Joint Interagency Task Force 401 (JIATF-401)

# Counter-Small Unmanned Aircraft Systems (C-sUAS) Quick Reference Guide

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JIATF-401

MESSAGE FROM THE DIRECTOR OF THE JOINT INTERAGENCY TASK FORCE 401,

The proliferation of unmanned aircraft systems (UAS) is changing the character of warfare and creating new challenges at home and abroad. Drones are increasingly capable, accessible, and adaptable, giving state and non-state actors the ability to conduct surveillance, disrupt operations, and deliver lethal effects. The threat is evolving rapidly, and our defenses must evolve with it.

JIATF 401's mission is to synchronize the Department's counter-UAS (C-UAS) efforts and accelerate the delivery of effective capabilities to protect our warfighters and the homeland. Accomplishing that mission requires more than delivering technology. It requires connecting the broader C-UAS community, sharing what works, identifying gaps, and ensuring that lessons, capabilities, and promising solutions move quickly to those who need them.

There is no silver bullet to address the C-UAS challenge. Effective defense requires a layered approach that integrates sensors, command and control, kinetic and non-kinetic effects, and, just as importantly, the training, tactics, authorities, and policies required to employ them effectively. Staying ahead of the threat also requires that warfighters, law enforcement, and security mission partners understand the capabilities available to them and learn from the latest operational experience.

This Quick Reference Guide is intended to help do that. It provides the broader C-UAS community of action with a common reference for current capabilities, emerging technologies, and evolving tactics, techniques, and procedures. It is not a substitute for doctrine or detailed technical guidance. Rather, it is a practical tool to help leaders and operators better understand the C-UAS landscape, identify solutions appropriate to their missions, and apply lessons learned from across the Joint Force and our interagency partners.

The drone threat will continue to change. We must remain equally adaptive: informed by operational experience, connected across organizations, and focused on rapidly putting effective solutions into the hands of those we ask to defend against it.

Matthew Ross
Brigadier General, U.S. Army
Director, Joint Interagency Task Force 401

Joint Interagency Task Force 401

# Counter-Small Unmanned Aircraft Systems (C-sUAS) Quick Reference Guide

Purpose: This Quick Reference Guide (QRG) is designed to provide an easily transportable reference guide to the Joint force and focuses on:

- Common terminology
- Small Unmanned Aircraft System (sUAS) description
- The sUAS threat
- Counter sUAS (C-sUAS) Systems
- Tactics, Techniques, and Procedures (TTPs) for C-sUAS
- Enemy TTPs
- Lessons Learned
- sUAS Reports & Immediate Action Drills

NOTE: This guide is not meant to supersede doctrine, commander's guidance, or established unit standard operating procedures. Examine and use this information considering your mission, the operational environment, and other situational factors.



**Disclaimer**

# Quick Reference Guide

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# Unmanned Aircraft (UA) Categorization

The unmanned aircraft (UA) categorization chart depicted below provides a basic framework to categorize UA. **This chart uses max gross takeoff weight as the most crucial factor to categorize UA.** However, the max gross takeoff weight range associated with Group 3 is rather large (56 - 1,320 pounds). As a result, Group 3 UA near the lower end of this range often share characteristics of Groups 1 and 2, and group 3 UA near the higher end of this range often share characteristics of Groups 4 and 5.

## (U) 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 |

# Small Unmanned Aircraft System (sUAS) Overview

Over the last quarter century, small unmanned aircraft systems (sUASs) have matured and continue to evolve. At present, their low-cost, ubiquity, and utility have altered the character of warfare. What began as a state-sponsored, intelligence, surveillance, and reconnaissance (ISR) capability has evolved into a versatile weapon system employed by state militaries, proxy forces, non-state armed groups, transnational criminal organizations, and individuals acting alone. Improvement in sUAS technology and economies of scale reduced technological and monetary barriers to entry, enabling state and non-state actors to rapidly acquire and field cutting-edge sUASs en-masse.

# UAS TYPES

**Rotary Wing/Multirotor**



| Advantages | Limitations |
|---|---|
| Vertical take off and landing (VTOL) | Flight time/range |
| Modifications | Load carrying capacity |
| Perch and stare capability | |
| Require little/no training | |
| Low cost, easy to acquire and conceal | |

**Fixed-Wing**



| Advantages | Limitations |
|---|---|
| Flight time | May have increased operational and sustainment requirements |
| Modifications | Needs room for take off/landing |
| Generally low audible signature | Has to constantly move forward, no ability to hover |
| Payloads | |

UAS will often include the following characteristics:

· A ground control station (GCS) that enables remote command and control of the UA.

· A bidirectional link between the UA and the GCS that provides control, status, and imagery information.

· A means of navigation – for example Global Navigation Satellite Systems (GNSS) (or other PNT), Inertial Navigation System (INS), Optic flow, Ultrasonic, etc.

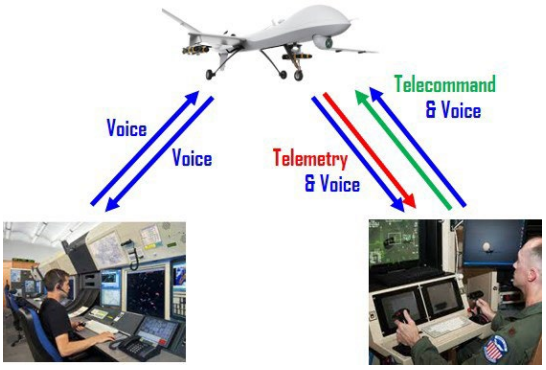
· Fiber drones are a type of unmanned aerial vehicle (UAV) that use fiber optic cables for guidance and control instead of traditional radio frequency (RF) signals.

*(Ref. A Comprehensive Approach to Countering Unmanned Aircraft Systems)*

Unmanned Aircraft (UA) =



Unmanned Aircraft System (UAS) =



# Ground Control Station (GCS)

Ground Control Station (GCS): A GCS is an interface device used by a remote pilot to manipulate the controls or flight path of the UA. GCS components often include:

- Flight Status Display
- Navigation Controls
- Range Extension
- Antenna (Omni/Directional)
- Transceiver (Typically 2.4/5.8 GHz, 433MHz, 900 MHz, and 1.2 GHz for COTS UAS)

## Flight Modes

**Manual mode –** In manual mode, the operator flies the UAS without a pre-programmed flight plan. The operator views the UA directly or utilizes an onboard sensor package. The UA may display more erratic flight characteristics using this flight mode.

**Semi-autonomous –** In semi-autonomous mode, the UA acts independently to some degree. It still requires pilot input for specific operations such as selection of a minimum or maximum altitude for the flight or providing the UA with control to manage distance, direction, and speed.

**Autonomous –** Pre-programmed flight mode for the UAS with no live input from the pilot/operator. Includes the ability to fly hands free and enables computer-controlled flight with pre-programmed missions. This mode will have a smoother, fixed flying path and transitions when turning to its next waypoint. The UAS may make in flight self-corrections without operator intervention in order to stay on mission.

**First Person View (FPV) Drones**– UASs equipped with a video camera and transmitting a real-time image to the pilot's goggles or helmet (controlled in the first person).

## Legitimate Uses for sUAS

Small UAS are routinely used by individuals and organizations within the U.S. (Military, Police, Firefighters, etc.) for:

- Recreational use
- Support of firefighting and search and rescue operations
- Monitoring and assessing critical infrastructure
- Providing disaster relief by transporting emergency medical supplies to remote locations
- Assisting with border security



# Small Unmanned Aircraft System (sUAS) Hazards

A continuous and evolving threat to U.S. forces and allies is the use of the small Unmanned Aircraft System (sUAS). Small UAS are abundant and difficult to detect. When integrated with an adversary's fire and Intelligence Surveillance Reconnaissance (ISR) capabilities they constitute a significant threat to friendly ground forces by restricting or denying a force's ability to move or operate.

In the Homeland, sUAS can be used by terrorists, criminal organizations (including transnational organizations), and lone actors to achieve specific objectives. Small UASs have been weaponized and are used by adversaries in multi-mission roles. Examples from Federal Aviation Administration (FAA) and Department of Homeland Security (DHS) include:

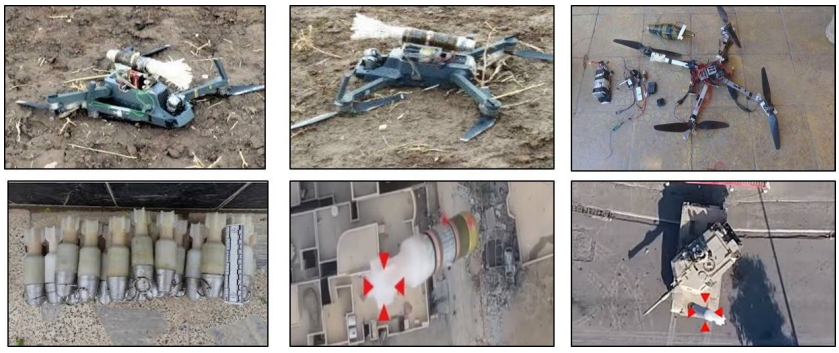
·**Drug Smuggling:** Cartels are known for using sUASs to smuggle drugs across borders and ISR operations to identify Customs and Border Protection (CBP) field checkpoints and foot patrols.

·**Prison Contraband:** Numerous prisons have reported sUAS being used to smuggle contraband such as cellphones, drugs, and weapons to inmates.

·**Domestic Terrorism:** Terrorist organizations could use a sUAS as a weapon system with a mission payload using homemade/improvised munitions that can be dropped from above or as an airborne guided bombs/claymore type device.

·**Flight Safety/Hazards to Flight Operations:** Numerous airports have reported sUAS that have impacted operations.

NOTE: sUAS affixed weapon systems can also include rocket launchers, conventional or improvised munitions, firearms, RF jammers, Chemical, Biological, Radiological, Nuclear, or Explosive (CBRNE) hazards, or other capabilities. The applications of threat sUASs are constantly evolving and can be used by State, Non-State, Asymmetric, Peer, Near-Peer actors.



Examples of sUAS with Weapon System as Mission Payload currently in use by terrorist organizations

To defeat the threat, the Joint force will need to use capabilities from all Services and Combatant Commands (CCMDs).

# Common Threat sUAS Missions

**Intelligence, Surveillance, and Reconnaissance (ISR):** Using mounted cameras, sUAS can provide an adversary with a contemporary ISR capability in real time. Thermal optics allow sUAS pilots the ability to detect heat signatures from objects, people, and animals.

**Command and Control (C2):** sUAS can provide an aerial view of the operational environment to provide situational awareness to force commanders, to better direct forces to accomplish assigned missions. sUAS can also act as a communication relay.

**Direct and Indirect Attack:** sUAS can be used as a fire-and-forget weapon and/or as a delivery platform used to guide, observe, spot, and/or adjust fires as well as return to home or conduct Battle Damage Assessment (BDA) after the attack. sUAS can be used to provide Forward Observer (FO) functionality that can enable adjustment of indirect fire (IDF) or provide direct line of sight (LOS) to the target.

**One-Way Attack (OWA):** Expendable sUAS equipped with an integrated warhead and are intended to detonate upon reaching their target.

**Harassment/Nuisance:** sUAS can be used in an improper manner that congests airspace or interdicts movement which may be intentional or unintentional.

**Swarm Attacks:** Swarming is defined as a method of operations in which multiple systems act as a cohesive unit by actively coordinating their actions. A swarm of UAS is a cluster, fleet, or set of aerial drones that work together to achieve a specific goal. The swarm is controlled either manually or autonomously. What differentiates a swarm from a group of individual UAS is the capability of the drones within the swarm to communicate with one another working together to accomplish prescribed objectives.



# Counter-Small Unmanned Aircraft Systems (C-sUAS)

*NOTE: THE FOLLOWING SYSTEMS ARE NOT ALL INCLUSIVE; THEY ARE WHAT ARE COMMONLY FOUND IN THE SERVICES TODAY.*

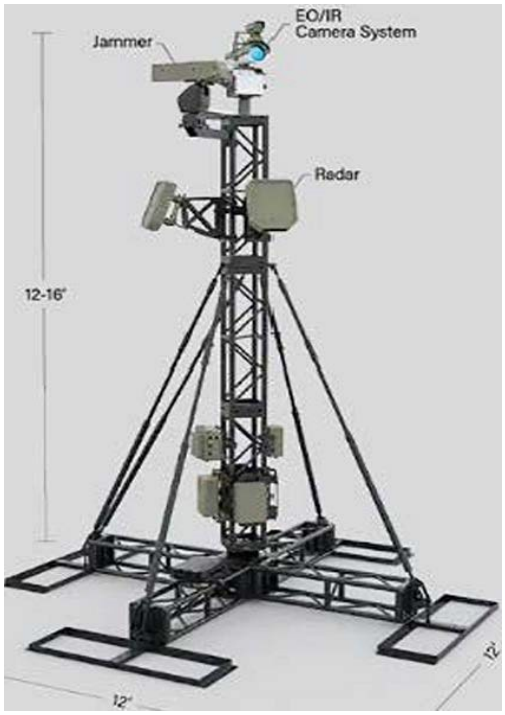


## Disclaimer

Use of C-sUASs relying on electromagnetic sensing for identifying and tracking threat sUAS and electromagnetic attack capabilities to disrupt or disable threat sUAS should be coordinated with the supporting electromagnetic warfare section to ensure electromagnetic spectrum deconfliction.

# Small Unmanned Aircraft Defense Systems (SUADS)

Fixed Site-SUADS
(FS-SUADS)




Rapidly Depolyable-SUADS
(RD-SUADS)




## FS-SUADS

· For deployment at permanent military installations, this fixed-site C-sUAS tower can be integrated as a group or for smaller bases be standalone enabling diverse base protection and 360-degree security. The base command located SUADS manages all base C-sUAS sensors, fuses their data into a common operating picture, and allows various mitigation techniques to be activated for a layered base defense solution.

## RD-SUADS

· Promoting combat agility, This C-sUAS is a self-contained, self-powered system that fits within a 463L pallet, enabling easy transport via military aircraft. Equipped with an integrated diesel generator with standalone operational capacity for four days between refueling. Additionally, the shore power interface allows sites with power infrastructure to operate the system utilizing standard DoW generator connections and base power connections.

## Fixed/Semi-Fixed Systems

# Fixed Site - Low-slow-small UAS Integrated Defeat System (FS-LIDS)



Description:

- FS-LIDS is an integrated C-UAS Detect, Track, Identify, and Defeat System-of-Systems.
- Duke (V) 4/5 and Direction Finding (DF) antennas provide improved detection and defeat.
- EO/IR Camera has an automatic slewing capability.
- Crossing lines of bearing (LOB) along with Radar enables camera slew for EO/IR Positive Identification.
- System ranges are classified.
- Major subsystems
- EW subsystem
- Radar subsystem
- Camera subsystem

Capabilities:

- The AN/TPQ-50 Multi-Mission Radar actively detects and tracks UAS, while the Nighthawk EO/IR Camera, and the Counter-Unmanned Aircraft Electronic Warfare System (CUAEWS) provides secondary location verification, identification, and classification of detected UAS.
- The CUAEWS suite defeats UAS through Electromagnetic Attack (EA): Disruption and jamming of Position, Timing, Navigation; Command Link; and Video downlink signals.
- FS-LIDS has kinetic capability when coupled with the Coyote family of interceptors and KurFS.

# Counter-Remote Control Model Aircraft Integrated Air Defense Network (CORIAN)





Work Station



Description:

- Addresses the Detect, Track, Identify, and Defeat phases of the engagement sequence.
- Configured to host multiple EW capabilities to non-kinetically defeat sUAS at long range.
- The system consists of passive sensor nodes/active sensor nodes for detection, geolocation, and disruption of Group 1 and Group 2 sUAS in the target library.

Capabilities:

- Provides continuous, automated monitoring, day or night.
- Operates in all weather conditions.
- Detects, identifies, and tracks the sUAS radio links to identify and locate UAS flying in restricted or protected airspace.
- Has the capability to locate sUAS ground control stations.

# Pulsar



Description:

· Pulsar is a software-defined radio (SDR) that jams the C2 link between pilot and aircraft and can also jam GPS and GLONASS to counter autonomous threats.

· Pulsar has demonstrated its capability in multiple demonstrations; it earned Joint Endorsement for its performance at the JCO EW Baseline.

Capabilities:

· EW Defeat Groups 1-3 CPNT

# Installation Counter-small UAS (I-CsUAS)




Description:

- Pulsar software-defined 360 degrees EW w/ Machine Learning = non-library based provides passive detection & RF defeat.
- Wide-Area Infrared System for Persistent Surveillance (WISP) passive AI-enabled EO/IR.
- Long Range Camera Tower (LRCT) provides 360 degrees active radar detection.
- Long Range Sentry Tower (LRST) provides 360 degrees active radar detection.
- Lattice AI to autonomously detect, track, identify and neutralize aerial threats.

Capabilities:

- Detect, Track, Identification and non-kinetic Defeat capabilities vs Low-Altitude Low Observable/Low Radar Cross Section threats to Critical Infrastructure.

# Pulsar-L




Description:

· The Pulsar L by Anduril is a compact, man-portable non-kinetic EW C-sUAS effector. It weighs little, deploys in under two minutes to establish an automated RF shield, and uses software-defined jamming to neutralize sUASs' communications at the tactical edge.

Capabilities:

· **Rapid Setup:** Deploys an effective electronic defense shield in less than 2 minutes without requiring specialized EW operators.

· **Autonomous Operations:** Detects, tracks, and blocks adversarial signals, remote-triggered threats, and sUAS in real time.

