentrations of manned aircraft. Positive control requires the ability to locate/identify aircraft electronically and maintain constant communication.

Procedural Control: This method uses pre-arranged orders, procedures, and coordination to control aircraft.[12] Procedural control is the primary method used by ASOCs and JAGICs to synchronize maneuver and fires. It relies on clear understanding of established plans like the ACP, appendix 10 (airspace), UAP, ACO, and higher echelon operations. Procedural control is particularly important when communications or situational awareness are limited.

The method of airspace control used for SUAS depends on the complexity of the operation and capabilities of the aircraft. Positive control might be used for larger SUAS operating near established airfields or on flights deliberately coordinated with manned aircraft, where precise tracking and communication are critical. Procedural control is more likely for routine SUAS missions, relying on pre-defined flight paths, altitude restrictions, and coordination with other

[11] JP 3-52, *Joint Airspace Control*, 22 October 2022. III-7.
[12] Ibid. I-5.

airspace users. SUAS missions originating outside of a ground commander's AO require specific coordination.

Brigades can achieve a more permissive airspace environment by participating in airspace planning and conducting effective airspace management.

At the brigade level, the freedom to manage airspace relies on well-rehearsed SOPs, a trained ADAM/BAE, an approved brigade UAP and appendix 10 (airspace), current ATOs and ACOs integrated into the brigade's command information systems, and sustained communications with the brigade's higher-echelon headquarters.

UNMANNED AIRCRAFT SYSTEM AIRSPACE AND THE OPERATIONS PROCESS

Proactive planning and effective airspace management enable brigade combat teams to more freely operate their SUAS.

Airspace management is integral to the Army's successful employment of SUAS. Airspace elements work with the commander and operations section to plan, coordinate, and regulate airspace use for all airspace users into the unit's overall operational plan.

Airspace planning is crucial to establishing conditions that enable procedural control. This involves incorporating SUAS ACMs into the overall airspace plan while considering factors like flight paths, altitude restrictions, and potential conflicts with manned aircraft. Airspace elements contribute subject matter expertise to staffs during planning, ensuring SUAS operations are integrated and aligned with commanders' intent. SUAS operations and airspace plans must change and adapt as the situation on the ground evolves.

During the preparation phase, airspace elements help refine the plan and conduct rehearsals, validating airspace procedures and coordination measures specific to SUAS missions. Execution relies on pre-coordinated measures outlined in orders, graphics, and unit SOPs, creating a predictable airspace environment that facilitates procedural control. Well-planned coordination measures and thoroughly trained SOPs enable rapid adjustments to SUAS routes and altitudes, as needed.

Continuous assessment is vital. Airspace elements monitor current and projected airspace use, track changes in higher-level orders, and maintain situational awareness of the theater ACP, ACO, and SPINS. Airspace elements should strive to ensure leaders and operators at echelons below brigade have the most up-to-date information governing SUAS employment and airspace.

Chapter 2
Small Unmanned Aircraft System Airspace Planning

This chapter introduces essential small unmanned aircraft system (SUAS) airspace planning and coordination concepts focused on lower tactical echelons—battalion, company, platoon, and squad. Although these echelons do not formally control airspace, leaders and SUAS teams must understand the established airspace control framework and airspace management procedures to operate their systems effectively and safely.

UNDERSTANDING SMALL UNMANNED AIRCRAFT SYSTEM OPERATIONS

Successfully employing SUAS at all echelons means integrating these assets into a battlespace shared with other manned and unmanned aircraft, air defense systems, sensors, and indirect fire systems. This integration relies on understanding and adhering to airspace instructions passed down from higher headquarters, typically through the corps/division appendix 10 (airspace) and air defense airspace management (ADAM)/brigade aviation element (BAE).

KEY CONCEPTS FOR SMALL UNMANNED AIRCRAFT SYSTEM OPERATIONS

The Operational Framework for Small Unmanned Aircraft Systems

All SUAS operations begin with orders from air and ground commanders. These directives are officially communicated through documents like the daily/weekly airspace control order (ACO) and air tasking order (ATO), supporting unit airspace plans (UAPs) and Army operation orders (OPORDs). Personnel at the battalion level and below typically receive only relevant excerpts or specific instructions derived from the ACO and ATO, as these are often classified. The ADAM/BAE is responsible for transforming these higher-level orders into actionable guidance for their subordinate units.

Key Concepts for Small Unmanned Aircraft System Operations at Lower Echelons

SUAS operations at lower-echelon levels typically involve two distinct mission types, each with different airspace requirements. These terms are not currently formalized. Commanders may define them locally based on their unit's standard operating procedures (SOPs):

- **Short-Range Reconnaissance (SRR):** These missions are flown at low altitudes and near the supported unit. Operations are often governed by unit SOPs or airspace coordinating measures (ACMs) established at the unit level (e.g., "SUAS operations will remain below 200 feet above ground level (AGL) and within 500 meters of the platoon's location."). See figure 2-1.

  Because of their limited range and altitude, SRR missions typically operate well below manned aircraft or established coordination levels (CLs) and rarely require formal, higher-level airspace deconfliction unless specific local procedures dictate otherwise. Although SRR missions are typically governed by unit SOPs, this does not imply their operations are any less stringently controlled; safe operation depends on trained and certified operators maintaining constant airspace awareness.

