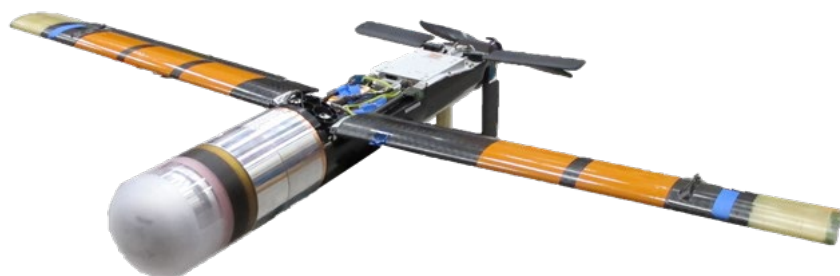


Counter-small Unmanned Aircraft Systems (C-sUAS) Catalog

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Coyote Block 3 Non-Kinetic, Photo from PEO Missiles and Space

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js.dsc.j7.mbx.jllis-coordinator@mail.mil.

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Acknowledging the Small UAS (sUAS) Problem:

sUAS (small unmanned aircraft system category groups 1-3) attacks pose a significant threat against installations and deployed forces globally. Daily news reports and social media regularly highlight sUAS attacks on U.S. Forces in Iraq and Syria. These reports emphasize not only the proliferation of sUAS capabilities but also the increasing effectiveness with which enemy forces are using them for intelligence collection, targeting, direct and indirect fires, electronic support, BDA, etc. Enemy sUASs continue to penetrate installations and fixed sites; growing more advanced in their ability to target military personnel and equipment.

This C-sUAS Reference Guide provides a small sample of an ever growing collection of C-sUAS references focused on detecting, tracking, identifying and defeating sUASs in LSCO against a peer adversary.

Purpose:

In acknowledging a need to address these challenges, this document provides a list of references to inform readers and provide potential solutions. The reference list consists of four categories: Understanding UAS and C-sUAS; C-sUAS Doctrine and Official References; C-sUAS Best Practices in Defense of Fixed Sites, and C-sUAS Best Practices in LSCO. However, while these references present many best practices and lessons learned from a C-sUAS perspective, they only begin to scratch the surface of autonomous vehicles in general. The U.S. Army will likely have to continue to develop innovative solutions to counter threats posed by other unmanned systems, including autonomous AI enabled drone swarms and ground vehicles.

Understanding UAS and C-sUAS:

Department of Defense Counter-Unmanned Aircraft Systems, Congressional Research Service, 7 June 2021

This Congressional Report provides a broad overview of UASs and associated systems.

<https://crsreports.congress.gov/product/pdf/IF/IF11426>

Counter-Unmanned Aircraft Systems Technology Guide, September 2019

Employing a System of Systems approach, i.e. multiple detection, tracking, identification and defeat capabilities against all components of the sUAS system (aircraft, ground control stations, links between the former, and launch systems) is the most effective strategy in order to increase the likelihood of countering sUAS threats. This document, written by the DHS, provides a great primer or overview of sUAS systems, how they function, and how to mitigate sUAS as a threat.

https://www.dhs.gov/sites/default/files/publications/c-uas-tech-guide_final_28feb2020.pdf

Counter-small Unmanned Aircraft Systems Operations - Legal Considerations

This primer will provide background on the threats posed to deployed U.S. military operations and the U.S. homeland, outline some legal considerations involved in C-sUAS operations, offer a sample set of C-sUAS Rules of Engagement (ROE)/Rules for the Use Of Force (RUF), and suggest draft C-sUAS ROE/RUF vignettes for training. Simply stated, this primer is intended to inform the reader of some basic C-sUAS concepts and help the reader recognize and analyze problems they will encounter in C-sUAS operations and training. With that said, however, the reader cannot entirely rely on this primer but must refer to theater, operation, and mission specific rules for further reference and guidance. (CAC Required)

<https://www.jllis.mil/cfc/Services/JLLISFileRemote.cfc?method=JLLISFileDownloadByGUID&GUID=39FFBBE2-C4F0-416C-55B5-FBC55D756E88>

DroneWars.net (This link may not work on some government networks)

This is a UK based organization opposed to armed drones and autonomous warfare. Although their goal is different than ours, it is a very useful open source of information. Specifically DroneWars.net maintains updated and detailed databases of worldwide drones. These databases detail drone strikes and drone crashes; as well as what drones a country owns, manufactures and/or sells. They also regularly publish detailed reports.