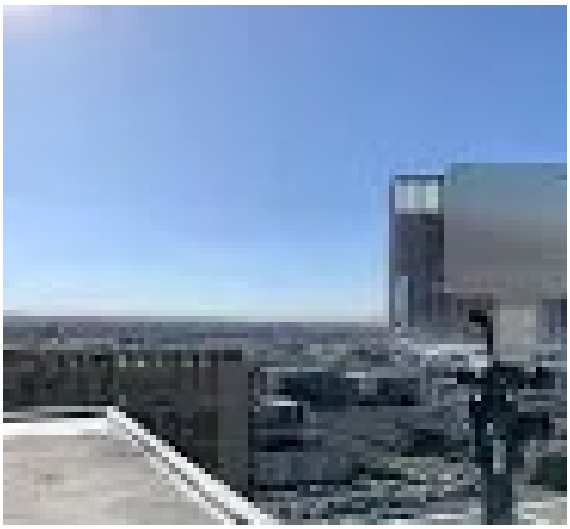
· **Full-Spectrum:** Operates a 360-degree defense envelope that actively detects, identifies, tracks, and defeats threats like loitering munitions and coordinated SUAS swarms.

· **Lattice AI Integration**: Directly interfaces with Anduril's Lattice software platform, enabling automated scanning, threat processing, and multi-unit networked operations with minimal manual oversight from the operator.

· **Software-Defined Agility:** Easily reprogrammable architecture adapts instantly to newly emerging or rapidly shifting adversary radio frequency tactics.

# EchoShield C-sUAS Radar





Description:

· EchoShield is an advanced, software-defined Ku-band 4D pulse-Doppler radar developed by Echodyne designed for counter-unmanned aerial systems (C-UAS). It delivers precise, real-time tracking, classification, and spatial data on small drones to cue optical systems and kinetic or soft-kill effectors.

Capabilities:

- **Radar Type:** Software-defined, cognitive Ku-band, pulse-Doppler.
- **Tracking Accuracy**: Delivers 0.5 degrees of angular tracking accuracy across 4D data (range, azimuth, elevation, and velocity).
- **Target Capacity:** Capable of tracking up to 400 small Unmanned Aerial Systems (sUAS) simultaneously.
- **Classification:** Utilizes Recursive Neural Network (RvNN) machine learning models to differentiate drones from birds or other airborne clutter.
- **Deployment Options:** Supported by a Rapid Deployment Kit (RDK) that links four radars for 360° hemispherical coverage up to a 25-kilometer detection range.

# Ninja





Description:

- The Ninja C-sUAS system is a fixed site, library based, Radio Frequency (RF) Detect, Track, Identify, and Defeat system.
- Disrupts enemy UAS communications through RF detection, tracking, and electronic attack.
- Passively detects, identifies and tracks sUAS, actively defeats hostile sUAS without indiscriminate interference to friendly systems.
- Ninja makes surgical electronic strikes on sUAS targets and seizes operational control of hostile drones while allowing friendly drones to continue uninhibited.

Capabilities:

- Passively detects RF signals, and processes the signal data to track, identify, and defeat threat sUAS through Electronic Attack (EA) for threats in the system library.
- Multiple defeat options may be available to the operator (depending on the threat signal protocols).
- Can operate as a stand-alone system or in a mesh network with other Ninja nodes and components.
- Ninja interoperates with jammers (EGON/Drake/Duke), and with autonomous interceptors.
- Ninja has mobile/dismounted and coverage augmentation variants (Ninja Manpack (MP), Ninja Transmit and Receive (TRx)).

# Ninja TRx






Description:

· The Ninja TRx is a low-cost, lightweight C-sUAS hardware component developed by Black River Systems Company. It acts as a modular transceiver designed to detect, track, and defeat hostile sUAS threats.

Capabilities:

· **Dual Functionality:** Intercepts and deciphers RF sUAS communication signals.

· **Mitigation Control:** Holds Group 1 and 2 sUASs in place, forces soft landings, or re-routes compromised aircraft.

· **Technology Base**: Built on industry-standard Software Defined Radios (SDRs) and powerful embedded computers

· **Scalable Defense:** Multiple units can be meshed to provide 360-degree protection and swarm mitigation.

· **Range Extension:** Plugs into a master Ninja Gen2 Fixed-Site deployment to cover RF blind spots and extend coverage.

· **Mobile/Expeditionary:** Pairs with a standalone Ninja Hub to run quick-setup defense operations without needing a full Gen2 base server.

# KurFS: Ku-band Radio Frequency System




Description:

- Provides target tracks for all groups of UAS and can discern air targets from ground movers.
- Performs Air Surveillance, allowing the operator to verify the airspace in the vicinity of the Coyote launcher is clear of friendly aircraft, and provides fire control for the Coyote.
- Its 10Hz update rate enables slew-to-cue tracking for the Nighthawk HD EO/IR Camera (360 Field of View) as well as video tracker compatibility.
- Multi-mission capability– providing Air Surveillance, Counter Target Acquisition, C-UAS and Fire Control quality.

Capabilities:

- Multi-mission radar
- It works with multiple weapon systems including the land-based Phalanx Weapon System (a rapid fire, computer controlled, radar-guided gun), 50-caliber guns and 30 mm cannons. The radar also supports the High Energy Laser (utilizing photons, or particles of light) and the Coyote weapon system.
- Precision tracking

# Marine Air Defense Integrated System (MADIS)



Description:

· Provides short range Detection, Tracking, Identification, RF-and-kinetic-Defeat of sUAS, Fixed-Wing, & Rotary Wing Aircraft. Short range surface-to-air shoot-on-the-move air defense weapon; short range electronic warfare C-UAS air defense weapon protection for the maneuver force. The MADIS system relies on two vehicles per section, (Mk1 & Mk2).

Capabilities:

· Remote Weapon Station w/ 30mm cannon using proximity-fuzed ammunition and coaxial-mounted 7.62mm machine guns on each vehicle.
· Air-to-Air Launcher (ATAL) w/ mounted FIM-92E Stinger Missiles.
· Counter-sUAS Enhancement System (CES): Trailers w/ Invariant APKWS and Anduril "Anvil" kinetic effectors.
· Multi-Function EW-Mounted (MFEW-M) electronic attack.

# Coyote Weapon System



## Kinetic



Block 2C



## Non-Kinetic (NK)



Block 3NK

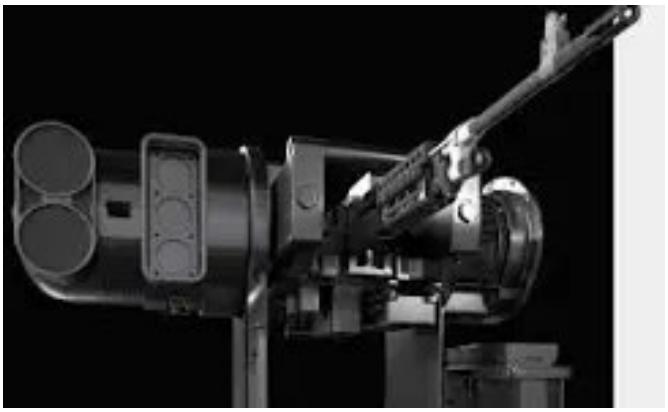
Description: Block 2C

- Coyote is a key component of the Counter-Unmanned Aircraft Systems (C-UAS) system-of-systems.
- Coyote kinetic is a ground launched, radar guided interceptor. that integrates into Fixed Site-Low, Slow, Small Unmanned Aircraft System Integrated Defeat System (FS-LIDS) and Mobile-LIDS (M-LIDS).
- All Coyote kinetic variants launch from either a 4-pack Fixed Site Coyote Launcher System (FSC-LS) or 2-pack Mobile Coyote Launcher System (MC-LS).
- Coyote is fully integrated into Forward Area Air Defense Command and Control (FAAD C2), includes airspace clearance and fratricide avoidance.
- The current Fire Control Radar for the system is the Ku-band Radio Frequency System (KuRFS).
- Fixed Site Coyote Launcher Systems are capable of mixed loadout with kinetic and non-kinetic variants.

Description: Block 3NK

- Coyote is a key component of the Counter-Unmanned Aircraft Systems (C-UAS) system-of-systems.
- Coyote non-kinetic is a ground launched, radar guided interceptor that integrates into Fixed Site-Low, Slow, Small Unmanned Aircraft System Integrated Defeat System (FS-LIDS).
- All Coyote non-kinetic variants launch from either a 4-pack Fixed Site Coyote Launcher System (FSC-LS) or a mobile launcher system.
- Single Interceptor can defeat multiple targets during a single engagement.
- Coyote is fully integrated into Forward Area Air Defense Command and Control (FAAD C2), includes airspace clearance and fratricide avoidance.
- The current Fire Control Radar for the system is the Ku-band Radio Frequency System (KuRFS).
- Fixed Site Coyote Launcher Systems are capable of mixed loadout with kinetic and non-kinetic variants.

# Bullfrog C-sUAS





Description:

· The Bullfrog C-UAS is an AI-powered, autonomous counter-drone weapon station developed by Allen Control Systems (ACS). Designed to defeat Group 1 through Group 3+ UAS. it combines advanced computer vision, precision robotics, and machine learning to autonomously detect, track, and engage fast-moving aerial threats with minimal operator input

Capabilities:

· **Passive Detection:** Uses passive tracking systems so it does not emit detectable radar or RF signals, keeping vehicle or position signatures hidden.

· **Fast Setup & Usability**: Can transition from storage to operational readiness in under two minutes, and operators can be fully qualified on the system in less than 30 minutes.

· **Autonomous Fire Control:** Uses AI to calculate trajectories instantly, requiring human command strictly to initiate the final fire sequence.

· **Weapon Integration**: Designed to mount standard kinetic armaments (such as .50 Cal machine guns, M249, or the M230 chain gun) onto tactical vehicles, naval craft, or fixed positions.

# Enhanced APKWS Ground Launcher Solution
# EAGLS



Description:

· MSI's Enhanced APKWS Ground Launcher Solution (EAGLS) C-UAS system integrates Program of Record components to provide a comprehensive kinetic defeat option for enemy sUAS threats. With proven building blocks of turret optics designator systems and remote weapons stations, launchers and APKWS guidance kits, EAGLS is a field-deployable system that can immediately provide a C-UAS capability in an austere environment, with low logistics, maintenance, and training impacts

Capabilities:

· Detect, Track, & Defeat Groups 1-3 UAS.

## Mounted Systems

# Light - Marine Air Defense Integrated System (L-MADIS)



Description:

- L-MADIS is a lightweight, vehicle mounted, C-UAS system of systems.
- Addresses detect, track, identify and defeat phases of the engagement sequence.
- Consists of two vehicles, one for command and the other as a sensor vehicle.
- Interoperable with FAAD C2 systems; onboard communications suite.
- Skyview and Modi are man-portable C-UAS systems which can be dismounted from the vehicles and used on foot-patrol.

Capabilities:

- Can Detect, Track, Identify, and Defeat threat UAS through the use of onboard systems*:
- RPS-62 – Multi-mission Radar (MMR)
- EO/IR and FLIR camera
- Skyview - passive RF detect system
- MODI electronic attack (EA) system
- Onboard ADSI C2/Graphic User Interface (GUI)
- C-sUAS Operator Assist provides operators with live, real-time cues of aerial objects and reduces human error in engagements.
- Optic automatically slews to cue to facilitate rapid positive identification of the object.

**NOTE: SYSTEM DESIGNED TO DETECT UAS/FW/RW AND DEFEAT SMALL UAS (sUAS) THREATS WHILE ON-THE-MOVE.*

# Army Multi-Purpose High Energy Laser (AMP-HEL)



Description:

- AMP-HEL is a lightweight, vehicle mounted, C-UAS system of systems.
- AMP-HEL provides Infantry Squad Vehicle (ISV) mounted 20-kilowatt class laser weapons for defeat of sUAS.
- Addresses detect, track, identify and defeat phases of the engagement sequence.

Capabilities:

- Can Detect, Track, Identify, and Defeat threat UAS through the use of onboard systems.
- Defeats primarily COTS drones and small rotary wing.
- Employment consist of Fixed Site, Convoy, Forward Operating Bases (FOB), and VIPs.
- AMP-HEL is a part of layered defense.

Limitations:

- Environmental considerations reduces effectiveness in dense urban areas and heavy rain/fog.
- Struggles with nano drones and high-speed/low altitude targets.
- Requires specific ROE; legal limits in specific airspace.

# Locust High Energy Laser (Locust-HEL)



Description:

· Locust HEL refers to the LOCUST High Energy Laser (HEL)' system, a modular directed-energy weapon designed to shoot down sUAS threats. Developed by AeroVironment (originally via Blue Halo), the system provides a low-cost, precise "hard kill" mechanism by focusing intense laser energy to melt or burn moving targets mid-air.

Capabilities:

· **Power Scaling:** Offers adjustable laser intensity ranging from 20 to over 35 kW to counter different drone classes.

· **Target Classification:** Utilizes AI-enabled software called AV Halo Pinpoint to automatically detect, track, and prioritize aerial threats.

· **Rapid Deployment**: Can be moved from a completely shut-down state to fully operational in under 15 minutes.

· **Easy Operation:** Uses simplified control consoles—similar to standard commercial gaming controllers—making it intuitive for Warfighters to operate.

Operational Platforms:

· **P-HEL (Palletized High Energy Laser**): Contained inside regular shipping pallets or containers to be easily dropped on ships or at fixed bases via forklift.

· **AMP-HEL (Army Multi-Purpose High Energy Laser):** Mounted directly onto mobile combat vehicles like the Joint Light Tactical Vehicle (JLTV) and the Infantry Squad Vehicle (ISV)

# Containerized Weapon System-Advanced Precision Kill Weapons System CWS-A (APKWS)



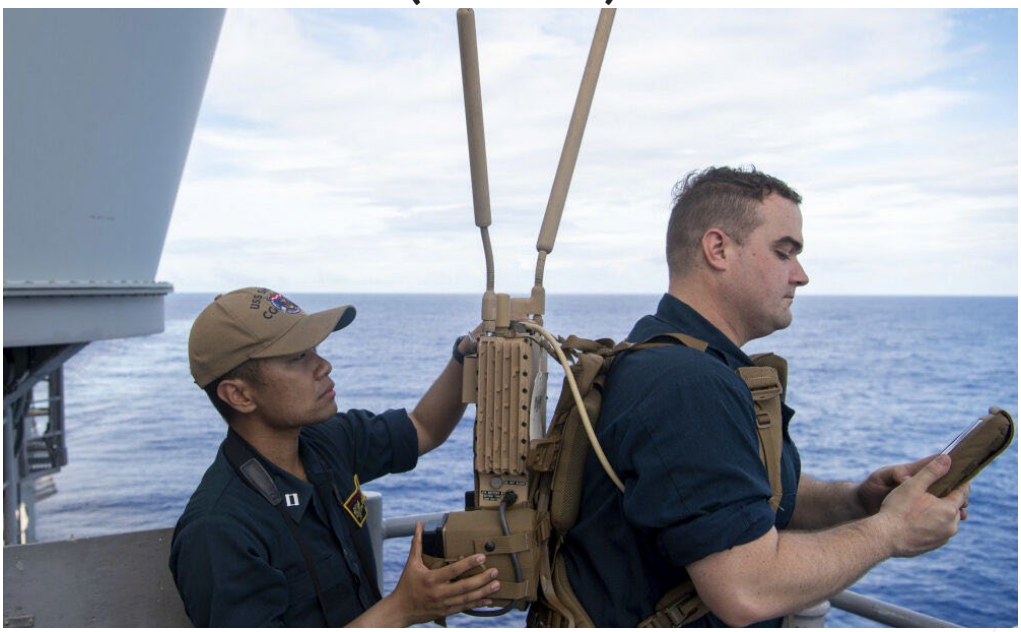
Description:

· CWS-A, also known as Containerized Weapon System-APKWS, is a modular, force protection solution developed by Invariant Corporation. It utilizes the Advanced Precision Kill Weapon System (APKWS) for enhanced lethality and precision strikes, particularly against drones and other threats. The system is designed to be versatile, reliable, and mission-ready, often integrated into a containerized platform for easy deployment.

Capabilities:

· The system is housed within a container, making it easy to transport and deploy to forward operating bases, combat posts, and critical locations.
· Designed to provide standalone force protection solution, offering enhanced fire enhanced firepower and precision engagement capabilities.
· The system has the ability to rapidly engage and destroy drones and makes it a valuable asset in the fight against unmanned aerial systems.

# Drone Restricted Access Using Known EW (DRAKE)



Description:

- DRAKE is a derivative of the Joint Counter RC-IED (JCREW) family of systems, repurposed for RF Command Link and GPS Disruption Jammer based on JCREW software defined radio architecture. Drake utilizes a preprogrammed database for jammer initiation against sUAS.
- The system utilizes the JCREW 3.3/T1B1 Counter Radio-Controlled IED Electronic Warfare (CREW) system augmented with additional COTS components.
- Demonstrated Range: 400+ meters
- Operating time: Up to 4 hours; average 2 hours
- Target: Groups 1 and 2
- Class: Detect System
- Weight: 15lbs.

Capabilities:

- The system counters radio frequency (RF) signals over a wide frequency range.
- The DRAKE system is a software defined platform that contains flexible resources to defeat current threats and is expandable to meet future threats.
- Manpack system that counters sUAS during flight.
- DRAKE is a radio-frequency negation system that delivers a non-kinetic, selective electronic attack of Group 1 drones.
- Integrates with the Mobile Application for UAS Identification (MAUI) mobile acoustic sensor that operates on Android cell phones and uses the phone's microphone to detect Group 1 drones.

# Titan (Blue Halo)



Description:

· Automated drone protection solution that prevent unwanted drones from entering the airspace before they can become a threat with minimal impact to communications. Titan addresses 98% of commercial-off-the-shelf (COTS) and hobbyist drone platforms. This includes air, land and sea unmanned platforms providing end users with hemispherical protection across multiple domains.

Capabilities:

· Fixed site, dismounted, and mobile represents the operational modes.
· Establishes protected space in minutes to keep operators, infrastructure, and information safe.
· Adapts with rapidly evolving threat so technology can be tailored to situational needs.
· Defends with minimal spectral impact to limit signal and communication disruption.