Figure 2-1. A Soldier from 1st Brigade Combat Team of the 101st Airborne Division operates a Black Widow system.[13]

- **Medium-Range Reconnaissance (MRR):** These missions are flown at greater altitudes and distances, potentially extending near or above the CL or into airspace used by manned aircraft. Operations with MRR SUAS, especially when flying near the CL, across unit boundaries, or in areas with other air traffic, often necessitate formal airspace coordinating measures requests (ACMREQs). MRR missions typically fly at or around 1,000 feet AGL, with some variance based on terrain and noise abatement factors. MRR platforms range from 10 to 25 kilometers and beyond; therefore, MRR missions may extend appreciably beyond the forward line of own troops (FLOT). Once past the FLOT, MRR management and control may become more permissive because of the lower density of friendly aircraft in this airspace.
- **Long-Range Reconnaissance (LRR)**: These missions may be flown below or above the CL out to maximum ranges of SUAS, 15 kilometers or more. Group 2 may fly LRR, but the majority of LRR is flown by group 3. LRR typically requires ACMREQs to deconflict with manned aircraft along with air defense units and other airspace users.
- **Launched Effects (LE)**: These missions encompass all UAS attack missions, including short- and long-range one-way attacks (OWAs), loitering munitions, and payload delivery systems. These systems may be recoverable or attritable, and feature autonomous and human-in-the-loop systems. Control of short-range, low-altitude LE platforms likely falls under unit SOPs; larger systems require specific coordination to deconflict.
- **ACMREQ Process:** Operators initiate these requests, which are processed through the battalion S-3 and the ADAM/BAE**.** This ensures the SUAS mission is integrated, approved by the appropriate airspace control element, and entered into the Tactical Airspace Integration System (TAIS) for visibility across the battlefield. TAIS is typically

[13] Photo by Michelle Miller. Program Executive Office, Aviation. https://www.dvidshub.net/image/9103511/army-accelerates-fielding-advanced-suas.

managed at the BCT; battalions should coordinate with their ADAM/BAE to ensure their ACMREQs are entered and tracked.

Understanding the Joint Air Tasking Cycle

The ATO and ACO can be thought of as the joint "playbook" for the air domain.[14] They are published by the joint force air component commander (JFACC) and airspace control authority (ACA) respectively on a 72- or 96-hour cycle and direct all air operations in the theater.

- The ATO tasks aircraft and other assets with specific missions and provides additional required details.[15]
- The ACO is like the "rules of the road" for the sky.[16] It defines safe corridors, restricted areas, and coordination altitudes to integrate joint air operations, prevent collisions and fratricide, and optimize weapons employment.

BATTALION AND COMPANY AIRSPACE OPERATIONS IN PRACTICE

SUAS operations in support of battalion and company missions are detailed in OPORDs and must align with the brigade UAPs, along with the current airspace control plan (ACP) and ACO. The ADAM/BAE is the key entity for coordinating formal and informal ACMs. It processes ACM requests for MRR/LRR SUAS and ensures approved measures are reflected in TAIS, making them visible to other airspace users. For SRR SUAS, unit-level adherence to unit SOPs and informal ACMs is the more typical method of control. The following describes SUAS operator coordination and deconfliction responsibilities:

- **Internal:** Company/platoon leadership and SUAS operators are responsible for deconflicting SUAS operations with other unit activities (e.g., other SUAS and indirect fires observation).
- **External:** For MRR and LRR SUAS, or when operating near boundaries or controlled airspaces, coordination is passed from the SUAS operator/team leader, through company leadership, then to the battalion S-3, who liaises with the ADAM/BAE.

Planning Considerations for Battalion/Company/Platoon Leadership

- **Commander's Intent:** Consider how SUAS operations support the commander's overall intent for the operation.
- **SUAS Capabilities and Limitations:** Leaders must understand the specific capabilities (range, endurance, and sensor package) and limitations (weather, terrain masking, and battery life) of their SUAS to provide reasonable and actionable objectives for SUAS operators.
- **Risk Management:** Leaders must assess and mitigate risks. Key risks include—
    - **Weather:** Wind, precipitation, and visibility.
    - **Terrain:** Line-of-sight for control, terrain masking for targets or threats, and suitable launch/recovery areas.

[14] Joint Publication (JP) 3-52, *Joint Airspace Control*, 22 October 2022. II-6.
[15] Ibid.
[16] JP 3-52, *Joint Airspace Control*, 22 October 2022. II-5.

- **Enemy Activity:** Air defense capabilities and electronic warfare (EW) threats.
- **Electromagnetic spectrum Congestion:** Interference with control links or data feeds.
- **Friendly Airspace Users:** Potential conflicts with other airspace users.

- **Contingency Planning:** Units must have simple, actionable contingency plans for common issues like lost or degraded communications, system malfunctions, emergency recovery procedures, and unexpected changes in the tactical or airspace situation.

Small Unmanned Aircraft System Mission Planning and Troop Leading Procedures

This section describes how SUAS missions are nested inside troop leading procedures (TLPs) at battalion-and-below echelons. Actions and outputs are provided for each step of the TLP to better inform leaders and SUAS operators how to best integrate SUAS operations with other unit activities. See figure 2-2.