<http://dronewars.net/>

Defense Threat Reduction Agency CUAS Smartcard

This 2019 Smartcard provides examples of categories of unmanned aircraft, with illustrations, and C-sUAS considerations for Detering, Detecting and Tracking, IDing, Defeating, Reporting and Recovering threat UAS. (CAC Required)

https://www.milsuite.mil/book/servlet/JiveServlet/downloadBody/958824-102-1-1720493/DTRA_CUAS_Smartcard_2019v3_Final.pdf

DoD Counter-Small Unmanned Aircraft Systems (C-sUAS) Quick Reference Guide, April 2021

Created by the Joint C-sUAS Office, this Reference Guide provides a macro level overview of threat UAS types and Best Practices, C-sUAS systems across the services, and Best Practices for C-sUAS. (CAC Required)

Visit: <https://jkodirect.jten.mil/Atlas2/page/desktop/DesktopHome.jsf>

From My Training click on Community then scroll to bottom of the page, click on “Joint Counter-Small UAS Office”, then click on “Non-Doctrinal Resources”, finally click on “DoD_C-sUAS_Quick_Reference_Guide_(QRG).pdf.”

The First War Won Primarily with Unmanned Systems Ten Lessons from the Second Nagorno-Karabakh War, John Antal, 2021

This document provides ten lessons from Azerbaijan's use of Turkish and Israeli UAS, precision fires and electronic warfare to dominate the fight and the considerations for future conflicts.

<https://johnantal.academia.edu/research#papers>

National Ground Intelligence Center (NGIC) Spirit UAS Database:

NGIC maintains a classified database of rotary winged UAS. Under Model Directory, authorized users will see a list of the models by group. The arrow to the left of Aviation will expand to show you a list of the models available by type.

Survey of Worldwide UAS and CUAS Activities and Events Aug – Sept 2019

This survey provides members of the Military and Law Enforcement communities information concerning the tactical employment of small Unmanned Aerial Systems (UAS) around the world. All information contained within the report was derived from publicly available information sources available on the Internet. The emphasis of the report is on the adversarial and criminal use of small UAS to help inform near term decisions related to designing effective counter-UAS systems (C-UAS) and developing Best Practices to defeat them. (CAC Required)

<https://www.jllis.mil/cfc/Services/JLLISFileRemote.cfc?method=JLLISFileDownloadByGUID&GUID=CAD2484B-D4FD-91CE-AA20-9AE1824F4392>

Counter UAS Systems 2.0: The Way Forward – Enhancements, Refinements, and Reporting (2018)

This Department of Defense strategy to counter threat UAS involves the development of capabilities at all echelons to detect, identify, and defeat threat UAS. JUONS-0558 supported the development and fielding of multiple C-UAS equipment in support of Operation Inherent Resolve (OIR) and Operation Freedom's Sentinel (OFS). In order to enhance defense and defense-in-depth measures against threat UAS, technicians must configure C-UAS equipment to perform optimally. C-UAS equipment performance depends on operating environment factors. This paper presents a way ahead for C-UAS system implementation. (CAC Required)

<https://call2.army.mil/toc.aspx?document=17792&filename=/docs/doc17792/17792.pdf>

Asymmetric Warfare Group (AWG) Operational Advisory Group CUAS Awareness Report

Due to the global proliferation of Group 1 UAS, the Asymmetric Warfare Group (AWG) set out to understand how a maneuver platoon detects, identifies, and defeats threat UAS using organic equipment. Once understood, AWG sought to inform the Army on the Best Practices that can be developed to counter this threat. (CAC Required)

[https://www.milsuite.mil/book/servlet/JiveServlet/downloadBody/894168-102-1-1532514/OA%20REPORT%20CUAS%20Awareness%20\(UFOUO\)%20AWG%2020150327.pdf](https://www.milsuite.mil/book/servlet/JiveServlet/downloadBody/894168-102-1-1532514/OA%20REPORT%20CUAS%20Awareness%20(UFOUO)%20AWG%2020150327.pdf)

AWG Report C-UAS Systems Micro-Assessment (2015)

A growing community of interest is making strides in providing materiel solutions that can help detect, identify, and defeat Group 1 UAS. These solutions will take time to develop. To close the immediate gap, leaders must change the mindset of Soldiers to assume that enemy forces cannot threaten them from the air. Doing so does not require an extensive investment of time or resources. Simply integrating a threat UAS into existing training will raise awareness and result in Soldiers creating effective non-materiel solutions to detect, identify, and defeat this emerging asymmetric threat. (CAC Required)

<https://www.jllis.mil/cfc/Services/JLLISFileRemote.cfc?method=JLLISFileDownloadByGUID&GUID=22404E80-5056-9A43-460C-6132BB038E1E>

AWG Unmanned Aerial System Threat Awareness Tactical Pocket Reference

This graphic training aide, produced by the Asymmetric Warfare Group, continues to provide relevant recommendations and truisms with respect to threat UAS. (CAC Required)

[https://www.milsuite.mil/book/servlet/JiveServlet/downloadBody/237363-102-2-425128/GTA_90-01-047_UnmannedAerialSystemThreatAwareness_\(UFOUO_AWG_201503\).pdf](https://www.milsuite.mil/book/servlet/JiveServlet/downloadBody/237363-102-2-425128/GTA_90-01-047_UnmannedAerialSystemThreatAwareness_(UFOUO_AWG_201503).pdf)