# Paladin
# Low Collateral Effects Interceptor (LCEI)



Description:

· Paladin is a Group 2 Low Collateral Effects Interceptor (LCEI) developed to defeat Group 1, 2, and small Group 3 UAS. It is a fully autonomous "wingman" for security operations with a suite of security missions, including perimeter security, sUAS interception, loudspeaker interdiction, and fence line inspection. The Paladin system receives a cue from any CUAS tracking sensor, the Paladin then interrogates the target with its onboard radar and computer vision sensors, followed by Paladin requesting authorization from the operator to perform the defeat.

Capabilities:

· Defeat Groups 1, 2, and small Group 3 UAS less than 50 mph.

# Enforce Air 2







Description:

· The EnforceAir2 by D-Fend Solutions is a next-generation, RF cyber-based C-sUAS. It passively detects, identifies, and locates sUAS threats and safely takes them over to land them in a predefined zone without jamming or using kinetic force.

Capabilities:

· **Detection Range:** Up to 4.5 km.
· **Mitigation Range:** Typical range of 1.2 to 4 km.
· **Technology Type:** Non-kinetic, non-jamming RF cyber takeover (prevents collateral damage or communication interference).
· **Core Hardware:** Purpose-built C-sUAS cyber software-defined radio (SDR).
· **Tactical & Stationary:** Compact setups using direct-connect antennas packed in lightweight cases.
· **Vehicular:** Upright configurations designed to save cargo space with simple tablet control.
· **Backpack:** A covert, man-portable option featuring internal operation and hot-swappable batteries for protection on the move.
· **Maritime:** Ruggedized for naval and merchant vessels in open-water scenarios.

# Anti-UAV Defence System (AUDS)





Description:

· The AUDS is designed to disrupt and neutralize Unmanned Aircraft Systems engaged in hostile airborne surveillance and potentially malicious activity.

· AUDS combines electronic-scanning radar target detection, electro-optical (EO) tracking/ classification and directional RF inhibition capability.

· AUDS is a smart sensor and effector package capable of remotely detecting small UASs and then tracking and classifying them before providing the option to disrupt their activity. The system may be used in remote or urban areas to prevent UASs being used for terrorist attacks, espionage or other malicious activities sites with critical infrastructure.

# DroneHunter



Description:

· With more than 5,000 drone captures, the DroneHunter is a counter-UAS effector with validated field success, stopping drone threats day and night resulting in less costly collateral damage. The DroneHunter is capable of acting alone, or in cooperation with multiple untis to protect large restricted areas.

Capabilites:

· Advanced AI allows adjustment tactics (mitigation modes) based on threat location, speed, and direction.
· Launches in seconds and can be completely reloaded for back-to-back sorties in less than 3 minutes.
· Armed with multiple NetGins and Drogue Chute, it can capture rotary and fixed-wing crafts, including Group 1,2 and low-end Group 3 Drones.

# Vampire (APKWS)




Description:

· The Vampire is a suitcase-type APKWS launcher and designator kit provides a rapid solution for arming non-tactical vehicles (NTV) and a variety of tactical vehicles, while integrating components to customer-specific specifications. The capability provides ground forces the ability to engage targets beyond the range of weapons carried by light forces.

Capabilities:

· Designed to complement the low-cost, low signature and availability of common NTVs and fit in any pickup or vehicle with a cargo bed.

· Installation can be completed in approximately two hours by two people using common tools.

· Everything is on the pallet. Power supply eliminates the need for a 24-volt alternator on the vehicle.

# Mobile - Low, Slow, Small UAS Integrated Defeat System (M-LIDS)





Description:

- MRAP All Terrain (M-ATV) mounted configuration for employment at the short-halt
- Two-vehicle solution: Electronic Warfare (EW) vehicle & Kinetic Defeat (KD) vehicle (can operate in a System of Systems architecture or independently)

Electronic Warfare (EW) vehicle:

- Incorporates LIDS base configuration into a mobile platform. Provides C-UAS detect, track, identification, and defeat capabilities (non-kinetic)
- Electronic warfare vehicle incorporates Fixed Site LIDS (slight decrease in effective detection and defeat range)
- Incorporates 50 caliber machine gun for personnel protection Electro-optical/ infrared camera gun system target acquisition range >2 km

Kinetic Defeat (KD) vehicle:

- Provides C-UAS detect, track, identification, and defeat capabilities (kinetic)
- Incorporates Coyote Block 2 interceptor, XM914 30mm chain gun, and M240 anti-personnel weapons
- Electro-optical/ infrared camera gun system target acquisition range >2 km
- KuMRFS Mobile (KuMRFS-M) provides Air Surveillance and Fire Control at the short-halt.

Capabilities:

- Capable of Detection, Tracking, ID/Classify, and Defeat through integration of multiple sensors and effectors.
- The M-LIDS Remote Integrated weapons Platform (RIwP) turret includes the Leonardo DRS Stabilized Sight Sensor (S3) EO/IR which provides the required D/R/I and built-in auto-tracker necessary to locate, identify, and track threats through kinetic engagements for both ground and air threats.
- EW integrated with FAAD C2 software, secure comms (wired/wireless network); mission recorder.

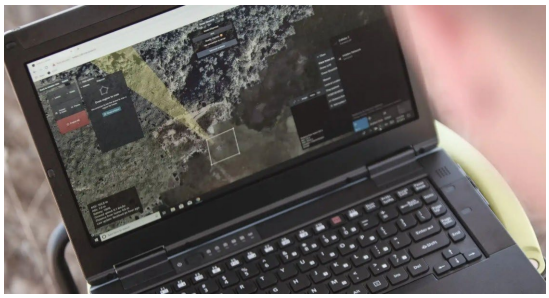
# Anvil



Sentry Tower



Anvil sUAS



Lattice Platform

Description:

- Anduril addresses the Detect and Defeat phases of the engagement sequence.
- Anvil is a kinetic subsystem component quadcopter that is cued by Lattice and navigates autonomously to intercept potential drone threats and provide visual feedback for positive identification by a human operator.
- Once authorized, Anvil uses physical speed and onboard terminal guidance to deliver kinetic energy to the threat with minimal collateral damage.

Capabilities:

- AI and computer vision technology to autonomously identify and track targets of interest that meet designated parameters across all deployed sensor platforms.
- Mitigate sUAS with minimal collateral damage.

# Leonidas Electronic Warfare CUAS System (HPM)




Description:

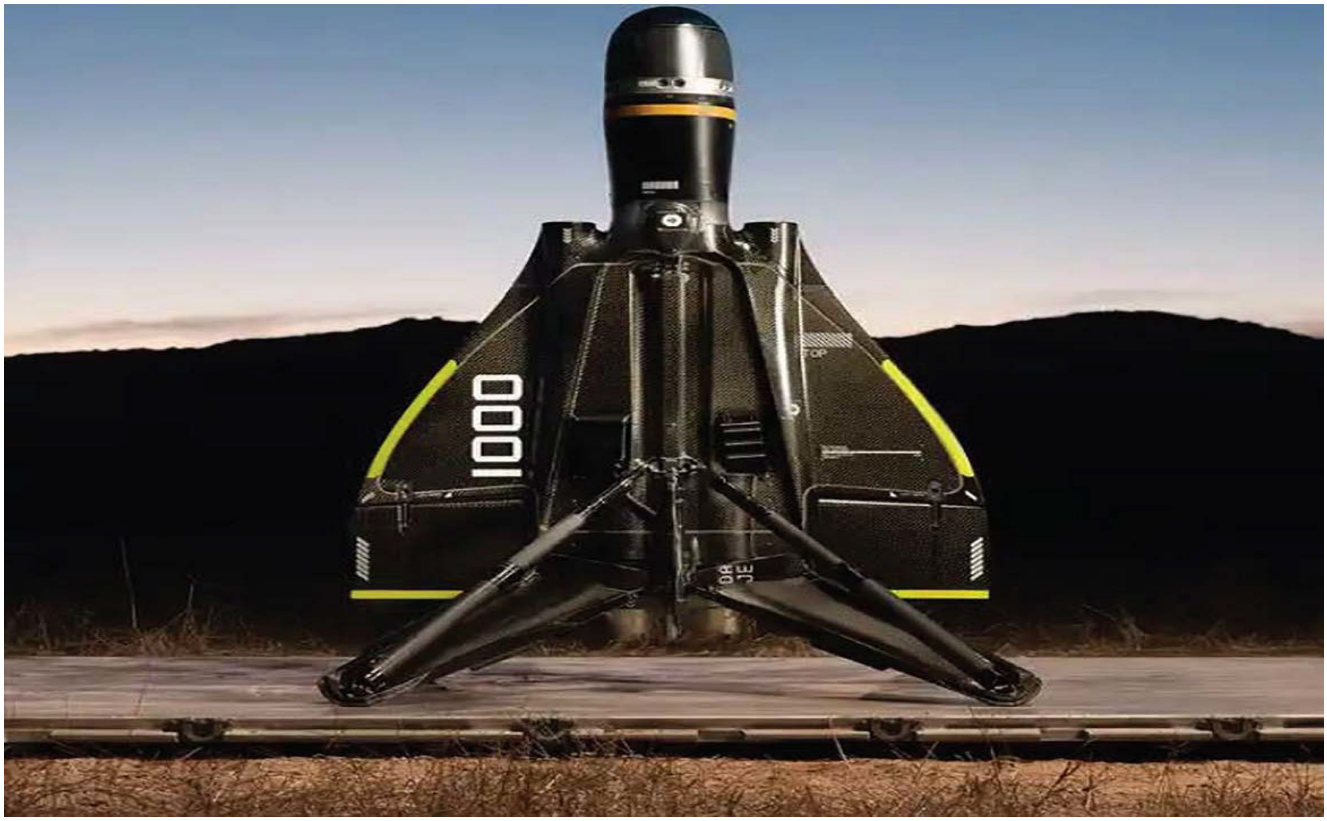
· Epirus' Electronic Warfare systems utilize solid-state, AI software driven, high-powered microwave (HPM) to disrupt and destroy critical electronic components in an unmanned aerial system (UAS), vehicles, outboard motors on vessels. At its core a precision or area fires non-kinetic counter electronics capability.

Capabilities:

· Range: Up to 8 KM (LRIP units)
· Targeting: Electronically steered beam, integrated with FAAD/C2
· Cold Start Time: < 20 minutes
· Ease of Transport: C-130 to theater, CH-47 or pickup truck towed to site Power Required: 15kW commercial generator
· Operator Safety: 20 ft. behind system (no x-rays)

Spectrum Management: Software defined precision channel control

# Roadrunner



Description:

· Roadrunner Interceptor is a jet powered vertical take-off and landing (VTOL), operator-supervised Autonomous Air Vehicle (AAV), high-explosive Group 3+ interceptor. Launch, loiter, return if unused, reuse.

Capabilities:

· Defeat Groups 3+ UAS.

# Bumblebee



Description:

· The Bumblebee C-sUAS is a low-cost, next-generation kinetic interceptor drone manufactured by Perennial Autonomy. It is specifically designed to neutralize hostile Group 1 and Group 2 sUAS through automated, high-speed physical collision.

Capabilities:

· **Pure Kinetic Defeat**: The drone uses a "hard kill" mechanism via a direct physical strike. By relying entirely on direct kinetic impact energy to break targets, it eliminates explosives or ammunition. This makes it safer for use over urban areas and domestic military installations by drastically reducing collateral damage.

· **Automated Target Recognition (ATR):** Operating as a first-person view (FPV) multirotor drone, it features edge-computing software that enables it to autonomously detect, track, lock onto, and ram moving enemy aircraft mid-air.

· **NDAA Compliance**: The Bumblebee is fully compliant with the [National Defense Authorization Act], meaning it is built without prohibited foreign components and can be immediately integrated into active U.S. military supply chains.

· **Starshield-Linked Ground Control:** The mobile ground station utilizes a compact radar, sensor mast, and SpaceX's Starshield satellite network to maintain connectivity and command links.

# Dedrone Drone Defender 2



Description:

· The Dedrone Defender 2 is an advanced, AI-powered smart jammer designed by Dedrone (part of Axon) to neutralize sUAS threats in urban and military frontline environments. It operates as a non-kinetic, lightweight weapon that disrupts drone communication links and GPS signals.

Capabilities:

· **AI-Powered Jamming:** Automatically identifies and targets unique drone protocols.

· **DedroneTracker.AI Integration:** Receives real-time drone tracking data for precise engagement guidance.

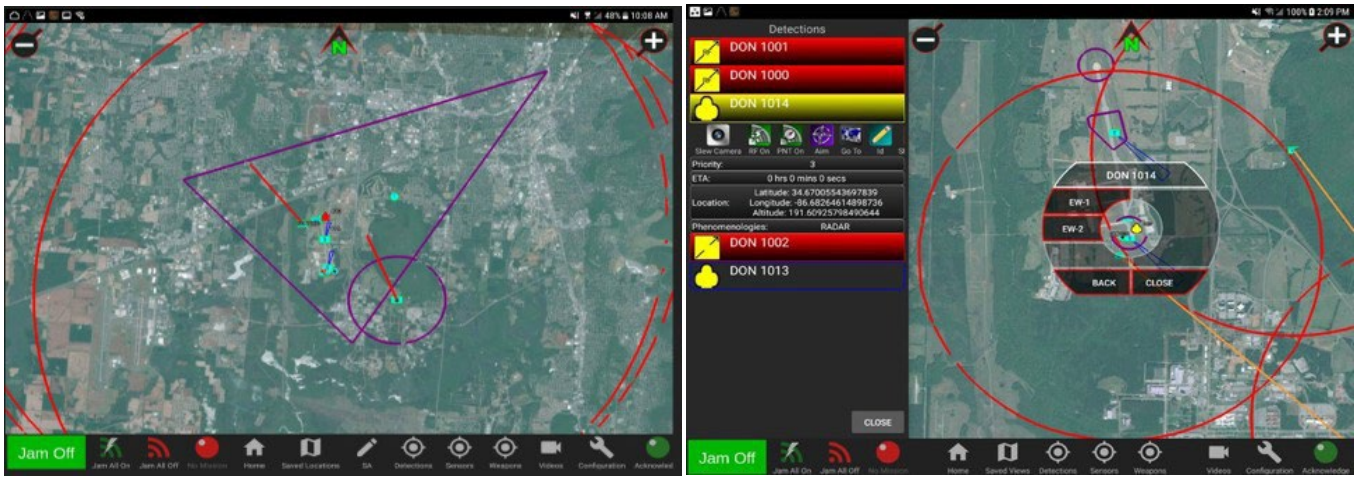
· **20-Degree Targeting Cone:** Ensures accurate neutralization even if the drone is hidden from direct line of sight.

· **Multi-Signal Disruption**: Deploys broad-spectrum RF and GNSS jamming simultaneously.

· **Collateral Protection:** Uses narrow-band directional jamming to avoid interfering with nearby civilian electronics.

· **Mitigation:** The operator uses this handheld smart jammer to sever the sUAS's control link, forcing it to safely land or return to its pilot.

# Medusa C2




Description:

- Medusa is a modern, modular, open, standards-based, agile, wholly Gov't-owned Command and Control (C2) software system.
- Interoperability via standards with legacy/other systems.
- For C-sUAS and C-RAM missions, it:
  - -Fuses, associates, and displays air tracks on a 3D map.
  - -Displays threat priority and sensor/effector status, historical playback, multi-sensor correlation, and aiming and engagement/disengagement of kinetic/non-kinetic countermeasures.

Capabilities:

- Medusa COP for fused situational awareness and control.
- Displays detection (radar, RF, acoustic), video (EO/IR, kinetic), current sensor status, protected areas (fixed and moving).
- Auto-prioritizes fused air track threats based on proximity and threat priority.
- Fuses radar detections from multiple radar sources.
- Associate detection modalities into single threats
- Displays air tracks using mil-std 2525 symbology
- Joint Tactical Data Link capable (more capability will be identified with the JKO Systems Familiarization Module).

# Dronebuster IV



Description:

· The Dronebuster IV by DZYNE Technologies is a handheld, tactical C-sUAS engineered to detect, track, identify, and defeat sUAS. It disrupts commercial sUAS control links and global navigation satellite systems across multiple frequency bands.

Capabilities:

· **Threat Neutralization:** Interferes with common commercial sUAS communication protocols and jams satellite navigation constellations (GPS, Galileo, GLONASS, BeiDou) across L1, L2, and L5 bands.

· **PNT Attack Mode:** Includes optional PNT (GNSS spoofing) capabilities to manipulate autonomous flight paths.

· **Integration:** ATAK-compatible and pairs with detection tracking suites for single-operator or Warfighter-level defense.

· **Operational Readiness**: Features a fast-training time under 5 minutes, NATO Mil-Spec certified battery, and options for handheld, mobile, or fixed-site deployment configurations

# SMASH 2000L



Description:

· The SMASH 2000L is an advanced, lightweight fire control system and smart optic made by **Smart Shooter** that uses computer vision and AI to track and shoot down moving targets like sUAS. It is adopted and deployed by the US Military to give regular riflemen a reliable way to defeat sUASs.

Capabilities:

· **Target Lock:** The built-in digital camera and computer track a selected target and paint a targeting box around it.

· **Trigger Control:** The smart trigger mechanism holds the shot back and only unlocks when the sights align with the calculated hit point.

· **Manual Override:** The trigger restriction can be unlocked so the user can fire normally at discretion.

· **Range:** Effective against ground targets up to 300 meters by day, and sUASs up to 100 meters day or night.

· **Weight:** 740 grams (reduced size and weight compared to older versions).

· **Battery Life:** Up to 72 hours of operation.