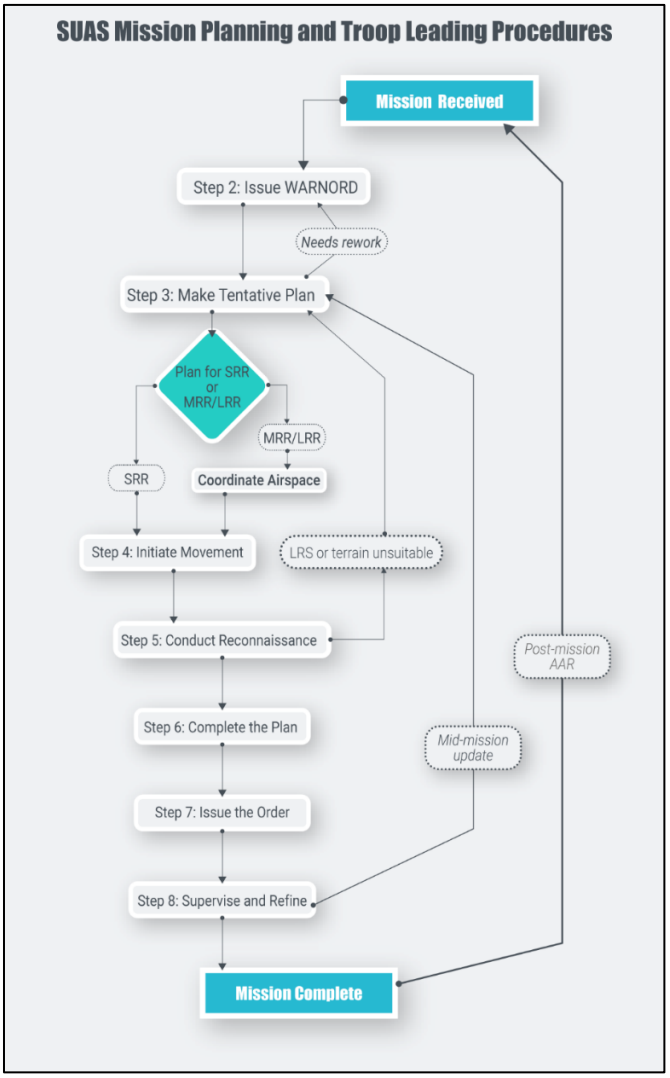

Figure 2-2. SUAS mission planning and TLPs

1. **Receive the Mission:**
    - **Actions:** Upon receiving a mission from higher headquarters, the unit command and SUAS team leader(s) identify potential SUAS support requirements. Review the current SUAS status, known friendly locations, and any standing airspace instructions or restrictions the ADAM/BAE relays.
    - **End State:** Understand the task and commander's intent, initial SUAS concept of support, and awareness of current airspace limitations.
2. **Issue a Warning Order (WARNORD):**
    - **Actions:** Alert SUAS operator(s) of the pending mission. Include basic information about the area of operations (AO) and potential tasks.
    - **End State:** SUAS team begins initial preparations (system checks, route, and loiter area planning).
3. **Make a Tentative Plan:**
    - **Actions:**
        - Determine specific SUAS tasks (e.g., route reconnaissance, overwatch for an assault, and specific named area of interest [NAI] surveillance).
        - Analyze terrain for optimal launch/recovery sites (LRSs), flight routes, and potential dead zones for communication.
        - **For SRR:** Plan operations consistent with unit SOPs and within the unit's immediate operational area, ensuring deconfliction with other local airspace users. See figure 2-3.

Figure 2-3. A Soldier from the 2nd Multi-Domain Task Force conducts a preflight inspection on a UAS during Exercise Arcane Thunder 25.[17]

[17] Photo by SSG Rajheem Dixon, 2nd Multi-Domain Task Force. https://www.dvidshub.net/image/9117715/soldiers-experiment-with-technology-arcane-thunder.

        - **For MRR/LRR:** Identify preliminary airspace requirements (desired area, altitude, and time on station). Communicate these needs up to the ADAM/BAE for integration and coordination.
        - Assess risks (weather, enemy, and terrain) and develop mitigation measures.
        - Develop contingency plans (lost link and alternate LRS).
    - **End State:** Tentative SUAS flight plan(s), primary and alternate LRS, identified risks and mitigation measures, coordination requests for MRR/LRR operations are submitted to higher.

4. **Initiate Movement:**
    - **Actions:** SUAS team commences movement to planned LRS and begins to prepare systems for flight.
    - **End State:** SUAS teams are moving and SUAS are ready for action.
5. **Conduct Reconnaissance:**
    - **Actions:** SUAS team leader confirms final suitability of LRS, verifies line-of-sight, and checks for local hazards. Final check for any updated airspace instructions from the battalion or ADAM/BAE. Conduct a map reconnaissance of the flight plan/routes.
    - **End State:** Confirmed LRS and updated situational awareness of local airspace and operational environment (OE).
6. **Complete the Plan:**
    - **Actions:** Finalize SUAS mission details based on other unit reconnaissance activities and any additional updated information. For MRR/LRR, confirm airspace clearance and parameters received from ADAM/BAE.
    - **End State:** Finalized SUAS mission plan, including objectives, routes, altitudes, timings, and contingencies.
7. **Issue the Order:**
    - **Actions:** Unit leadership and/or the SUAS team leader briefs the SUAS operator(s) on final mission specifics: objectives, flight path, altitudes, communication plan (callsigns and frequencies), emergency procedures, no-fly areas, and any additional specific instructions.
    - **End State:** SUAS operator(s) understand the mission and are ready for execution.
8. **Supervise and Refine (Execution Phase):**
    - **Actions:**
        - Monitor SUAS operations through continuous contact with SUAS operators.

        - **For MRR/LRR:** Maintain communication with the ADAM/BAE to ensure operations remain integrated with other airspace users. Be prepared to adjust flight profiles, timings, or mission objectives based on real-time conditions or instructions.
        - **For SRR:** Maintain communication with the battalion for dynamic changes to the local tactical situation. Be prepared to adjust flight profiles, timings, or mission objectives based on real-time conditions or instructions.
        - Conduct after action reviews (AARs) post-mission or post-operation to identify lessons learned for future SUAS employment.
    - **End State:** Successful mission execution, continuous situational awareness, dynamic adjustments as needed, and lessons learned.

Enforcing a robust lessons learned cycle ensures unit SOPs continuously evolve to meet new operational challenges.

Preplanned Small Unmanned Aircraft System Operations

Preplanned SUAS missions are those that allow leaders and operators ample lead time to plan and execute SUAS operations. These operations are common when supporting larger battalion or brigade missions. Key factors supporting successful preplanned SUAS operations include—

- **Early Integration with TLP:** Include SUAS considerations from the "Receive the Mission" step of TLP. This ensures SUAS capabilities are effectively factored into the overall operational plan. For MRR/LRR, this allows timely and detailed submission of airspace requests to the ADAM/BAE.
- **Detailed Preparation:**
    - **Intelligence Focus:** Obtain information from the S-2 on known/suspected enemy air defenses, potential electronic attack, and terrain that impacts SUAS line-of-sight.
    - **Airspace Coordination (MRR/LRR):** Submit detailed airspace requests to the ADAM/BAE well in advance. Clearly define operating areas, altitudes, times, and how SUAS support the mission. SUAS leadership/operators should be prepared to provide details to battalion or brigade planners.
- **Synchronize with Other Elements:**
    - **Within the Platoon/Company:** Ensure SUAS plans are deconflicted with other local airspace users.
    - **Army/Joint Fires Integration (Primarily MRR/LRR):** If SUAS are supporting fires, coordinate closely with the forward observer (FO) or company/battalion fire support elements for targeting and battle damage assessment.
- **Execute and Adapt:**

- **Thorough Pre-Mission Checks and Briefs:** Ensure SUAS operators understand objectives, adhere to SOPs, and are aware of all coordination measures (especially altitude restrictions and boundaries), contingency plans, and communication protocols. For SRR, execution is often in accordance with SOP and training; deviations are briefed by exception. For MRR/LRR, any deviations from standard flight profiles are briefed on contact to the ADAM/BAE.
- **Communication Procedures:** Use established communication frequencies, call signs, and reporting formats per unit SOPs and mission orders for clear communication with the controlling element and for passing information to the battalion/ADAM/BAE, as required.
- **Real-time Coordination (Primarily MRR/LRR):** Maintain situational awareness of any changes in the airspace or mission requirements. Proactively coordinate adjustments when operating in airspace shared with rotary-wing aircraft.

A well-rehearsed unit SOP allows for more rapid and effective SUAS employment during unexpected situations.

Dynamic Small Unmanned Aircraft System Operations

Dynamic SUAS operations emphasize speed and adaptability, often with minimal planning time. SRR operations, in particular, are frequently dynamic and governed largely by unit SOPs and tactics, techniques, and procedures (TTPs).

- **Launch and Coordination Procedures:**
  - **On-Call Posture:** Maintain a high state of readiness: preflighted aircraft (as much as SOPs allow), charged batteries, and available crews. Pre-identify potential LRS.
  - **Immediate Communication (Upon Receiving Tasking):**
    - **SRR:** Unit leadership informs SUAS operator(s) and begins deconflicting with other organic elements in the unit.
    - **MRR/LRR:** SUAS team or unit leadership immediately contacts the ADAM/BAE or S-3 with essential information: requesting unit, desired support, target area/NAI, and desired time/duration.
  - **Real-time Airspace Clearance (MRR/LRR):** The ADAM/BAE rapidly deconflicts the requested airspace and issues a concise clearance, including approved altitude, flight restrictions, and coordination points.
- **Dynamic Retasking:** Be prepared to receive new or adjusted missions while airborne, especially for MRR/LRR systems. Updates to mission will typically come from unit leadership based on the situation and evolving tactical needs. Updates to airspace coordination typically come from the ADAM/BAE.
- **Data Exploitation and Dissemination:**

- **Streamlined Analysis:** Focus on rapid identification, support to targeting, and reporting of priority intelligence requirements (PIRs).
- **Rapid Dissemination:** Use voice calls, digital messages, or pre-formatted reports to transmit critical information quickly to unit staff members and leadership.
- **Marked Imagery:** If capabilities allow, quickly mark and transmit key imagery (enemy positions or obstacles) to provide actionable intelligence.

Challenges for Small Unmanned Aircraft System Operations

- **Communications Reliability:** Operating in a congested or contested electromagnetic spectrum (EMS) can disrupt control links or data feeds. Plan for primary, alternate, contingency, and emergency (PACE) communications; use terrain for masking, when possible.
- **Operator Workload and Fatigue:** Dynamic and high-stress environments can overwhelm operators. Leaders must be cognizant of work/rest cycles for SUAS operators and mitigate risks associated with fatigue, especially during sustained operations. Use crew rotations if multiple qualified operators are available. Training for high-stress scenarios and adherence to SOPs can reduce cognitive load.
- **Survivability:** Because of their EMS and visual signature, relative lack of mobility, and impact on the battlefield, SUAS operators and ground stations are vulnerable and high-value targets. Leaders and operators must prioritize survivability measures, such as EMS and visual signature discipline and regular survivability movement.

Chapter 3
Small Unmanned Aircraft System Airspace Tactics, Techniques, And Procedures

This chapter outlines select tactics, techniques, and procedures (TTPs) and best practices to improve airspace coordination at the unit level and improve the efficiency of small unmanned aircraft system (SUAS) operations.

PLANNING AND COORDINATION

A well-rehearsed and extensively validated brigade standard operating procedure (SOP) is the center of gravity for successful SUAS operations. This SOP must be relevant, easily understood, and practical, focusing on information that directly enables lower echelon leaders and SUAS crews. It should omit extraneous details irrelevant to brigade and below level operations.

> Realistic training using live aircraft, tactical software, and multiple simultaneous airspace users is a best practice to validate and evolve unit SUAS SOPs.

Rigorous training is paramount for rehearsing and validating the SOP. This training should establish and test procedural controls, such as standardized airspace measures and critical notification timelines in realistic, high-intensity training environments. Training must also include elements, such as electronic warfare (EW) and degraded communications to ensure the SOP functions as needed, even in sub-optimal conditions.

Other key planning and coordination TTPs include—

- **Brigade-Level Airspace Working Groups**: Regular participation of SUAS representatives in forums like brigade airspace, information collection, and targeting working groups is crucial. These meetings, involving the air defense airspace management (ADAM)/brigade aviation element (BAE), aviation elements, fire support elements, and maneuver units, ensure all stakeholders understand the commander's intent, deconflict airspace, and establish clear communication for routine and contingency operations, especially for medium-range reconnaissance (MRR) and long-range reconnaissance (LRR) integration.