# FIM-92 MANPADS STINGER

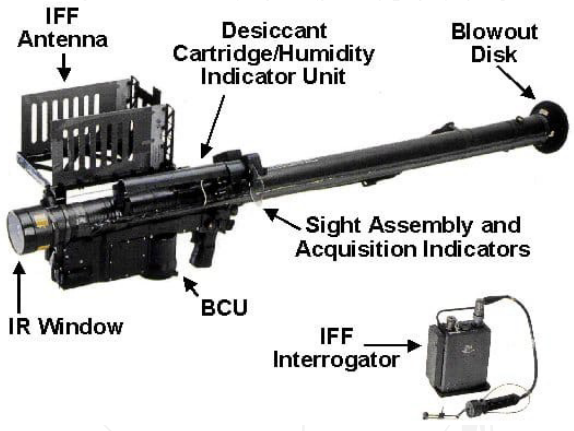


Description:

- The FIM-92 Stinger is a shoulder-fired Man-Portable Air Defense System (MANPADS) that operates as an infrared homing surface-to-air missile (SAM).
- The lethal SAM can be deployed for defense against all classes of helicopters, unmanned aircraft vehicles (UAVs), cruise missiles, as well as low-level fixed and rotary-wing aircraft.
- Handheld launcher consists of a launch tube, Battery Coolant Unit (BCU), separable gripstock assembly, sight assembly and a separate Identification Friend or Foe (IFF) interrogator, with a total weight of 35lbs.
- The Stinger is controlled by two operators and can operate under all weather conditions.

Capabilities:

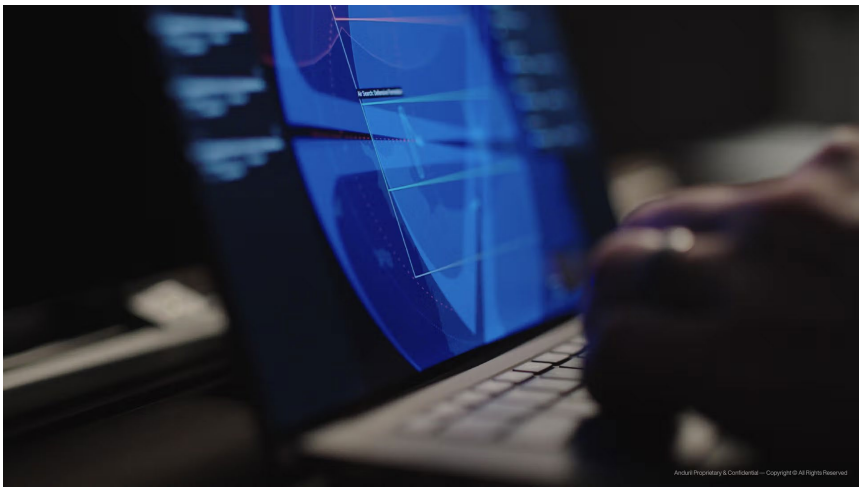
- Fires Basic, RMP and Block I missiles with no modification required
- Gripstock
  - Contains all pre-launch electronics and IFF antenna for MANPADS use
  - Reusable for multiple firings
- Battery Coolant Unit
  - Contains thermal battery and argon gas coolant
  - Expendable; supports one missile launch
    Battery Coolant Unit
- Identification Friend or Foe (IFF) Interrogator
  - Contains IFF system electronics and Removable Power source
  - IFF compatible with U.S./NATO equipment
  - Weight approximately 5lbs
- Integrated with FAAD C2 software
- **Effective against Group 3 sUAS.**



## Command and Control (C2) Systems

# Lattice Command and Control (Lattice C2) *

***NOTE: All C2 PLATFORMS ARE INTENDED TO BE INTEROPERABLE WITH EACH OTHER.***



Description:

·Anduril's Lattice platform acts as an AI-powered C2 software backbone for C-sUAS operations. It acts as an open operating system that integrates multiple sensors and weapon effectors into a single, unified interface. Instead of requiring human operators to manually parse separate radar screens, video feeds, and radio frequencies. Lattice C2 automates the entire sUAS-defense kill chain.

Capabilities:

- **Sensor Fusion:** Merges tracking data from diverse hardware like Anduril's Spyglass radar and third-party systems.

- **AI Classification:** Identifies and filters targets automatically, separating birds from Group 1-3 drone threats.

- **Machine-to-Machine Tasking:** Recommends the optimal course of action and automatically queues the threat for the operator.

- **Layered Defeat Integration:** Commands various effectors to eliminate threats, ranging from EW to HPM systems and kinetic solutions such as interceptor drones.

## Command and Control (C2) Systems

# Forward Area Air Defense Command and Control (FAAD C2) *

***NOTE: All C2 PLATFORMS ARE INTENDED TO BE INTEROPERABLE WITH EACH OTHER.**



Description:

The Forward Area Air Defense Command and Control (FAAD C2) system consists of:

- Modular Open System Architecture (MOSA) software.
- Supports the Air and Missile Defense (AMD) mission by providing real-time: correlated air tracks and Command, Control, Communications, Computers and Intelligence (C4I) information to higher, adjacent, and lower units.

Capabilities:

Adapted to protect the warfighter by countering Indirect Fire (IDF) and Unmanned Aircraft System (UAS) attacks directed at Forward Operating Bases (FOBs) and other high-value assets.

- Modified to perform the C2 portion for C-sUAS capabilities.
- Integrates system-of-systems capabilities such as radars, cameras, kinetic and non-kinetic weapon systems.
- Provides real time correlated air picture of the battlespace.
- Provides positive aircraft identification.
- Provides early detection, warning and response to forward deployed forces.

# Tactics, Techniques, and Procedures (TTPs)



## Disclaimer

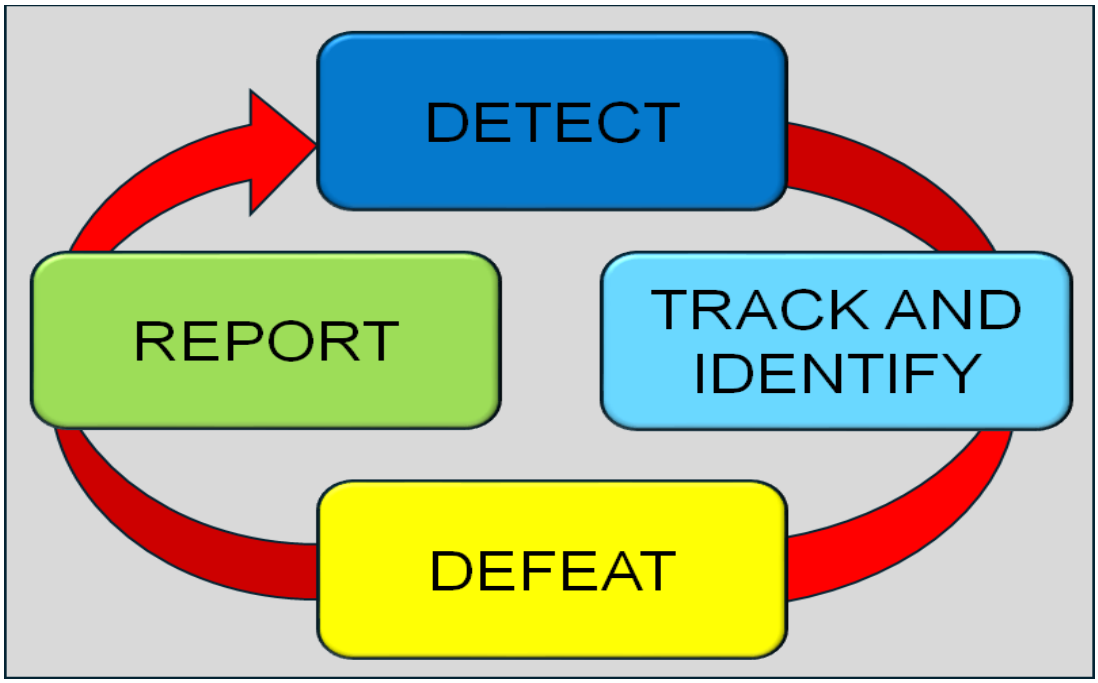
TTPs are crucial for Warfighters as they outline the "who," "what," "where," "when," and "how" of warfighting, ensuring that operations are conducted effectively and efficiently.

# Tactics, Techniques, and Procedures (TTP) for C-sUAS

Successful C-sUAS operations must include both Passive and Active measures, employed as part of a layered defense strategy against sUAS threats. C-sUAS tasks should be seamlessly integrated into the units or installations force protection and defense framework (or defense objectives). Training, equipment proficiency measurements, and certifications should be tailored for the threat environment applicable to the operating location.

C-sUAS operations follow a four-step process of Detect-Track and Identify-Defeat-Report.

These 4 steps are a continuous cycle.




Ref: ATP-3-01.81, 2025

1) **Detect** – Detection and Tracking of a UAS is made through systems or personnel.
2) **Track and Identify** – This step determines whether the UAS is identified as friendly, hazardous or hostile.
3) **Defeat** – Kinetic or Non-Kinetic countermeasures are used to defeat threat, dependent on rules of engagement (ROE).
4) **Report** – Report any detected sUAS immediately.

Planning:

Commanders, leaders and planners must include the simultaneous application both passive and active measures during operational planning and employment as part of a layered defense strategy against sUAS threats. Leaders must understand active measures help deny the initiative to the enemy or adversary, while the execution of passive defense measures prepares the force against threat and hazard effects and accelerates the mitigation of those effects. Key tasks to integrate into plans and combined arms unit training strategies addressing sUAS threats are:

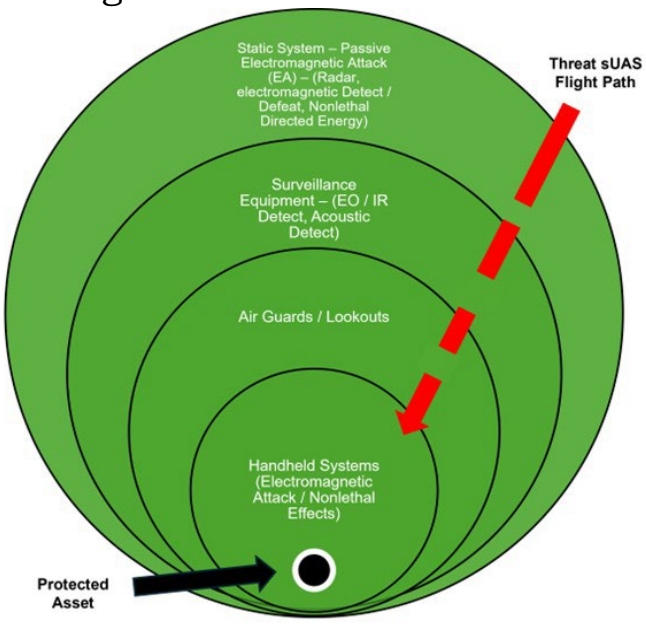
- Identify critical assets to be protected.
- Perform cover and concealment.
- Harden unit positions.
- Employ dedicated air guards.
- Perform visual aircraft recognition training.
- Conduct air threat avoidance techniques.
- Conduct deception/decoys, and dispersion techniques.
- Establish a security force and quick reaction force.
- Establish an early warning sensor network.
- Conduct sUAS reporting procedures.
- Conduct downed sUAS recovery/battle damage assessment.
- Select sUAS defeat mechanisms.
- Perform unit recovery and reconstitution.
- Disseminate sUAS threat warning and response option readiness levels.
- Coordinate threat representative sUAS red team flights for system operational readiness and training purposes.
- Understand and employ C-sUAS systems to maximize range and effectiveness
- Employ multiple capabilities to provide redundancy, mutual support, and complementary capabilities in depth.
- Determine likely launch sites and controller locations relative to friendly operations in time and space.

Layered Defense:

Employing a layered defense or defense in depth:

- Layer area and Local defense assets to ensure mutual support
- Ensures that coverage increases as the threat sUAS approaches (number and density of C-sUAS assets increases as range to protected assets reduces)
- Ensures dead space coverage through mutual support of systems
- Enables co-location and integration of complementary supporting systems

The graphic below shows layering of capabilities. This layering ensures increasing capability density as a threat approaches the inner ring of defense.



(U) Layered C-sUAS Defense

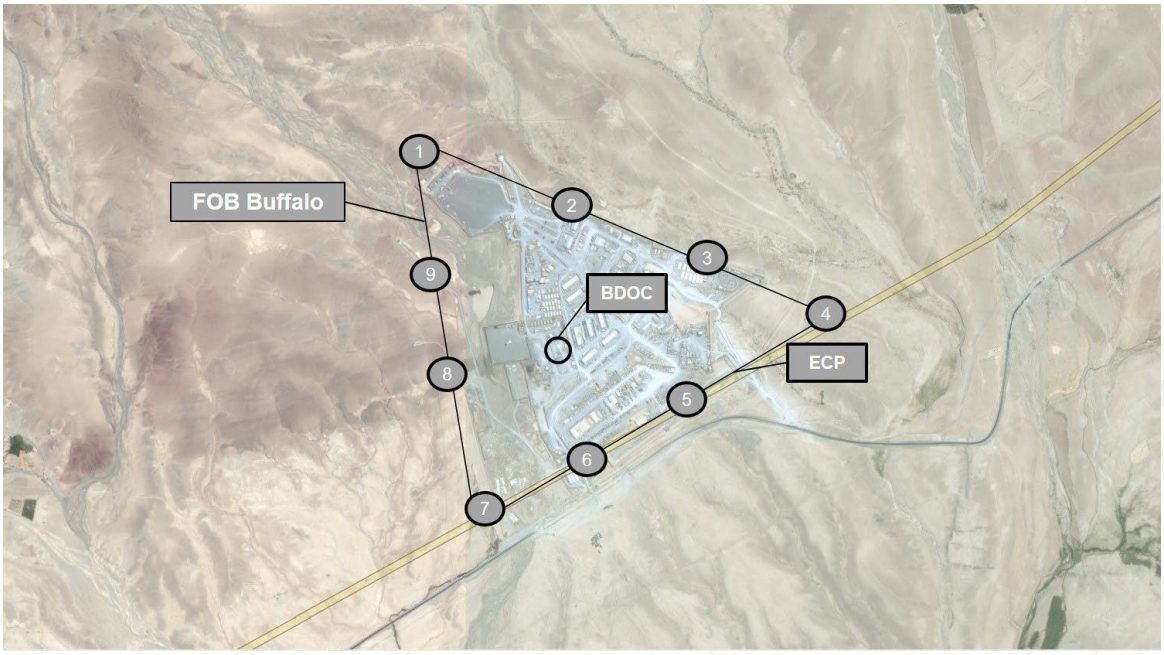
System Employment Considerations

- Threat
  - o Identify all potential threat sUAS for the area of operations.
  - o Identify common enemy tactics, techniques and procedures.
- Site Selection
  - o Consider leveraging Field Service Representative (FSR)/Mobile Training Team (MTT) support (resources if available) for C-sUAS systems site surveys and system validation. The following are a list of criteria involved in site selection:
  - o Line of Sight (LOS). Many systems require LOS to a target. Analyze terrain to identify dead spaces and determine coverage strategies. LOS verification can be accomplished through use of 3-D mapping tools and visual LOS analysis.
    - Multiple systems should be employed to ensure no dead zones.
    - Systems are emplaced to maximize LOS.
  - o Integrate all C-sUAS plans and operations for EW with the non-kinetic effects cell in the air operations center.
  - o Analyze terrain to ensure optimum placement of sensors to reduce signal disruption.
- Priorities of Protection
  - o Identify Commander's critical assets for protection.
  - o Focus defense based on priorities. Emplace assets to secure high priority assets first.
- System Limitations
  - o Range of system (kinetic and non-kinetic
  - o Atmospheric and terrain effects
  - o Equipment optimization
  - o Jamming Frequencies
  - o System library limitations
  - o Other RF transmitting systems (vehicle Wi-Fi, remote doors, etc.)

## Layering Area and Local Defense

Developing C-sUAS Area and Local Defensive Zones are forms of a defense in depth, where observation positions combined with multiple C-sUAS systems are utilized in a layered and integrated manner to provide maximum protection from a threat sUAS.

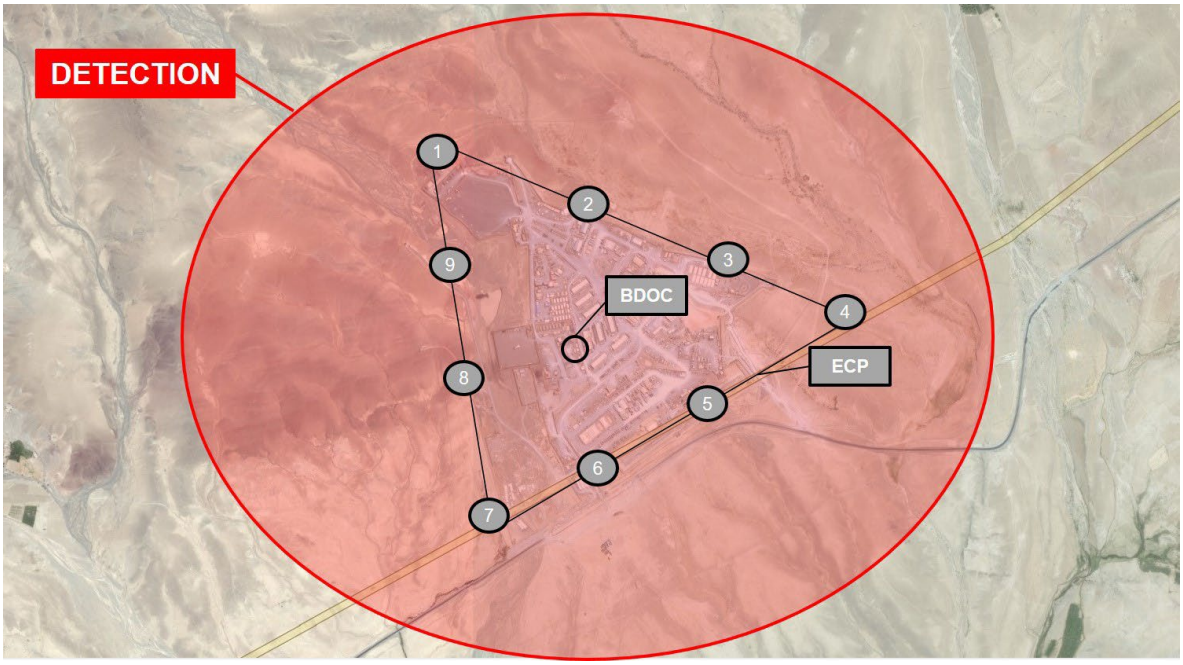
A thorough analysis and survey of system emplacement should be conducted prior to systems installation; special emphasis should be placed on understanding the background Electromagnetic Environment (EME) of the AO and optimizing equipment for operation, ensuring systems have clear line of sight and are not placed in defilade or other areas that may affect RF propagation.