- **Standardized Airspace Coordinating Measures Requests (ACMREQs) Procedures:** Using standardized templates and a well-rehearsed unit SOP for ACMREQs streamlines the airspace approval process. Templates ensure consistent and clear communication of necessary information (operating areas, altitudes, times, and justifications) to the ADAM/BAE. A practiced SOP ensures all stakeholders understand their roles and receive critical information.

- **Routine Airspace Coordination Areas:** Establishing routine airspace coordination areas within the unit's area of operations (AO) reduces risk, accelerates planning for SUAS missions, and allows ADAM/BAE resources to focus on more complex airspace management. An example UAP establishes a regular 24-hour SUAS restricted operations zone (ROZ) that is tied to each maneuver battalion's boundaries. The SUAS ROZ should be approximately 3 kilometers behind the forward line of own troops (FLOT) and out 3

kilometers beyond the battalion's objective or engagement area, with a ceiling up to 300 feet AGL, enabling the majority of SRR missions to fly without separate ACMREQs.

- **Shared Airspace Visualization:** Although direct access to advanced digital mapping tools by all SUAS operators may be limited, the ADAM/BAE should leverage systems like the Tactical Airspace Integration System (TAIS) and Advanced Field Artillery Tactical Data System (AFATDS) whenever possible to improve situational awareness for SUAS users and commanders. These tools facilitate a shared understanding of the airspace, enabling the visualization of planned SUAS flight paths alongside other air activities like aviation elements and fire support trajectories. This supports collaborative planning efforts and builds shared situational awareness among all airspace users.

EXECUTION AND DECONFLICTION

Altitude Separation: Assigning specific altitude blocks for SUAS operations is a fundamental deconfliction technique. This practice, detailed within the unit SOP and relevant annexes (e.g., division/brigade annex C, appendix 10), accounts for mission requirements, risk, and system capabilities to assign optimal and standardized altitude layers to each SUAS type throughout the unit. System capability is the most important planning factor; smaller and/or less capable systems likely require lower operating altitudes because of shorter operational ranges and less capable sensor systems. Well-planned altitude separation simplifies deconfliction and minimizes collision risk with other aircraft, especially in congested airspace.

The following are examples of separation guidelines:

- **Very Short-Range Systems:** Operations are generally confined to the treetop/obstruction level or below. No prior coordination is typically required, though operators may immediately be required to "go to ground" if any rotary-wing traffic is observed.

- **Short-Range Reconnaissance (SRR) Systems:** Operated at 300 feet above ground level (AGL) and below. Although direct ADAM/BAE coordination may not be mandatory, a strong SOP involves coordinating with the battalion/brigade S-3 or ADAM/BAE for optimal flight times and leveraging its awareness of planned rotary-wing routes. SRR operators must also immediately "go to ground" if rotary-wing aircraft are observed.

- **MRR Systems:** Operated at 1,000 feet AGL and below. Coordination with the ADAM/BAE is required. Unit SOPs should establish standard route parameters and mission area ROZ dimensions for MRR flights.

- **LRR Systems:** Typically flown 2,000 to 4,000 feet AGL, depending on the mission and sensor payload. ADAM/BAE coordination is mandatory. A minimum of 30 minutes prior notification is recommended, especially if operating above the coordination level (CL), to allow the ADAM/BAE sufficient time to submit an ACMREQ to the division for approval. Standard route and mission area ROZ parameters for LRR systems must also be defined in the unit SOP.

- **Lateral Separation:** Making use of natural (terrain features) and artificial (unit boundaries and grid lines) offers additional opportunity for physical separation of UAS. Planners should develop SOPs that make the best use of tools readily available and useful

to operators; terrain features, such as rivers and roads make ideal lateral boundaries, easily visible to most UAS platforms while in flight. Artificial lateral boundaries are most useful for systems operated in conjunction with digital airspace management tools.

- **Route Planning:** SUAS operators flying in rear areas should plan flight paths that avoid known high-traffic areas for Army aviation, artillery firing points, and potential close air support (CAS) ingress/egress routes. This technique reduces the likelihood of encountering other aircraft and simplifies airspace coordination.
- **Time-Phased Operations:** Phase SUAS launch, transit, and recovery times to avoid periods of peak activity in busy areas, such as air assaults, resupply, or joint air pulses. This procedural approach ensures SUAS operations do not impact other critical efforts, while simultaneously reducing risk.

COMMUNICATIONS AND TARGETING

- **Dedicated SUAS Frequencies:** Using designated, preplanned frequencies specifically for SUAS operations minimizes interference with other battlefield emitters and can work to minimize enemy EW impact. Frequencies for SUAS should be coordinated through the unit's spectrum manager and validated against the joint restricted frequency list (JRFL).
- **Standardized Reporting Formats:** Employing standardized reporting formats for SUAS observations, target information, and airspace situation updates reduces ambiguity and communication errors, while speeding action.
- **SUAS, EW, and Targeting Integration:** Ensuring active and practiced links between SUAS operators, EW personnel, and targeting personnel works to offset enemy EW effects on friendly SUAS operations and facilitates rapid targeting of enemy emitters in the AO.

OPERATIONAL CONSTRAINTS AND CONTINGENCIES

- **Weather Impact and Standardized Responses:** SUAS are particularly sensitive to weather. Continuous monitoring and coordination with meteorological staff members are essential to assessing conditions such as winds; cloud floors, layers, and ceilings; prevailing visibility (including the effects of precipitation or other obscurants); precipitation (type and intensity); and temperature extremes. Unit SOPs must include a branch plan for varying conditions. These procedures should define operational thresholds and actions based on how specific weather elements impact SUAS capabilities. Commanders of all types must be aware of weather-specific impacts on the SUAS supporting them.
- **Emergency Recall Procedures:** An actionable and reliable system must be in place for the rapid recall or flight termination of all SUAS operating in a given airspace volume. Such procedures are critical for responding to unexpected airspace closures, dynamic changes in the tactical situation, or any safety concerns that necessitate the immediate grounding or recovery of SUAS assets.
- **Deconfliction With Mortars and Artillery:** Commanders, enabled by staff input, decide which SUAS or mission types do not need to deconflict with indirect fires munition flight paths and firing points. Particularly during high-intensity large-scale combat operations

(LSCO), commanders must balance the risk of excessively constricting operations versus the risk of SUAS colliding with munitions.

- **Return Procedures and Survivability:** Crews should consider measures, such as multiple or offset landing points to improve survivability. Crews should actively monitor enemy surveillance of landing points.

PROCEDURAL AIRSPACE CONTROL TACTICS, TECHNIQUES, AND PROCEDURES

- **Visual Flight Rules (VFRs) Operations:** For low-risk missions in uncongested airspace, leverage VFR procedures where SUAS operators maintain visual contact with their aircraft on launch and recovery to ensure separation from other air traffic. Clearly define altitudes and lateral boundaries for VFR SUAS flights to minimize the risk of conflict with manned aircraft.

- **Lateral Boundary Designators:** When possible, leverage large, readily identifiable terrain features—such as roads, rivers, bridges, or buildings—to define lateral boundaries for SUAS operating areas. This simplifies airspace visualization for SUAS operators and other airspace users.

- **Altitude Reservation System:** Implement a system that routinely assigns specific altitude blocks to specific units or systems within the unit's airspace. A well-rehearsed SOP ensures shared understanding regarding which systems habitually operate at which altitudes.

- **Designated SUAS Training Areas:** Establish habitual airspace areas within unit AOs designated for SUAS training and proficiency flights that do not require the same level of airspace coordination as operational missions.

LOSS OF LINK TACTICS, TECHNIQUES, AND PROCEDURES

- **Preprogrammed Return-to-Home (RTH) Procedures:** If the system allows, program a designated RTH protocol. The RTH procedure should transit the aircraft to a safe location within friendly lines while, if possible, avoiding friendly units on the ground and restricted volumes of airspace. RTH flights should use a cleared altitude that avoids terrain and obstacles. If the SUAS cannot immediately land upon reaching the RTH point (e.g., because of a need to clear the area), program a contingent holding pattern or loiter procedure. This allows the ground crew to regain communication and prepare for a safe landing.

- **Visual Search Procedures:** Train SUAS crews and Soldiers across the unit on standardized search procedures to locate grounded SUAS that deviate from a RTH path or are otherwise not immediately visible upon return.

- **Emergency Landing Zones:** Designate predetermined emergency landing zones within the brigade AO. These zones should be secure open areas with minimal obstacles and easy accessibility to crews or other personnel assisting with recovery.

- **Lost-Link Reporting:** Establish clear reporting procedures for lost-link events. The SUAS operator should immediately notify the ADAM/BAE, providing the last known location, altitude, and time of the loss of link (LOL).

Appendix A
Small Unmanned Aircraft System Mission Flow Guide

This guide provides a basic overview of small unmanned aircraft system (SUAS) mission execution, intended to inform commands and staff members about the fundamentals of SUAS operations supporting their unit. See A-1.