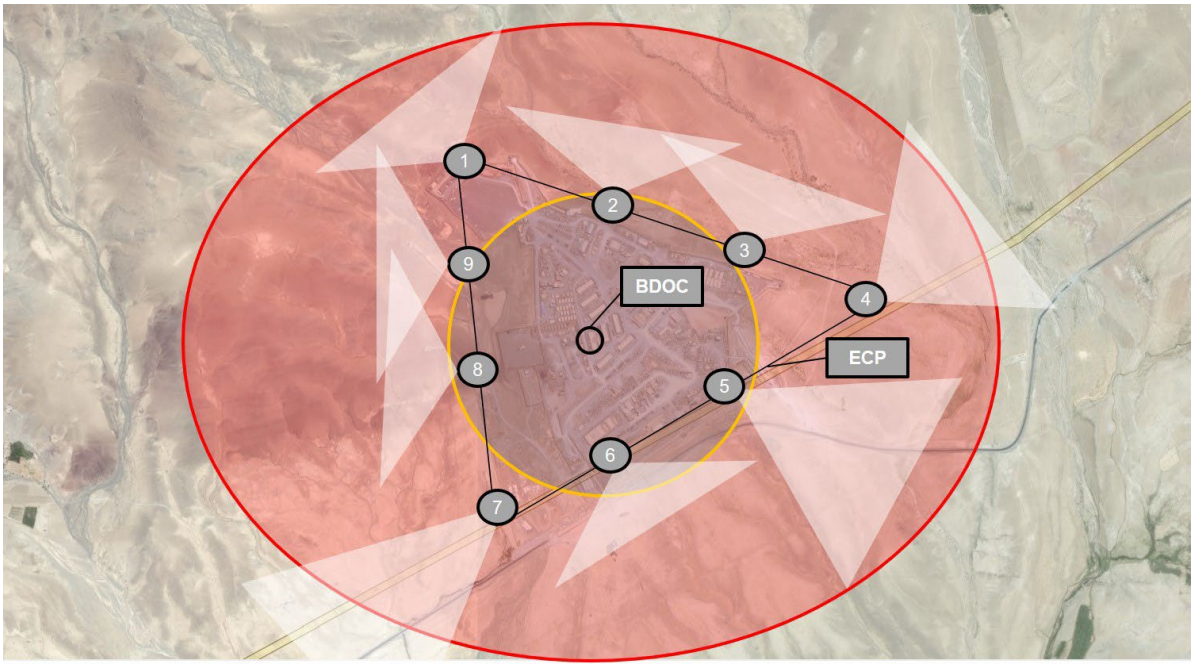

Effective Area Defensive Zones will allow the Base Defense Operations Center (BDOC) to employ C-sUAS detection, identification, tracking, and defeat capabilities to their fullest potential.

***Note**: While examples of specific TTPs may describe specific environments, the concepts are applicable to any environment.*

***Note**: The BDOC may also be called an emergency operations center at permanent U.S. bases. For this publication, the term BDOC denotes both base defense and emergency operations center.*



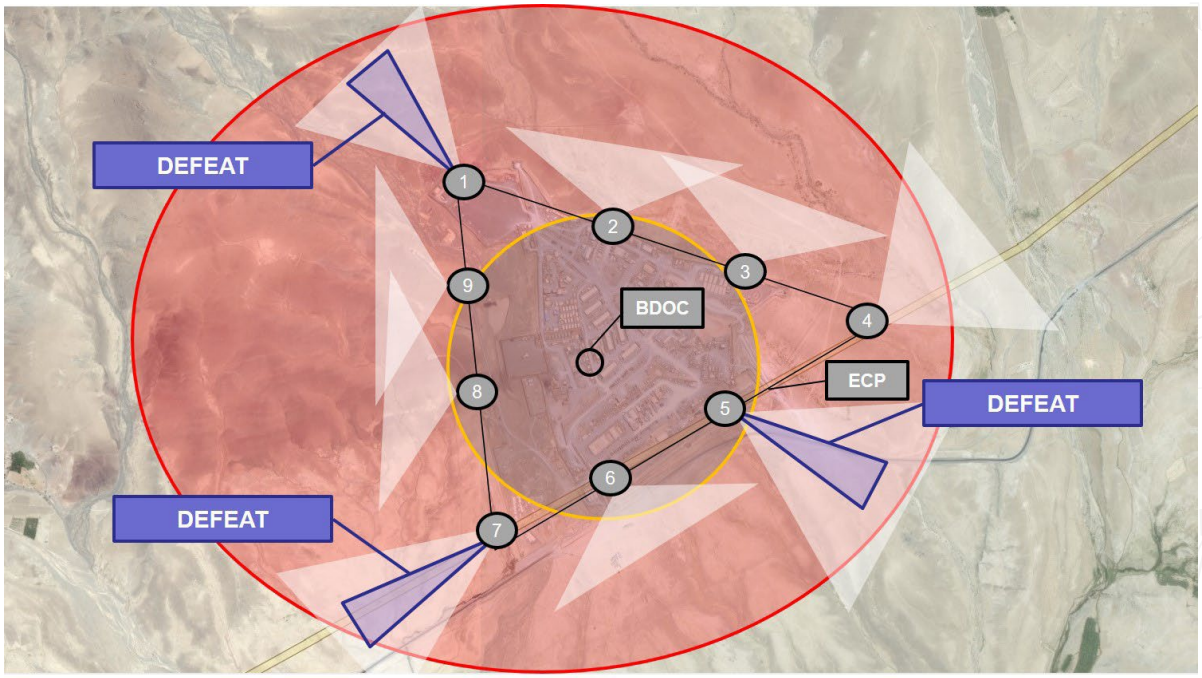

Once the maximum detect range has been identified, the maximum defeat range must be established. The maximum defeat range will vary by system but must be identified to prevent threat sUAS from completing its assigned task.




Security Forces (SECFOR) positions (Air Guards/Lookouts) must be prepared to visually detect threat sUAS during hours of day light and limited visibility.

The Local Defensive Zones utilize handheld directional, and pack carried omni-directional defeat systems that ideally should be positioned at SECFOR positions.

Due to the lesser capability of handheld directional defeat systems, planners should consider emplacing some to defend critical assets while having others mobile to allow for them to be dispatched to any location on the installation. Additional employment sites can also include but not be limited to patrol bases and forward operating bases.

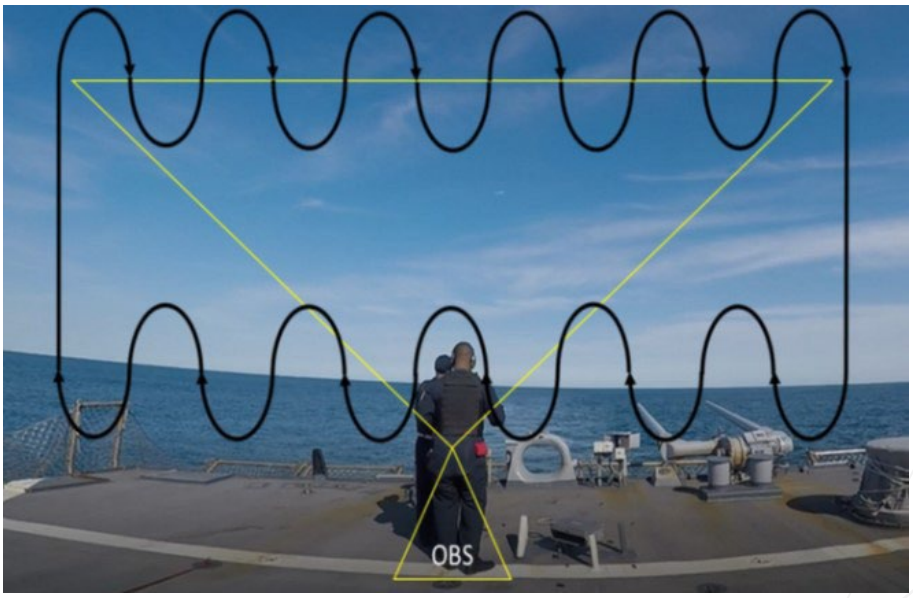



If available, pack carried omni-directional defeat systems can be utilized to provide defeat capabilities to smaller segments of the installation.

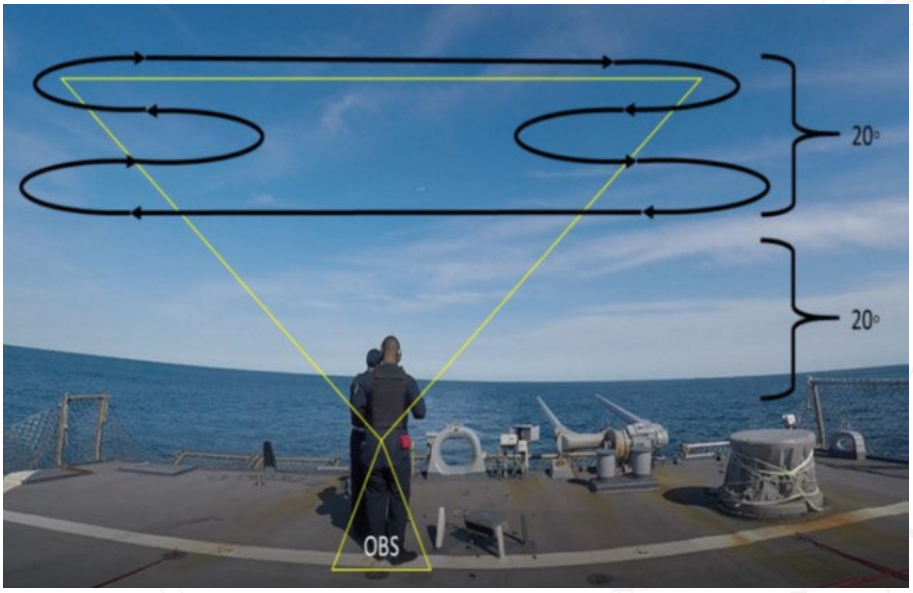
Planners should consider emplacing these systems on elevated positions to prevent masking from terrain and structures.

Scanning Techniques:

Vertical Scan

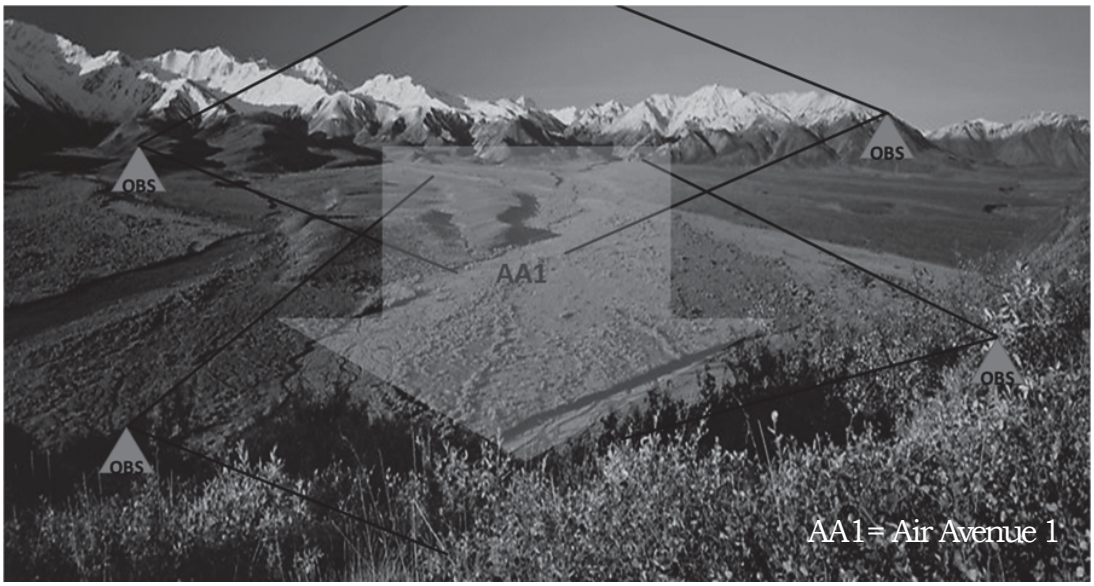



Horizontal Scan




Personnel assigned to observer duties need to be vigilant, eyes on the horizon. Personnel should be trained under both daylight and nighttime conditions to recognize and identify sUAS most likely to be encountered. Observers will perform actions such as search and scan techniques for approaching threat sUAS. Early warning is the key for observers. Sector limits must cover likely avenues of approach for threat sUAS; scan the rooftops of surrounding buildings or trees that can provide cover or concealment to the enemy. (Reference ATP 3-01.81, 2025)

In-Depth



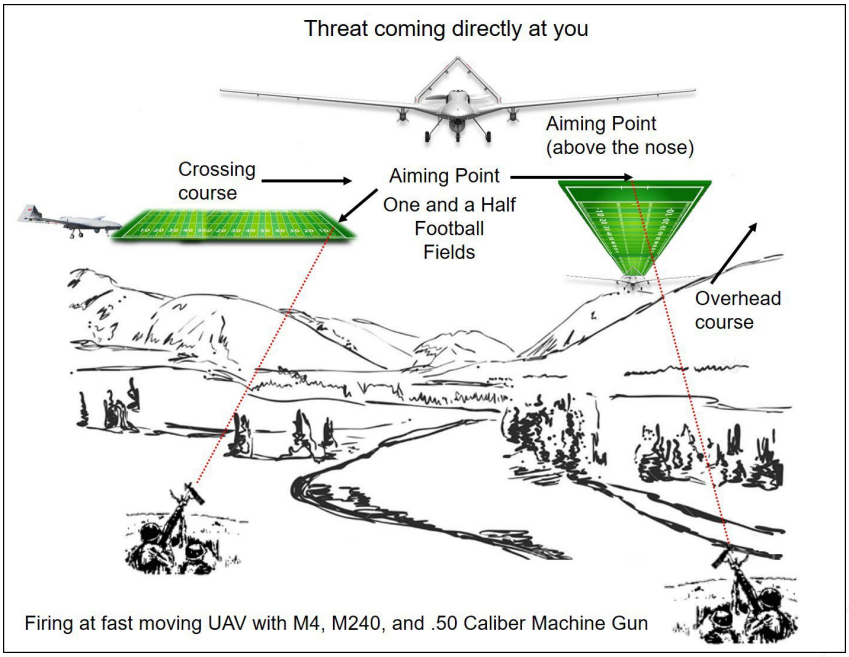

Linear



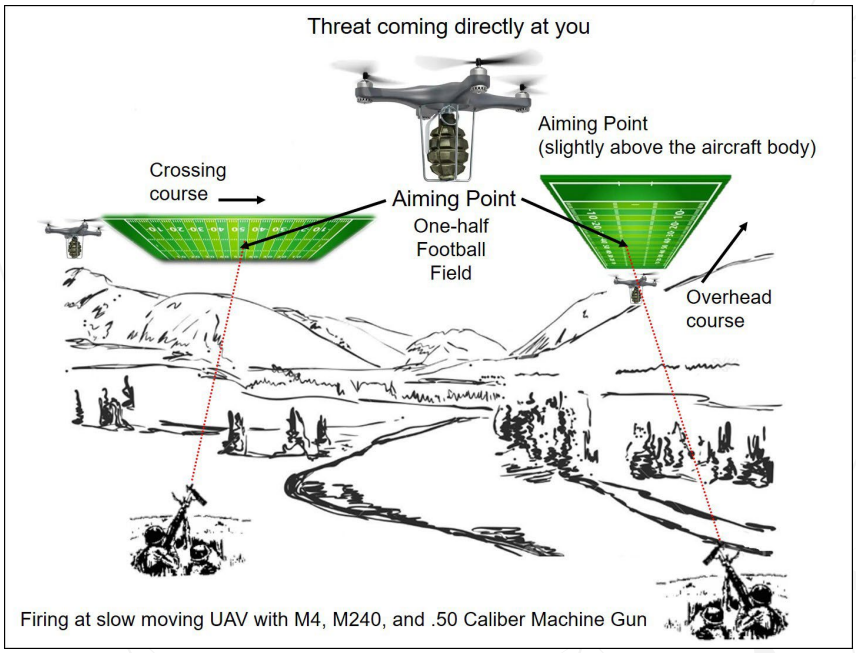

Positioning observers in-depth allows observation of the entire sector. This technique is most effective when the terrain contains features that provide the enemy with cover and concealment or multiple C-sUAS avenues of approach. Linear placement is effective when the enemy is not moving and provides optimum observation of the enemy. (Reference ATP 3-01.81, 2025)

## Small Arms Defense Techniques:

Football Field Technique (FW)




Football Field Technique (RW)




The football field technique is a simple method of estimating lead distance. The theory is that most people have played or watched football and have a concept of how long a football field is. When told to lead the target by one football field, everyone aims at approximately the same point in space. One person's error in making the football field estimate will be offset by another person's error. The variation in aiming points will ensure that massed fire is delivered into a volume of space in front of the target rather than on a small point. Also, the differing perspectives from which the Warfighter's view the target will act to further distribute the fire over a volume of space. The pictures above show an example of this technique used with aiming points for both fixed- and RW aircraft. (Reference ATP 3-01.8, 2016)