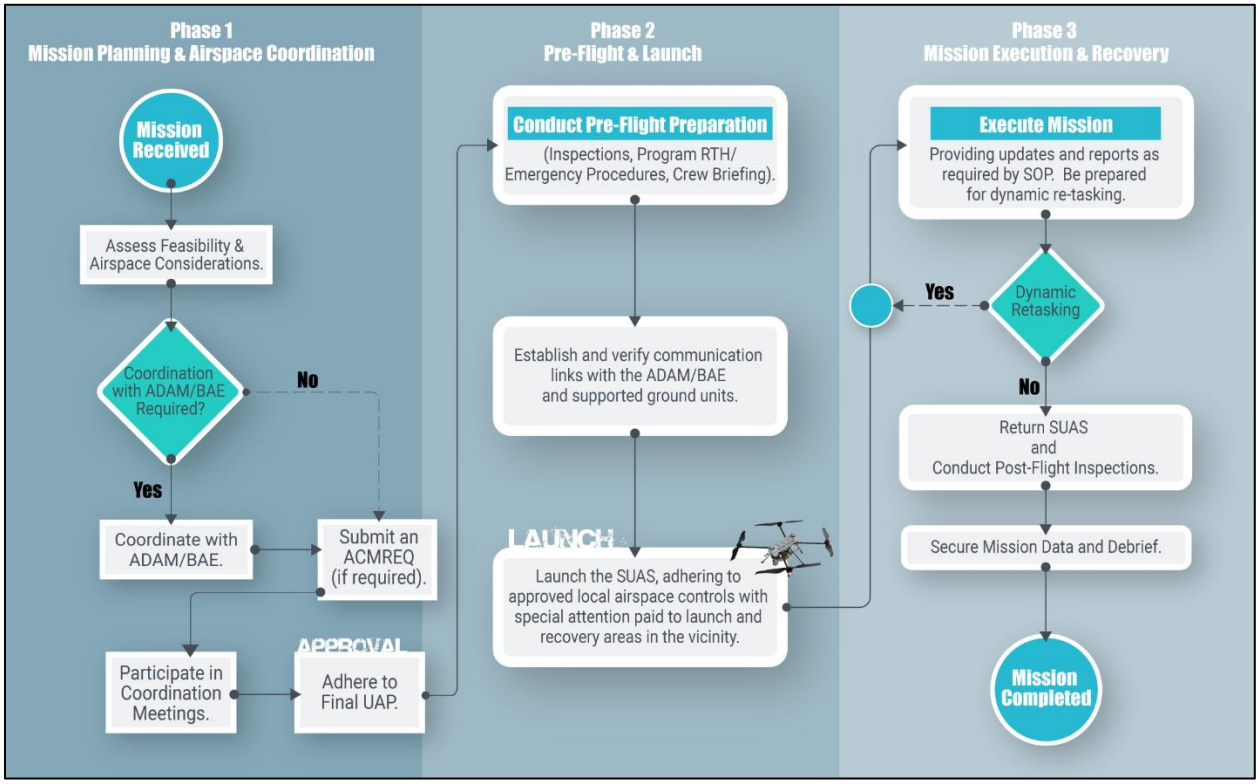

Figure A-1. Three phases of SUAS mission execution

PHASE 1: MISSION PLANNING AND AIRSPACE COORDINATION

1. **Mission Receipt and Assessment:** Receive mission tasking (objective, area of interest, duration, and intelligence requirements). Assess feasibility, asset availability, and preliminary airspace considerations. Advise commands and staff members of assessment results and any changes to risk level.

2. **Coordinate with Air Defense Airspace Management (ADAM)/Brigade Aviation Element (BAE):** If required for the mission, contact the ADAM/BAE to request airspace guidance. Provide preliminary mission details and determine if an airspace coordinating measures request (ACMREQ) or coordination meeting is needed.

3. **Airspace Approval:** Submit an ACMREQ (if required) and participate in coordination meetings to deconflict with other airspace users. Ensure all crews adhere to the final unit airspace plan (UAP).

PHASE 2: PREFLIGHT AND LAUNCH

4. **Preflight Preparation:** Conduct thorough inspections of the SUAS, ground control station, and equipment (battery, communications, and sensors). Program return-to-home (RTH) and emergency procedures, briefing the crew accordingly.
5. **Communication Check:** Establish and verify communication links with the ADAM/BAE and supported ground units.
6. **Launch:** Launch the SUAS, adhering to approved local airspace controls while paying special attention to launch and recovery areas in the vicinity.

PHASE 3: MISSION EXECUTION AND RECOVERY

7. **Execute Mission:** Conduct the mission, providing updates and reports, as required by standard operating procedures (SOPs). Be prepared for dynamic retasking.
8. **Recovery and Post-Flight:** Return the SUAS to the designated recovery point. Conduct post-flight inspections, secure mission data, and debrief the crew, ADAM/BAE, and supported units, as required by SOPs.

Appendix B
Sample Small Unmanned Airspace Coordinating Measures Request Formats

Sample Unmanned Airspace Coordinating Measures Request (ACMREQ) Format

Unit: (submitting unit name and call sign) **Date-Time Group (DTG) Submitted:** (YYYYMMDDHHMMZ) **Mission/Operation Name:** (name of operation or exercise) **Point of Contact:** (name, rank, position, DSN, cell)

1. Requested Airspace Coordinating Measure(s)

- Restricted Area (RA)
- Altitude Reservation
- Pre-Coordinated Flight Path
- Other: (pecify)

2. Airspace Requirements

- **Location:** (grid coordinates, landmarks, or area description)
- **Dimensions:** (radius, length, and width [as applicable])
- **Altitude(s):** (feet above ground level [AGL] or mean sea level [MSL])
- **Time Period(s):** (start DTG to end DTG)

3. Supporting Justification

(Clearly articulate the operational justification for the requested airspace. Explain how the requested measure supports the commander's intent, the overall mission, and any specific intelligence or targeting requirements. If deconfliction with other airspace users is a concern, explain how the request mitigates those concerns.)

4. Supporting Information (As Applicable)

- SUAS Platform(s): (specify type and capabilities)
- Sensor Payload(s): (specify type and capabilities)
- Number of SUAS: (indicate quantity)
- Contingency Plan (lost link, etc.): (summarize)
- Primary, alternate, contingency, and emergency (PACE) Plan for Communications: (include encryption and link security measures)

Simplified ACMREQ Format (For Routine Operations)

Unit: (submitting unit name and call sign) **DTG:** (YYYYMMDDHHMMZ)

SUAS Type: (type) **Location:** (general area description or landmark) **Time:** (start to stop)

Remarks: (any additional information or special instructions)

Submission and Approval (Medium-Range Reconnaissance [MRR] and SRR)

- Submit ACMREQs to the air defense airspace management (ADAM)/brigade aviation element (BAE) through designated communication channels (email, digital systems, etc.).
- Ensure the request is submitted with sufficient lead time for processing and deconfliction.
- The ADAM/BAE will review the request and provide approval or guidance on any necessary modifications.
- Maintain communication with the ADAM/BAE throughout the mission for any changes or updates to airspace coordinating measures.

Appendix C
Army Small Unmanned Aircraft System Overview

This appendix provides a general overview of small unmanned aircraft system (SUAS) platforms employed by the Army, categorized by their operational roles: short-range reconnaissance (SRR), medium-range reconnaissance (MRR), and long-range reconnaissance (LRR). These role-based categories generally align with traditional Department of Defense (DOD) unmanned aircraft system (UAS) groupings (groups 1 through 5) that are based on factors such as maximum takeoff weight (MTOW), operating altitude, and speed. Typically, SRR systems correspond to group 1, while MRR and LRR systems often align with group 2, with some advanced LRR capabilities nearing group 3.

Note: Specific system capabilities, payloads, and operating procedures vary based on model, configuration, and software versions. Always consult official technical manuals (TMs), training circulars (TCs), and program of record (POR) documentation for the most current and authoritative information.

Note: Continued use and development of commercial off-the-shelf (COTS) SUAS is likely to expand significantly in the short term. Rapid prototyping and fielding of these systems may evolve these descriptions and definitions.

SHORT-RANGE RECONNAISSANCE SMALL UNMANNED AIRCRAFT SYSTEMS

- **Typical Platforms:** RQ-28A (Skydio), Black Widow, and similar micro or small hand-launched systems (some previously categorized as handheld SUAS or lower-end group 1).
- **Primary Roles:** Very short-range to short-range reconnaissance, direct situational awareness, and security for dismounted troops, squads, platoons, and companies.
- **Key Features:**
    - Extremely portable, often pocket-sized or backpackable, capable of being carried and launched by a single Soldier or small team.
    - Characterized by quiet operation and small size, offering a stealthy intelligence-gathering capability, especially for micro systems.
    - Range typically varies from a few hundred meters for micro systems up to approximately 10 miles for larger SRR platforms.
    - Primarily equipped with electro-optical (EO) and/or infrared (IR) cameras for real-time video.
    - Relatively simple to operate and maintain.
- **Employment Considerations:**
    - Ideal for squad-, platoon-, and company-level operations, including urban environments, complex terrain, or other confined spaces.
    - Provides immediate “over-the-hill” or “around-the-corner” reconnaissance directly to the point of need.

- Micro systems often operate below treetop level. Although all SUAS require airspace awareness, the smallest SRR systems may operate under less restrictive airspace coordination procedures, though adherence to local standard operating procedures (SOPs) is mandatory.

MEDIUM-RANGE RECONNAISSANCE SMALL UNMANNED AIRCRAFT SYSTEMS

- **Typical Platforms:** Anduril Ghost systems and similar platforms.
- **Primary Roles:** Reconnaissance, surveillance, and target acquisition support for company- and battalion-level operations.
- **Key Features:**
  - Greater range, endurance, and altitude capabilities than SRR systems.
  - May carry more advanced or modular payloads, potentially including multi-sensor options.
  - Can be hand, mechanical, or vertical takeoff and landing (VTOL) launched, depending on the specific system.
  - Improved datalinks and navigational capabilities.
- **Employment Considerations:**
  - Suitable for providing tactical intelligence over broader areas for company and battalion operations.
  - Bridges the gap between the immediate reconnaissance of SRR and the wider area coverage of LRR.
  - Requires more deliberate airspace planning and coordination than most SRR systems because of their increased operational envelope (altitude and range).

LONG-RANGE RECONNAISSANCE SMALL UNMANNED AIRCRAFT SYSTEMS

- **Typical Platforms:** Stalker, P550, and similar class systems.
- **Primary Roles:** Extended-range reconnaissance, surveillance, target acquisition, and force protection over wider operational areas.
- **Key Features:**
  - Significantly longer range and endurance than MRR systems (often 20 miles or more).
  - Capable of carrying heavier and more sophisticated payloads, which may include multi-sensor EO/IR systems, laser pointers/designators (platform dependent), and advanced communications relays.
  - May require catapult launch, paved, or runway-independent VTOL systems.
- **Employment Considerations:**

- Typically employed at battalion and brigade levels to support broader operational objectives.
- Offers a balance between tactical responsiveness and increased intelligence, surveillance, and reconnaissance (ISR) capabilities.
- Airspace coordination is critical and more complex because of their extended range, higher operating altitudes, physical size, and potential to interact with other manned and unmanned aircraft.

Note on Other UAS Categories: The Army historically employed groups 3 and 4 UASs that operated at higher echelons and altitudes, possessed greater capabilities and endurance, and demanded more rigorous and detailed airspace management. Following the divestment of the RQ-7 Shadow and MQ-1C Grey Eagle, the Army currently does not have groups 3 or 4 UAS PORs, but future systems in one or both categories are likely.

References

ARMY DOCTRINE PUBLICATIONS

- Army Doctrine Publication (ADP) 3-0, *Operations*, 21 March 2025. Outlines Army doctrine for conducting unified land operations, including air-ground integration.
- ADP 5-0, *The Operations Process*, 31 July 2019. Provides a detailed framework for Army planning, preparation, and execution of operations.
- ADP 3-90, *Offense and Defense*, 31 July 2019. Discusses offensive and defensive operations, with implications for airspace management in maneuver contexts.

ARMY FIELD MANUALS

- Field Manual (FM) 3-52, *Airspace Control*, 20 October 2016. Provides detailed information on Army-specific airspace control procedures and responsibilities.
- FM 3-52, *Airspace* (draft)[18]
- FM 6-0, *Commander and Staff Organization and Operations*, 16 May 2022. Outlines staff responsibilities and processes, including those related to airspace management.

JOINT PUBLICATIONS

- Joint Publication (JP) 3-0, *Joint Campaigns and Operations*, 18 June 2022.
- JP 3-30, *Joint Air Operations*, 28 April 2025.
- JP 3-52, *Joint Airspace Control*, 22 October 2022.

ONLINE RESOURCES

- **Army Publishing Directorate:** https://armypubs.army.mil/.
- **Federal Aviation Administration:** https://www.faa.gov/.

OTHER RELEVANT PUBLICATIONS AND RESOURCES

- **Federal Aviation Administration (FAA) Regulations:** Consult relevant FAA regulations governing UAS operations in the National Airspace System (e.g., 14 Code of Federal Regulations [CFF] Part 107).
- **Army Unmanned Aircraft System (UAS) Training Materials:** Refer to specific training materials and publications provided for the relevant small unmanned aircraft system (SUAS) platform(s) being employed.
- **Unit Standard Operating Procedures (SOPs):** Adhere to any established unit SOPs governing SUAS operations, airspace coordination, and safety procedures.
- **Manufacturer Technical Manuals:** Consult manufacturer-provided technical manuals for detailed information on SUAS system specifications, operating limitations, and maintenance procedures.

[18] The material in this publication is under development and subject to change. When published, this publication will supersede FM 3-52, *Airspace Control*, 20 October 2016.

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