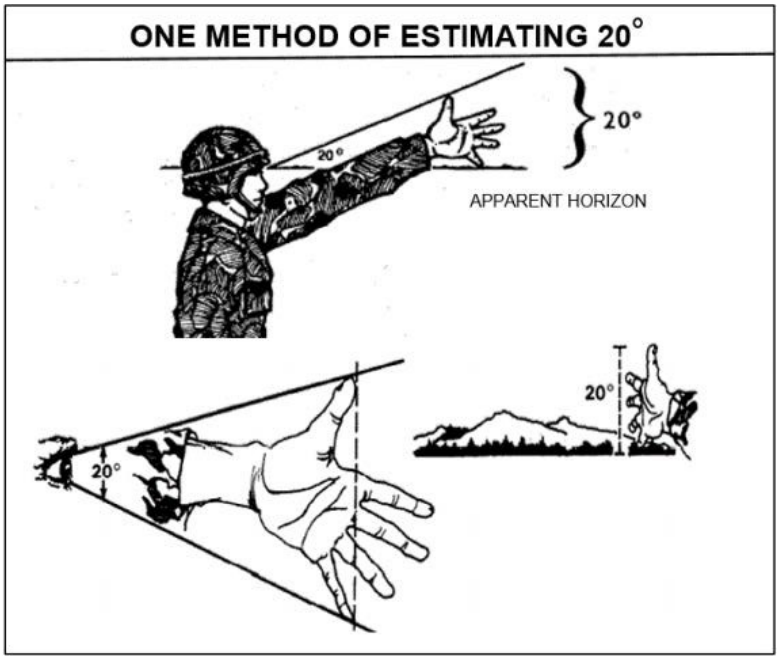
## Aiming Points:

Aiming points used to engage hostile fixed wing and rotary wing are different but may be used on a variety of different threats. An example of this technique would apply if an air breathing threat (ABT) were detected and the decision was made to engage, they should be engaged using the FW aiming point technique. UASs should be engaged using the rotary wing aiming point technique. The rules for selecting aiming points are simple, easily learned, and retained. The various aiming points are summarized in the Table below. (Reference ATP 3-01.8, 2016)

| Aiming Point Example | | |
|---|---|---|
| Aerial Plaform Type | Course | Aiming Point |
| UAS | Crossing | (UAS Group 1) half a football field in front<br>(UAS Group 2 and 3) one and a half football fields in front |
| UAS | Directly At You | Slightly above UAS body |
| UAS | Hovering | Slightly above UAS body |

## Estimation of Upper Search Limits

When scanning for aircraft, crewmembers may miss high-flying aircraft if they limit their search near the horizon while also missing low-flying aircraft if they concentrate their search too high above the horizon. The correct upper limit of search is 20 degrees. Estimate 20 degrees using the technique illustrated below. With the fingers fully spread, the tip of the thumb is the upper search limit. (Reference ATP 3-01.8, 2016)



## Combined Arms for Air Defense (CAFADS):

Combined arms for air defense constitutes another element of Army AMD that can provide vital protection from air threats and contribute to the freedom of maneuver for friendly forces. Units conducting C-sUAS missions should identify if there are any Air Defense assets within their Area of Operation and coordinate properly. Collaboration assists units during planning and development by sharing information and intelligence collection products. Coordinated planning ensures the combined arms effort is integrated and synchronized with the overall AMD effort. (FM 3-01, 2020, ATP 3-01.8, 2016)

C-sUAS Actions by Non-Air Defense Artillery Forces

| C-sUAS Actions by Non-Air Defense Artillery Forces | | | | | |
|---|---|---|---|---|---|
| Maneuver Forces | Aviation Forces | Special Operating Forces | Field Artillery Forces | Intelligence Forces | Other Support Forces |
| • Passive Defense (Hardening, concealment, compartmentalization, etc.)<br>• Active Defense (engage with small arms, crew-served weapons, and/ or assigned Air Defense and C-sUAS Systems)<br>• Direct attack on ground C2 stations and launch sites | • Passive Defense (Hardening, concealment, compartmentalization, etc.)<br>• Active Defense (engage with small arms, crew-served weapons, and/ or assigned Air Defense and C-sUAS Systems)<br>• Engage as targets of opportunity or in self-defense<br>• Attack launch/ airfield facilities and ground C2 stations. | • Passive Defense (Hardening, concealment, compartmentalization, etc.)<br>• Active Defense (engage with small arms, crew-served weapons, and/ or assigned Air Defense and C-sUAS Systems)<br>• Direct attack on ground C2 stations and launch sites | • Passive Defense (Hardening, concealment, compartmentalization, etc.)<br>• Collect and analyze data threat capabilities<br>• Provide early warning<br>• Provide targeting data for attack operations | • Passive Defense (Hardening, concealment, compartmentalization, etc.)<br>• Active Defense (engage with small arms, crew-served weapons, and/ or assigned Air Defense and C-sUAS Systems)<br>• Target C2 stations and launch sites<br>• Support the air picture with data from artillery sensors | Passive Defense (Hardening, concealmen, compartmentalization, etc.)<br>• Active Defense (engage with small arms, crew-served weapons, and/ or assigned Air Defense and C- sUAS Systems) |

**Survivability Operations:**

- Survivability Operations: Those military activities that alter the physical environment to provide or improve cover, camouflage, and concealment. (ATP 3-37.34)
- When existing terrain features offer insufficient cover and concealment:
- Altering the physical environment to provide or improve cover and concealment enhances survivability.
- Similarly, using natural or artificial materials, such as camouflage, may confuse or mislead the enemy or adversary. Together, these are called survivability operations—those protection activities that alter the physical environment by providing or improving camouflage, cover, and concealment.
    - Survivability prioritizes:
    - Camouflage
    - Cover
    - Concealment





**Camouflage and Concealment:**

- Threat sUAS can be employed with cameras to gain intelligence, to target, or observe friendly assets.
- The skillful use of camouflage and concealment techniques are critical elements in mitigating the sUAS threat.
    - Camouflage uses natural or artificial materials on personnel, objects, and tactical positions to confuse, mislead, or evade the enemy.
    - Concealment makes use of terrain and other natural or man-made features to protect from observation and surveillance.
    - Cover essential for protecting personnel, weapons, and supplies while deceiving the enemy.
- Some general techniques for employing camouflage and concealment include:
    - Hiding screens a target from enemy sensors.
    - Blending alters target appearance so that it appears to become a part of the background.
    - Disguising applies materials on a target to mislead the enemy as to its true identity.
    - Disrupting alters or eliminates regular patterns and target characteristics.
    - Decoying deploys a false/simulated target to cause the enemy to conclude that it has found the correct target and uses EM deception techniques to confuse intelligence, surveillance, and reconnaissance (ISR) systems.

**Decoys and Deception:**

Decoys can divert enemy sUAS attention and munitions away from actual positions and personnel. Use available materials to construct dummy positions, vehicles, and equipment. Position decoys with a deliberate engagement plan to increase their credibility. Decoy effectiveness increases when combined with other deception measures, such as false radio traffic, false trails (going to a fake position and then going to a different position, so it looks like multiple teams were dropped off vice one), and pattern-of-life manipulation.

**Camouflage and Concealment:**

Enemy RSTA drones rely primarily on electro-optical and infrared sensors to detect and identify targets. Warfighters should apply camouflage discipline against both spectrums. It is also important to mask indicators of assets that can be labeled as high-payoff target sites.

**Overhead Cover and Concealment:**

In defensive positions, fighting holes and crew-served weapons positions must include overhead concealment sufficient to defeat visual and infrared observation from directly above.

- In patrol bases, assembly areas, and objective rally points, warfighters should exploit natural overhead concealment (e.g., dense canopy, rock overhangs, and structures) and supplement with camouflage netting and natural materials.
- Overhead cover should be constructed to defeat both observation and the blast and fragmentation effects of sUAS-delivered munitions (e.g., modified grenades, mortar rounds, or improvised explosive payloads). Even light overhead cover (e.g., plywood with sandbag layers) can significantly reduce the effectiveness of small munition drops. Rocks create ricochets, and physical placement near them should be carefully analyzed.

**Construct and Improve Positions:**

Prioritize overhead cover. Even hasty positions should include some form of overhead protection.

- Apply and maintain camouflage. Refresh natural vegetation camouflage as it wilts or changes color.

Minimize the footprint and signature of individual positions. Dispose of trash; meal, ready to eat (MRE) packaging; and other debris that creates visual contrast.

- Construct and maintain individual decoys when directed.



**Dispersion:**

Warfighters should avoid presenting concentrated, high-payoff targets for enemy fires and attack drones. If not already dispersed, small units should spread out to the maximum extent possible that still allows for effective command and control, mutual support, and be balanced to conduct rapid displacement. Units should be trained and equipped to go into an assault with dispersed units. Machine guns might not be able to be online for support by fire together and mortars might not be able to be laid in using a 'lazy W'. An effective adversary will establish a priority target list, and crew served weapons might be high on the list. Unit tactics, techniques, and procedures (TTP) should be established to mass effects of fires, while dispersing combat power. Considerations for dispersion include:

- Use of checkpoints, objective rally points, phase lines, and other tactical control measures can facilitate command and control over greater distances.
- Satellite patrolling techniques allow elements to move along parallel or offset routes and remain within supporting distance while reducing the number of Warfighters exposed to a single drone strike.
- Unit leaders should balance dispersion against any loss in C-sUAS coverage as the unit spreads beyond the effective range of limited electromagnetic warfare and kinetic-defeat weapons.
- During halts, avoid gathering at intersections, chokepoints, or prominent terrain features that are likely enemy sUAS observation priorities.

**Noise and Light Discipline:**

While sUAS acoustic sensors are generally limited, some enemy systems employ acoustic detection to cue other sensors. Warfighters should consistently maintain noise discipline within the tactical situation. Light discipline is critical. Visible light sources (e.g., flashlights, cell phones, vehicle headlights, and cigarettes) are easily detected by electro-optical sensors on sUAS, particularly at night.

**Electromagnetic Signature Management:**

Enemy sUAS and their associated electromagnetic warfare systems can detect, locate, and target radio frequency emissions from radios, cell phones, GPS devices, and other electronic equipment. Warfighters should:

- Abide by EMCON procedures as directed by the unit's communication plan.
- Minimize transmission duration and power output and use directional antennas when available.
- Not use personal electronic devices, including cell phones, smartwatches, and fitness trackers. They emit radio frequency signatures that can be exploited by enemy SIGINT and sUAS-mounted electromagnetic sensing payloads.
- Be aware that some enemy SUAS are specifically equipped with radio frequency direction-finding payloads designed to locate emitters at the squad level.

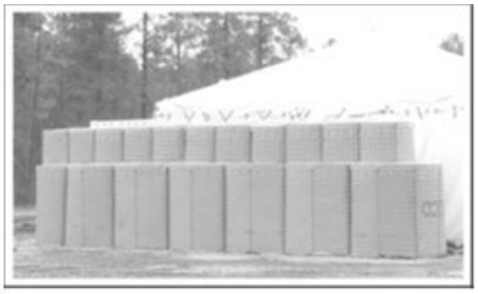
## Cover and Hardening:

- Hardened facilities are specifically reinforced for protection against direct and indirect fire to include protection for key assets from explosive and nonexplosive hazards. This includes CONUS assets, facilities and installations covered under 130i.
- Hardened overhead cover mitigates the effects of improvised munitions delivered by threat UAS on such assets as:
  - Fighting Positons
  - Operation Centers
  - Petroleum, Oil, Lubricant (POL) Sites
  - Ammunition Supply Points (ASPs)
  - Critical Communication Nodes
  - Standoff must be considered when hardening a facility.



Munitions

- Techniques that increase the hardening of structures may include:
  - Establishing standoff from the occupied structure.
  - Emplacing ditches and berms to mitigate blast effects.
  - Establishing fighting positions and protective bunkers for personnel.



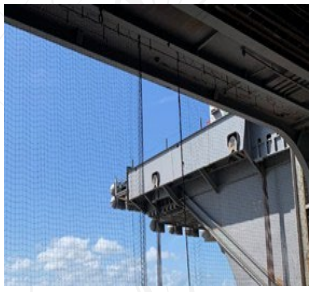
Soil-filled containers used as protective perimeter walls



Earth Berms

- Techniques that increase the hardening of structures (continued):
  - Covering doors and windows with screens or plywood to prevent observation inside the structure and limit the entrance of munitions.
  - Applying blast protection fabrics and materials to interior walls to mitigate masonry wall fragmentation.
  - Constructing pre-detonation roof and screens.

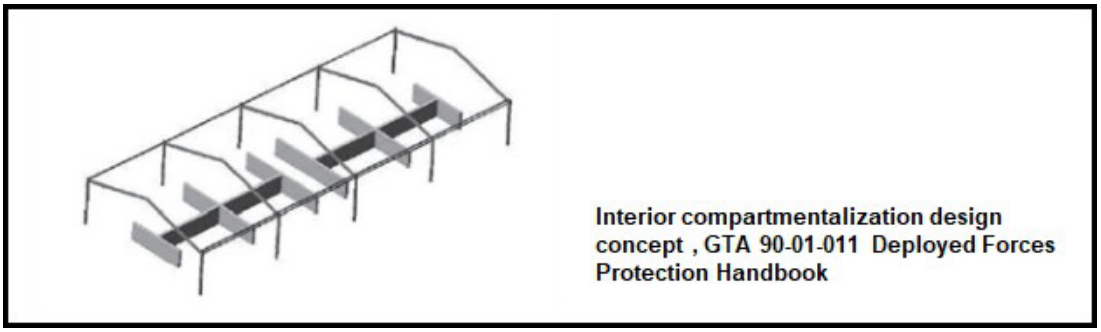




UAS/sUAS curtains can be used as entanglement/barriers to protect sensitive areas from drone penetration.

**Compartmentalization:**

- In areas with high personnel concentration (dining facilities, sleeping quarters, fitness centers, and recreation centers), survivability is greatly increased by compartmentalization.
- Compartmentalization refers to dividing a large, facility/area into smaller components using ballistic-resistant walls.
  - Walls can be placed inside and outside a facility to mitigate fragmentation hazards.
  - Care must be taken to ensure materials used for protective walls do not also become a fragmentation hazard.



Interior compartmentalization design concept , GTA 90-01-011 Deployed Forces Protection Handbook

- Compartmentalization can also be used to protect exposed exterior assets such as generators and fuel tanks.
- Divide your critical assets to:
- Mitigate effects of attacks on critical assets.
- Limit damage to a single compartment rather than the whole area.



Exterior compartmentalization for generators



Exterior compartmentalization for fuel tanks

**Signature Management and Fieldcraft:**

The following continuing actions can be summarized as "good fieldcraft" adapted for the sUAS threat environment. While none of these techniques are new, their disciplined application against the specific detection capabilities of enemy sUAS are more critical now than ever before to defeat threat electro-optical and infrared cameras, radio frequency sensors, and acoustic detection payloads.

**Passive Defense and Signature Management:**

- Enforcing continuous camouflage and concealment discipline, including overhead and frontal concealment from enemy sUAS, reducing thermal signature, and reducing visual signature. Use friendly assets to observe how friendly positions look from different angles.
- Dispersing personnel, vehicles, equipment, and command posts to avoid presenting concentrated, high-payoff targets to enemy RSTA and strike sUAS, while maintaining effective command and control and mutual support.
- Enforcing strict EMCON discipline at the company level, including reducing radio traffic, minimizing transmission duration, and reducing power settings to the minimum necessary. Use wire communications and messengers when possible.
- Ensuring Warfighters understand that encrypted and frequency-hopping radios do NOT protect against enemy direction finding. Enemy sUAS equipped with electromagnetic support payloads can still detect and locate the source of a transmission.
- Minimizing the use of electronic devices (e.g., cell phones, GPS receivers, tablets, and other emitters) that create electromagnetic signatures that can be exploitable by enemy sUAS-mounted sensors.
- Varying movement patterns, routes, and timelines to deny enemy sUAS the ability to establish pattern-of-life analysis on the company's operations.
- Positioning command posts, logistic points, and key leaders in locations that provide overhead cover and concealment from enemy aerial observation, avoiding open terrain and predictable positions.

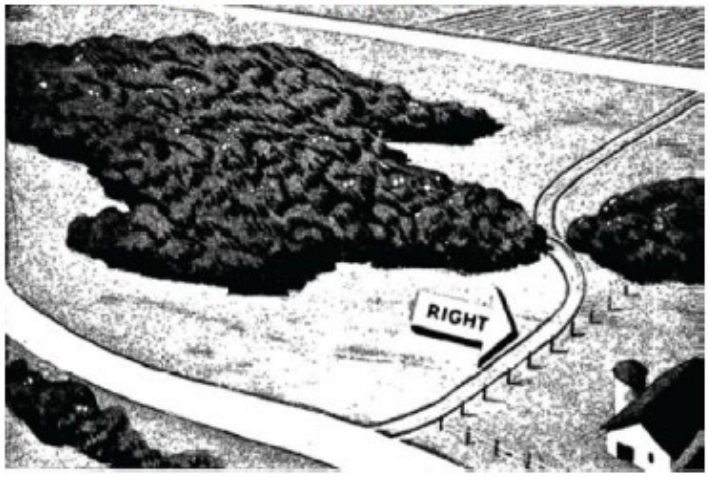
**Visual Camouflage:**

- Apply personal camouflage appropriate to the terrain and environment.
- Eliminate shine from watches, eyeglasses, optics, and equipment.
- Avoid wearing or carrying items that contrast with the surrounding terrain.
- Use techniques such as using 2 tarps with a 6” gap in between or double stacking the poncho liner and tarp together.
- Use organic SUAS to view friendly positions from the sky and walking positions to identify areas that need improvement.
- Stay low, especially during dawn and dusk, to reduce shadows.

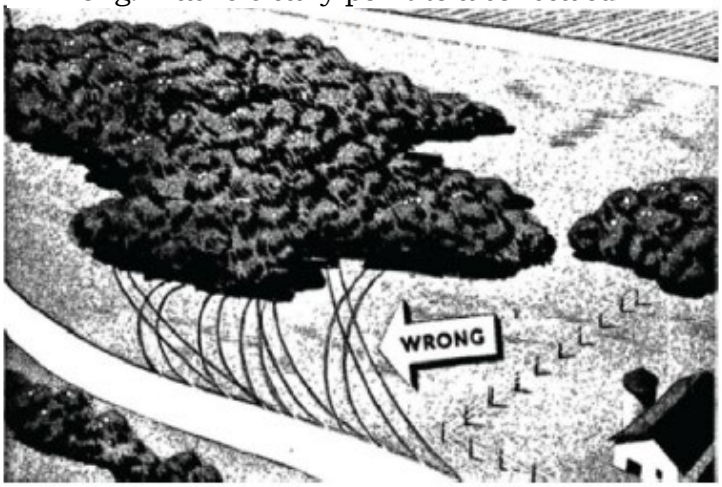
**Track and Trail Discipline:**

- Consider impressions made from unit movement.
- Have vehicles follow the same tracks.
- Rear area security can be tasked with covering tracks.

Correct: Single track helps protect concealed TAA




Wrong: Tracks clearly point to a concealed TAA



**Engagement Authorities:**

The compressed timelines of counter-smaller UAS engagements require pre-delegated authorities and clearly defined engagement criteria. Commanders should establish weapons control status (WCS), engagement zones, and ROE that enable operators to engage sUAS threats without requiring real-time approval from higher echelons. Commanders should train and rehearse the detect-identify-track-engage-assess kill web supported by automated decision aids to present engagement recommendations to operators in the time available.

Engagement authority frameworks need to account for the risk of fratricide against friendly UASs, collateral damage to civilian populations and infrastructure, and the electromagnetic effects on friendly systems. Positive identification requirements must balance the need for certainty against the time constraints of the threat. In addition, engagement authority should be pre-coordinated through installation defense plans, with US forces authorized to engage threats to US assets and/or personnel.

Installation commanders execute C-sUAS operations under force protection authorities to defend assigned forces, facilities, and assets against sUAS threats. Installation commanders delegate engagement authority for sUAS threats to installation forces and assets consistent with Title 10 130i permissions, theater ROE, applicable rules for the use of force, and self-defense provisions under international law and SOFA agreements, depending on location.

Counter-sUAS execution is integrated into installation defense plans per JP 3-10, *Joint Security Operations in Theater*, antiterrorism plans and force protection programs as a critical capability for countering sUAS threats to installation operations, personnel, and mission-critical assets.

Installation commanders establish C-sUAS SOPs addressing detection and identification; tracking and engagement decision-making processes; effector employment coordination; and post-engagement actions, including battle damage assessment (BDA) and sUAS exploitation.

# C-sUAS Battle Drills



## Disclaimer

Battle drills are essential to the Warfighter's knowledge base. They provide a baseline understanding of the standards required to effectively execute broader tasks.

# React to Reconnaissance, Surveillance, and Target Acquisition (RSTA) Drone

If a Warfighter has detected an enemy drone, they should assume that it has also detected the Warfighter in the area. Once detected, immediate actions are required to complicate further enemy targeting. The three principal means to do this are dispersion, cover and concealment, and movement.

• **Alert.** Immediately alert the unit using the established signal.

• **Disperse.** Spread out to avoid presenting a concentrated target. Use pre-designated rally points and tactical control measures to maintain command and control over dispersed elements.

• **Seek Cover and Concealment.** Use terrain to your advantage. Move to positions with overhead cover and concealment, reducing thermal signature. Get low to reduce visual and shadow signatures.

• **Move.** If the current position is compromised, displace to alternate positions using covered and concealed routes. Movement should be unpredictable—avoid moving in straight lines or along obvious routes.

• **Defeat.** If within effective range, and engagement is authorized, attempt to destroy the RSTA drone to prevent it from providing targeting data to enemy fires or attack drones.

• **Anticipate Follow-On Attack.** Once detected by enemy RSTA drones, warfighters should generally assume that enemy strike drones or indirect fires will follow. Take immediate actions to prepare for follow-on attack.

# React to Attack Drone

An attack drone on a terminal approach represents an immediate, lethal threat. Reaction time is extremely limited.

• **Alert.** Immediately alert the unit using the established signal.

• **Disperse.** If cover is not immediately available, disperse rapidly to reduce the number of casualties from a single munition.

• **Seek Cover**. Move to the nearest available cover. Overhead cover is the most effective protection against drone-delivered munitions. Even partial cover (e.g., behind a wall, inside a vehicle, or in a depression) is better than remaining in the open.

• **Defeat.** If the attack drone is within range, and engagement is feasible, engage with all available means. Concentrated small arms fire, electromagnetic warfare jamming, or any other available method should be employed immediately.

• **Get Low.** If no cover is available and dispersion is not possible, get as low as possible to reduce exposure to blast and fragmentation.

# Enemy Tactics, Techniques, and Procedures (TTPs)



## Disclaimer

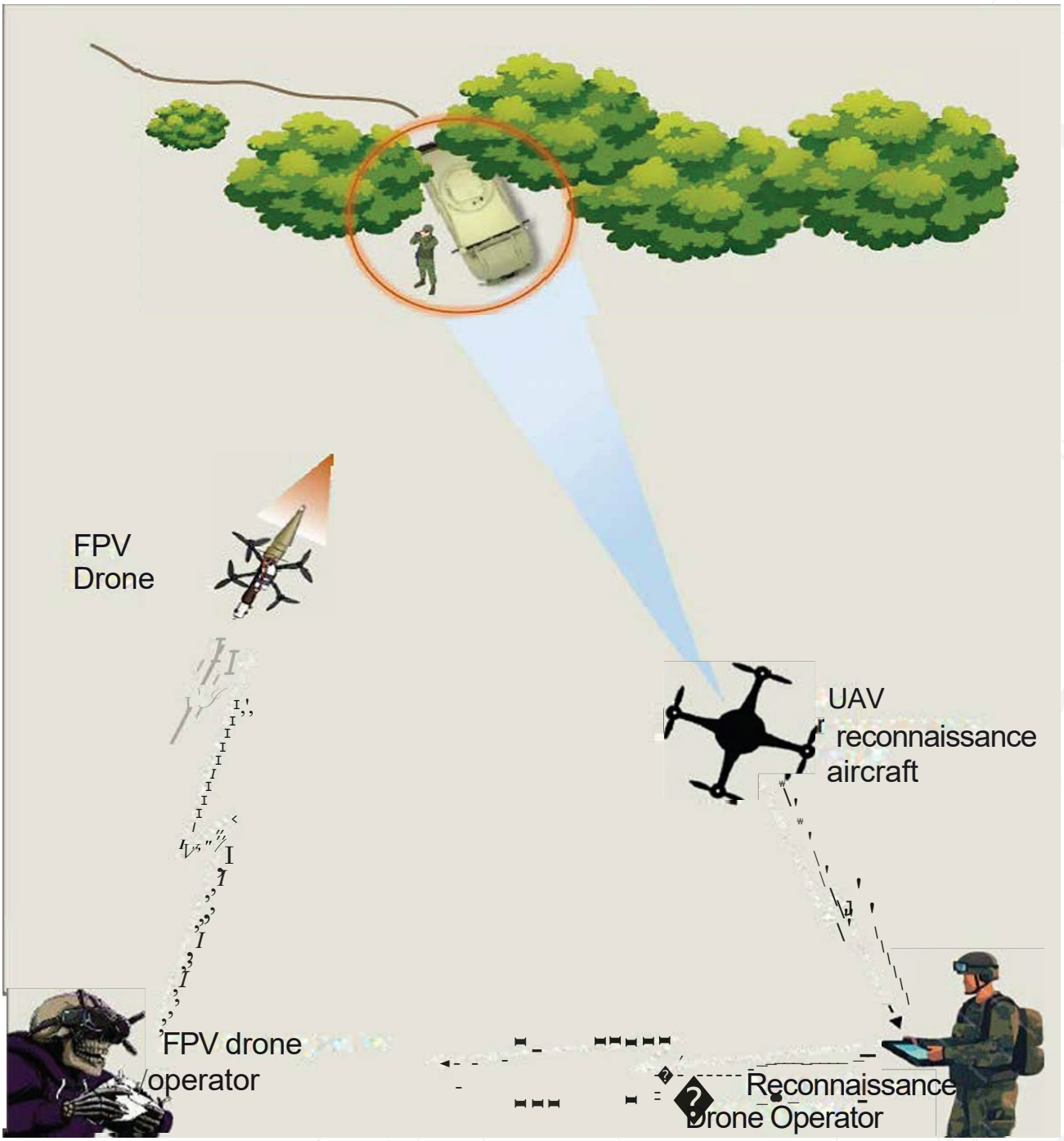
Modern warfare is characterized by rapid change, technological advancement, and complex operational environments. Understanding enemy TTPs are essential be able to react quickly and decisively in dynamic situations, reducing risk of confusion and errors.

**Enemy TTPs:**

· Classic: Target detection by a reconnaissance UAV-launching the drone and its destruction.

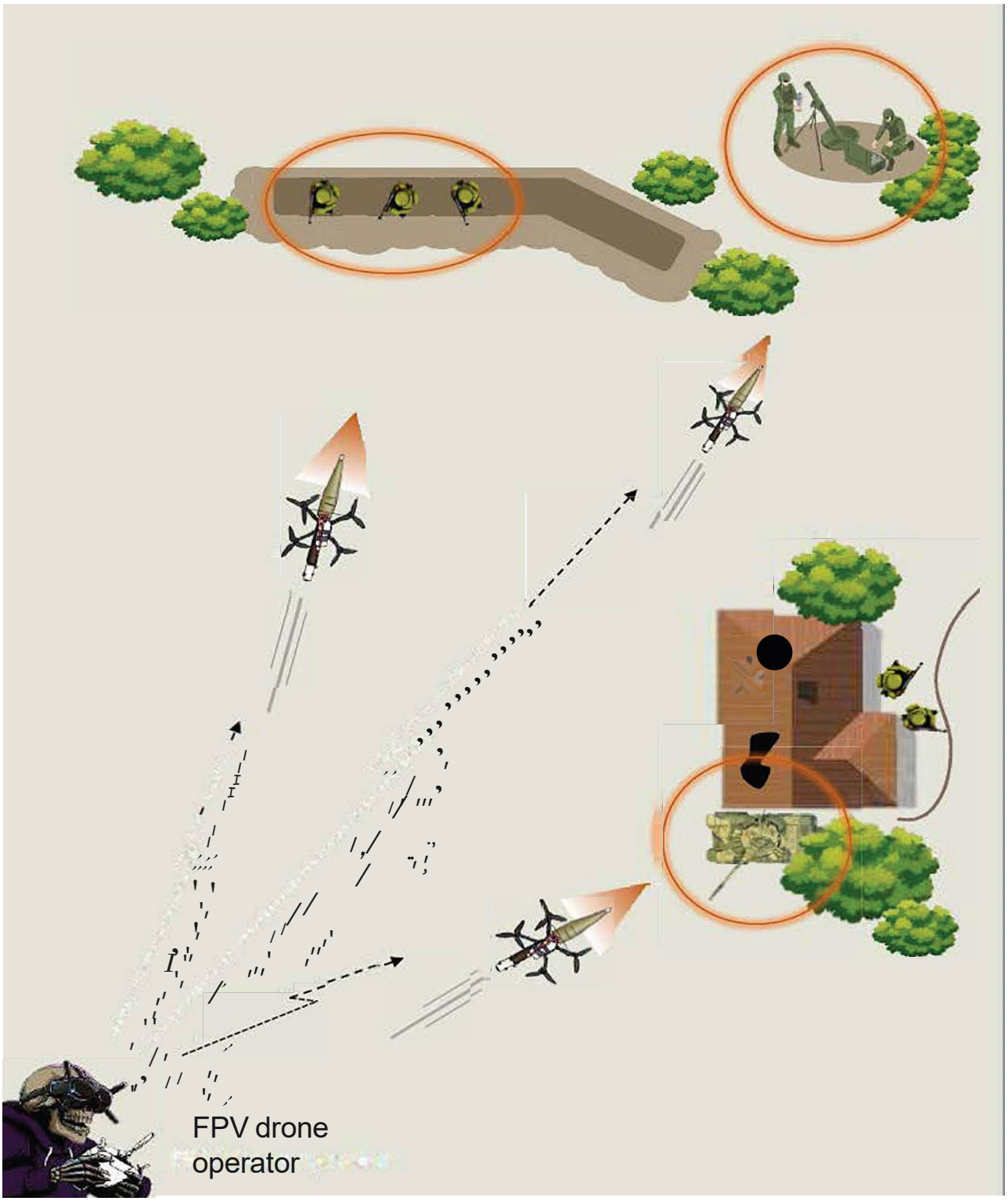
· The most common method of combat use. It consists of detecting the target by a reconnaissance drone and transmitting the coordinates to the FPV operator to destroy it.

· Video recording of the destruction of the object is carried out by a UAV reconnaissance.



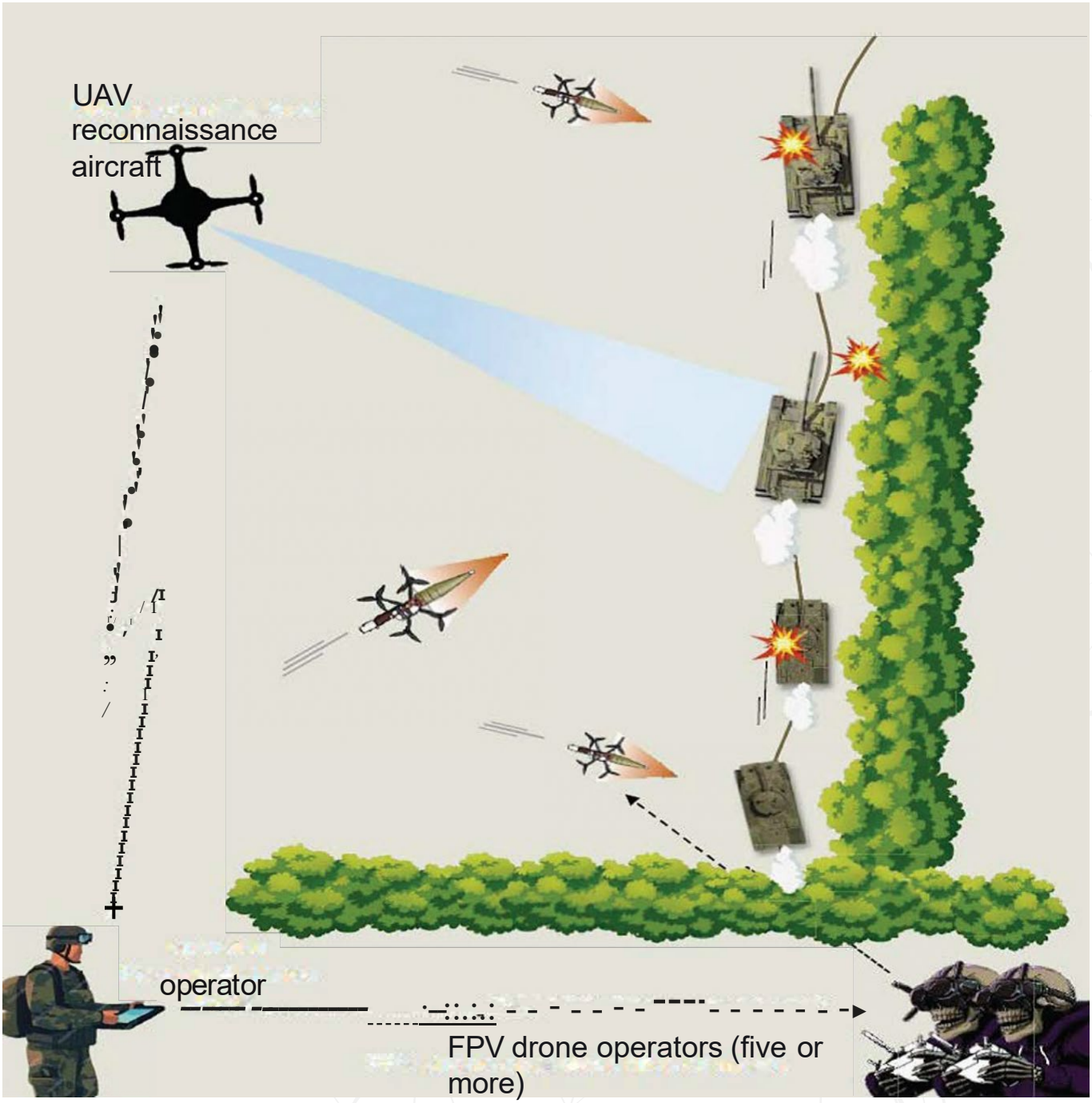
**Enemy TTPs:**

- Free Hunting: FPV strike on objects and positions detected in advance.
- The essence of this method is the independent delivery of strikes by FPV drones on pre-discovered objects and enemy positions.



**Enemy TTPs:**

- FPV Swarm: FPV group strike on selected targets, objects.
- The method is based on the opening of targets (objects) by a UAV reconnaissance aircraft and the massive impact of "kamikaze" drones in order to destroy them.
- As a rule, the total consumption is 5-12 devices.
- Video recording of the destruction of the object is carried out by a reconnaissance drone.
- A combination of FPV drone strikes with artillery and mortar fire is possible.



# Reporting Guidance

## sUAS DoW Reporting Guidance:

- Per sUAS Reporting EXORD, dated 17 Dec 21, SMALL UNMANNED AIRCRAFT SYSTEMS (SUAS) REPORTING EXECUTE ORDER, CCMDs, and Services, have mandatory reporting guidance for sUAS incidents.
- The Initial sUAS Incident or Incursion Report is required no later than 24 hours of any sUAS incident affecting DoW installations, commands or agencies.
- The Initial sUAS Engagement Report is required within 48 hours of any sUAS incident affecting DoW installations, commands or agencies that involve an engagement.
- CCMDs, Services, and their respective subordinates will input reports into the Command and Control of the Information Environment (C2IE), the DoW's sUAS reporting repository. Additionally, DoW, CCMDs, Services, and their respective subordinates will report incidents, incursions, and engagements through their respective Combatant Command Joint Operations Centers and Service Watch Cells.

## sUAS DoW Reporting Definitions:

- An incident is any occurrence where sUAS(s) present(s) a hazard or threat to a DoW mission, installation, facility, or asset.
- An incursion is any occurrence where sUAS(s) penetrates established airspace boundaries of a DoW installation, facility, asset, or protected airspace of a mobile asset. This includes sUAS operating in special use airspace without prior authorization or coordination.
- An engagement is the employment of any Counter-UAS (C-UAS) capability, kinetic or non-kinetic.

**Every sUAS Incident or Incursion will be reported by the CCMD, Service, within 24 Hours using the Template below with existing CCMD or Service Reporting Procedures. (* denotes a required response and ** denotes a required response with additional reporting requirements):**

LINE 1: *BASE OR FACILITY NAME; STATE/COUNTRY

LINE 2: *DATE TIME GROUP (DTG) OF INCIDENT OR INCURSION (ZULU) AND DURATION: DDHHHH ZULU MMMYYYY LINE 3: *REPORTING GEOGRAPHIC AREA: USAFRICOM, USCENTCOM, USEUCOM, USINDOPACOM, USNORTHCOM, USSOUTHCOM

LINE 3A: *REPORTING SERVICE/COMPONENT: ARMY, NAVY, AIR FORCE, MARINE CORPS, SPACE FORCE, COAST GUARD, NATIONAL GUARD, AIR NATIONAL GUARD, OTHER

LINE 4: *UNIT/ORGANIZATION CONTACT INFORMATION (UNIT/ORGANIZATION, NAME, RANK/GRADE, EMAIL, PHONE NUMBER)

LINE 5: *GEO-LOCATION OF INCIDENT OR INCURSION (LAT-LONG OR MGRS OF THE OBSERVER/SENSOR TO THE UNMANNED AIRCRAFT)

LINE 6: *INCIDENT OR INCURSION ENVIRONMENT: U.S./ HOST NATION/ THEATER OF WAR/ INTERNATIONAL WATERS

LINE 7: *TOTAL NUMBER OF SUAS DETECTED (1-XXX)

LINE 8: *FIRST DETECTION: OUTSIDE INSTALLATION/ OUTSIDE INSTALLATION - RESTRICTED AREA/ WITHIN INSTALLATION/ WITHIN INSTALLATION - RESTRICTED AREA/ MOBILE

LINE 9: *DETECTION METHOD: VISUAL/ RADAR/ ELECTRONIC/ EO-IR/ ACOUSTIC/ OTHER (e.g. LOCAL OR STATE LAW ENFORCEMENT, ETC)

LINE 10: *SUAS AIRFRAME: FIXED WING/ ROTARY WING/ UNKNOWN/ OTHER

LINE 11: SUAS DETAILED DESCRIPTION (NUMBER OF ROTORS, NUMBER OF LIGHTS, LIGHT PATTERN (BLINKING/SOLID), COLOR OF LIGHTS, PAYLOAD, MOVEMENT PATTERN ETC.)

LINE 12: C-SUAS EQUIPMENT OPERATIONAL: YES/ NO/ UNKNOWN/ N/A

LINE 13: **SUAS ENGAGED: YES (ENGAGEMENT REPORT AND CJCS AND CCDR CCIR) / NO / N/A

LINE 14: **SUAS INCIDENT OR INCURSION HAS A MISSION IMPACT (COMMANDER'S ASSESSMENT): YES (CJCS AND CCDR CCIR) / NO

LINE 15: **SUAS INCIDENT UNSAFE/ UNPROFESSIONAL (COMMANDER'S ASSESSMENT): YES (CJCS CCIR) / NO LINE 16: *SUAS INCIDENT OR INCURSION NARRATIVE

**Every sUAS engagement, regardless of effectiveness will be reported by the CCMD, Service, and/or Defense Agency no later than 48 hours using the template below:**

LINE 1: TITLE: *BASE OR FACILITY NAME; STATE/COUNTRY

LINE 2: ENGAGEMENT START DATE TIME GROUP (DTG) (ZULU): DDHHHH ZULU MMMYYYY

LINE 3: TOTAL TIME OF INITIAL/ FOLLOW-ON ENGAGEMENTS: HHMM

LINE 4: TYPE OF ENGAGEMENT: RF/ KINETIC/ C-PNT/ OTHER

LINE 5: C-SUAS ENGAGEMENT EFFECTIVE? YES/ NO/ UNKNOWN

LINE 6: ANY CONFIRMED ELECTRONIC/COLLATORAL EFFECTS FROM C-sUAS SYSTEMS: YES / NO/ UNKNOWN (EXPLAIN IN NARRATIVE, LINE 11)
LINE 7: WAS THE SUAS CONFISCATED AND / OR CAPTURED? YES/ NO/ UNKNOWN

LINE 8: ATTRIBUTION: WAS THE SUAS OPERATOR LOCATED AND/OR INTERVIEWED? YES/ NO/ UNKNOWN/ N/A

LINE 9: FAA AND/OR HOST NATION EQUIVALENT NOTIFIED: YES/ NO

LINE 10: IS VIDEO AND/OR PHOTO AVAILABLE? YES/ NO/ N/A

LINE 11: sUAS ENGAGEMENT NARRATIVE (*IF CONFISCATED AND/OR CAPTURED EXPLAIN WHO HAS IT):

# Small UAS Individual Reporting



Upon detection of a suspected or confirmed enemy sUAS, prioritize survivability and defeat actions first. Once the situation stabilizes, reports should be passed to higher echelons to enable timely intelligence updates and inform the broader C-sUAS defense.

Establish a standardized verbal and visual alert system for enemy sUAS detection that every Warfighter in the unit knows and can execute immediately, such as:

"Hawkeye": Verbal alert on detection of any unidentified or enemy sUAS.
Predetermined hand and arm signal: Use in situations requiring noise discipline.
Radio brevity code: Use when radio use is authorized.
Clear, concise, and immediate reporting is the foundation of an effective C-sUAS defense. Information has no value until it is shared. All Warfighters should be proficient in submitting these standard reports over the appropriate tactical net to ensure information is rapidly disseminated.

## sUAS Spotting Report (sUAS SPOTREP)

The sUAS SPOTREP is the initial and most critical report made by any Warfighter that detects a potential sUAS. The purpose of the sUAS SPOTREP is to provide immediate, perishable information to the unit and higher headquarters to build situational awareness. When describing the system and current threat activity, be as descriptive as possible.

| sUAS SPOTREP | | |
|---|---|---|
| **Line** | Information Required | **Example** |
| **1. Unit** | • **Your unit callsign** | **" Charlie 1, this is Charlie 2-1"** |
| **2. Observer Location** | • **Your current 8-digit grid location** | **"My location grid one-eight-sierra, papa-hotel, one-two-three-four, five-six-seven-eight"** |
| **3. Location** | • **Direction (in degrees magnetic)**<br>• **Distance (in meters) from you** | **"SUAS/UGV/UMV at two-seven-zero degrees, eight-hundred meters"** |
| **4.Description** | • **Number, type, ex. (quadcopter, fixed wing)**<br>• **Current Threat Activity** | **"One quadcopter, grey colored with a white sensor in the center, hovering in place"** |

**Full Example:** "Charlie 1 this is Charlie 2-1, sUAS SPOTREP, Charlie 1, my location grid 18S PH 1234 5678, sUAS at two-seven-zero degrees, eight-hundred meters, one quadcopter, hovering in place."

# Attack, Enemy Equipment, Destruction, Action, Casualties (AEDAC) Report

The AEDAC Report is a follow-on report submitted after a C-sUAS engagement to provide a preliminary battle damage assessment. The report informs the commander of the results of the engagement and the intelligence that can be gained.

| AEDAC REPORT | | | |
|---|---|---|---|
| **Letter** | **Meaning** | **Information Required** | **Example** |
| **A** | **Attack** | • **Your unit callsign**<br>• **8-digit grid location of the engagement**<br>• **Type of engagement (swarm, loitering, dropper)** | **"Charlie 1-2, 8-digit grid, swarm attack."** |
| **E** | **Enemy Equipment** | • **Number and type of sUAS/UGV/UMV** | **"Four by quadcopters, one by fix wing."** |
| **D** | **Destruction** | • **Method of defeat (small arms, electromagnetic warfare jammer)**<br>• **Observed results (destroyed by fire, forced to land, crashed)** | **"Four by quadcopters were destroyed by 5.56, one by fixed wing forced to land by electromagnetic warfare jammer."** |
| **A** | **Action** | • **Location (grid) or (direction) of downed asset wreckage, if known.**<br>• **Request intent for recovery or exploitation team** | **"(8-digit grid) or (direction) from my position. What is higher intent?"** |
| **C** | **Casualties** | • **Report any friendly or civilian casualties** | **No casualties to report at this time.** |

**Full Example:** "Charlie 1 this is Charlie 2-1, AEDAC report, Charlie 1, my location grid 18S PH 1234 5678, potential swarm attack, four by quads, one by fix-wing, four by quadcopters destroyed by 5.56 and one fix wing drone defeated by electromagnetic warfare jammer, north of my position 500 meters, will await exploitation team and need EOD [explosive ordnance disposal] at my location, no casualties to report at this time."

# SCAN Report

The SCAN Report provides a standardized immediate action drill for Warfighters to detect, report, and protect themselves from sUAS threats. This drill adapts the familiar "5 & 25" IED [improvised explosive device] check methodology to the three-dimensional, aerial threat. It is the individual Warfighter's role in the detect, track, identify, and defeat (DTID) targeting cycle.

| SCAN REPORT | | |
|---|---|---|
| **S** | **SEEK COVER & CONCEALMENT** | • **Break your silhouette and mask your thermal signature.**<br>• **Immediately move under the best available overhead cover (trees, building overhangs, camouflage netting).**<br>• **If no overhead cover is available, get low to the ground to minimize your shadow and blend with the terrain.** |
| **C** | **CHECK LOW SKY**<br>**(5-Meter Check)** | • **Conduct a rapid, 360-degree scan of your immediate airspace, from the horizon up to a 45-degree angle. You are the primary sensor for this zone.**<br>• **Listen and look.**<br>• **Immediately execute "React Drill."**<br>• **Disperse from other Warfighters into any terrain that may disrupt the drone's ability to fly or reduce the effectiveness of the explosive.** |
| **A** | **ANNOUNCE & REPORT**<br>**(Transition to 25-Meter Check)** | • **If a drone is detected in the higher airspace (above 45 degrees) or at a distance, it is a probable RSTA platform.**<br>• **Immediately transmit a SPOTREP amended over the radio that captures: "Direction, Distance, Type"** |
| **N** | **NOW SCAN HIGH SKY**<br>**(25-Meter Check)** | • **After the initial low-sky check, conduct a more deliberate, systematic scan of the higher airspace and out to the horizon to track and identify the threat.**<br>• **Use optics to search for loitering or transiting drones.**<br>• **Look for "anything out of the ordinary," just as you would for IED indicators. Examples: Drones hiding in the sun's glare, drones using cloud cover for concealment, and unusual bird-like objects that are not behaving like birds. Advanced enemy systems may use algorithms to mimic natural flight patterns.**<br>• **Follow up your initial SPOTREP and/or AEDAC when possible.**<br>• **This provides critical data on the most effective method to DEFEAT the threat.** |

# Recover and Exploit Downed Enemy sUAS

If an enemy sUAS is downed (whether by friendly action, malfunction, or other cause

-Do not immediately approach. Downed enemy sUAS might be booby-trapped, still transmitting video or location data, or contain hazardous materials (e.g., damaged batteries and unexploded munitions).

-Immediately report the downed sUAS to the squad leader, including location, type of sUAS, and apparent condition.

-Secure the area by establishing security around the downed sUAS at a safe distance.

-Mark and document it. Use friendly assets to photograph it from multiple angles and note any markings, modifications, or attached functions. Send photographs to higher echelon.

-Recover if directed. Recovery of downed enemy sUAS for tactical exploitation might be necessary. Placing the SUAS in a faraday bag or shielded container might prevent any remote wipe, detonation, or tracking signals from the enemy operator. Recovery can provide valuable intelligence on enemy capabilities, frequencies, and TTPs. Follow unit SOPs and higher headquarters guidance for recovery procedures.

| A – Five C's for Encountering a Downed Drone | |
|---|---|
| **Confirm** | **From a safe distance, use binoculars or other optics to confirm that the object is suspicious and looks like a potential drone. Do not touch or move the object.** |
| **Clear** | **Evacuate the area to a safe distance.** |
| **Control** | **Control all entry and exit points** |
| **Call** | **Call up Size, Activity, Location, Unit, Time, and Equipment (SALUTE) Report to higher and EOD.** |
| **Continue** | **Continue with mission by "Mark (report 8-digit grid) and Bypass"** |

# Lessons Learned



## Disclaimer

Lessons learned provide a system in which discovered lessons and best practices are validated and corrective actions are implemented into doctrine, training, education, and leadership.

The Joint Lessons Learned Program (JLLP) is a knowledge management and continuous improvement program that supports organizational learning from experience gained in joint operations, training events, exercises, experiments, wargames, and other activities, as well as historic data. The program's primary objective is to enhance Joint Force readiness and effectiveness, and contribute to improvements in doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy (DOTMLPF-P) across the Joint Force. The JLLP accomplishes the CJCS's responsibility through building a community across the joint force which executes a five-phase process of discovery, validation, resolution, evaluation, and dissemination.

**C-sUAS Lessons Learned Quick Links:**

- **Joint Lessons Learned (JLLIS):** https://www.jllis.mil/
- **Joint Interagency Task Force 401 (JIATF-401) Lessons Leaned:** https://armyeitaas.sharepoint-mil.us/teams/JCOJCWG/SitePages/Lessons-Learned.aspx
- **Transformation and Lessons Learned Manager – Army (TLLM-Army):** https://armyeitaas.sharepoint-mil.us/sites/T2C-CAC-TID-TLLM-A
- **Marine Corps Center for Lessons Learned (MCCLL)**: https://usmc.sharepoint-mil.us/sites/TECOM_MCCLL
- **Navy Lessons Learned Information System (NLLIS):** https://www.doncio.navy.mil/(csu3prjur4iqoz45e5bfog45)/CHIPS/ArticleDetails.aspx?ID=5022
- **U.S. Coast Guard Lessons Learned:** https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/Office-of-Investigations-Casualty-Analysis/Safety-Alerts/
- **NATO Lessons Learned:** https://www.jallc.nato.int/activities/lessons-learned
- **CJCSI 3150.25H Joint Lessons Learned Program**
- **AR 11-33 Army Lessons Learned Program**
- **AFI10-1302 Air Force Lessons Learned Program**
- **MCO 3504.1A Marine Center for Lessons Learned Program**
- **OPNAV 3500.37D Navy Lessons Learned Program**



# ANNEX A. Common Acronyms

| | |
|---|---|
| ADSI | Air Defense System Integrator |
| AGE | Army Globe Engine |
| AMD | Air and Missile Defense |
| ATAK | Android Tactical Assault Kit |
| BC | Bal Chatri |
| BDOC | Base Defense Operations Center |
| C4I | Command, Control, Communications, Computers, and Intelligence |
| COP | Common Operating Picture |
| COTS | Commercial-off-the-Shelf |
| CORAIN | Counter-Remote Control Model Aircraft Integrated Air Defense Network |
| CUAEWS | Counter Unmanned Aircraft Electronic Warfare System |
| DF | Direct Fire |
| DF | Direction Finding |
| DTRA | Defense Threat Reduction Agency |
| EA | Electronic Attack |
| ECM | Electronic Countermeasure |
| EME | Electromagnetic Environment |
| EO/IR | Electro-Optical Infra-Red |
| EW | Electromagnetic Warfare |
| EW PNT | Electronic Warfare Position, Navigation, and Timing |
| FAA | Federal Aviation Administration |
| FAAD C2 | Forward Area Air Defense Command and Control |
| FLIR | Forward Looking InfraRed |
| FPGA | Field-programmable Gate Array |
| FSK | Fixed Site Kit |
| FW | Fixed Wing |
| FOB | Forward Operating Base |
| FOV | Field of View |
| FS-LIDS | Fixed Site - Low-slow-small UAS Integrated Defeat System |
| FSR | Field Service Representative |
| GCS | Ground Control Station |
| GPS | Global Positioning System |



# ANNEX A. Common Acronyms

| | |
|---|---|
| GUI | Graphic User Interface |
| HMI | Host Message Interface |
| HN | Host Nation |
| ICO | Interface Control Officer |
| ISR | Intelligence Surveillance and Reconnaissance |
| JCO | Joint Counter Small Unmanned Aircraft System Office |
| KuRFS | Ku-band Radio Frequency System |
| L-MADIS | Light – Marine Air Defense Integrated System |
| LNA | Low Noise Amplifier |
| LOB | Line of Bearing |
| LOS | Line of Sight |
| M-ATV | MRAP All-Terrain Vehicle |
| MBITR | Multiband Inter/Intra Team Radio |
| M-LIDS | Mobile - Low-slow-small UAS Integrated Defeat System |
| MEDUSA C2 | Multi-Environmental Domain Unmanned Systems Application Command and Control |
| MOSA | Modular Open System Architecture |
| MMR | Multi-Mission Radar |
| MRAP | Mine-Resistant Ambush Protected |
| MTT | Mobile Training Team |
| NORAD | North American Aerospace Defense Command |
| RW | Rotary Wing |
| SALUTE | Size, Activity, Location, Unit, Time, Equipment |
| sUAS | Small Unmanned Aircraft System |
| TDoA | Time Difference of Arrival |
| TTP | Tactics, Techniques, and Procedures |
| TRx | Transmit and Receive |
| UA | Unmanned Aircraft |
| UAS | Unmanned Aircraft System |
| UAV | Unmanned Aircraft Vehicle |
| VTOL | Vertical Take-off and Landing |



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