C-sUAS Doctrine and Official References:

Army Techniques Publication 3-01.81, Counter-Unmanned Aircraft System Techniques, April 2017 (currently being revised, will be titled Counter-Small Unmanned Aircraft System Techniques)

This ATP outlines “planning considerations for defending against low, slow, small [LSS] unmanned air threats during operations,” as well as “how to plan for, and incorporate, C-UAS soldier tasks into unit training events.”

https://armypubs.army.mil/ProductMaps/PubForm/Details.aspx?PUB_ID=1002108

ATP 3-01.8 Techniques for Combined Arms for Air Defense, July 2016

This ATP focuses on how combined arm forces protect themselves from aerial threats, including sUAS.

https://armypubs.army.mil/epubs/dr_pubs/dr_a/pdf/web/atp%203-01x8%20final.pdf

ATP 3-01.15 AMD Multi-Service Tactics, Techniques, and Procedures for Air and Missile Defense, March 2019

Updated to include low, slow, and small (LSS) sUASs, Chapter VI focuses on UAS groups, the UAS Operational Environment, planning considerations, a standardized UAS Detection Report example, and passive defense for C-UAS, and active defense for C-UAS. (CAC Required)

https://armypubs.army.mil/epubs/DR_pubs/DR_d/ARN15491-ATP_3-01.15-000-WEB-1.pdf

U.S. Army Counter Unmanned-Aircraft System Strategy, May 2016

This document represents the U.S. Army's first major effort to align C-UAS efforts across the force. The strategy seeks to provide forces at all echelons with solutions across the DOTMLPF-P Framework that will enable defeat of UAS.

<https://www.ssri-j.com/MediaReport/DocumentUS/ArmyCUASStrategy.pdf>

DoD Counter Small Unmanned Aircraft Systems Strategy, December 2020

This strategy provides the framework for addressing sUAS across the spectrum from hazard to threat in the homeland, host nations, and contingency locations.

<https://media.defense.gov/2021/Jan/07/2002561080/-1/-1/1/DEPARTMENT-OF-DEFENSE-COUNTER-SMALL-UNMANNED-AIRCRAFT-SYSTEMS-STRATEGY.PDF>

ATP 3-37.34, Survivability Operations, April 2018

Updated with UAS considerations, this document emphasizes many of the active and passive measures units can take to survive UAS threats, including mobility, dispersion, camouflage and concealment. (CAC Required)

https://armypubs.army.mil/epubs/DR_pubs/DR_c/pdf/web/ARN8431_ATP%203-37x34%20FINAL%20WEB.pdf

C-sUAS Best Practices in Defense of Fixed Sites:

US ARMY Air Defense Artillery C-sUAS milSuite page

This unit teaches an approved C-UAS course at Yuma Proving Grounds (YPG). (CAC Required)

<https://www.milsuite.mil/book/groups/air-defense-artillery-c-suas>

CUAS Lessons from the Front Lines FY20, Brown/Kurz/Owens/Robertson, 19 October 2020

This is an excellent summary of BDOC and installation-focused, fixed site best practices, lessons learned and Best Practices for C-sUAS. (CAC Required)

<https://call2.army.mil/docs/doc18037/18037.pdf>

C-sUAS Best Practices in LSCO:

AWG Operational Advisor Report Counter Unmanned Aircraft System (C-UAS)

This short, insightful synopsis of three training scenarios with sUAS provides insight to how small units typically respond to UAS activities. (CAC Required)

<https://www.milsuite.mil/book/docs/DOC-434899>

Military Review “Army Counter-UAS 2021-2028”, Scott, April 2021

This is an excellent reference for Division focused Best Practices, highlights 25ID’s experiences and C-UAS lessons learned/best practices during WFX 20-3, especially from a targeting perspective.

<https://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/March-April-2021/Scott-Counter-UAS/>

“EW and the Counter UAS Fight” White Paper, Bolser, Ian D.

This resource provides tactical level experience, insights and recommendations with respect to C-sUAS from NTC Senior EW OC/T MAJ (then CPT) Ian D. Bolser. MAJ Bolser identifies three effective lines of defense for C-sUAS and provides information on the nature of small (Groups 1 and 2) UASs. (CAC Required).

<https://www.milsuite.mil/book/docs/DOC-735017>

“Threat from Above: Defending Against Small Unmanned Aircraft Systems,” MAJ Matthew G. Easley, Aviation Digest, April-June 2021

This article provides insights for how tactical formations counter sUAS in their area of operations.

https://home.army.mil/rucker/application/files/8016/2497/3111/AD_Apr-June_2021-WEB.pdf

“Defeating the aerial threat in warfighter exercises,” Air Defense Artillery Journal, 2020 Issue 3, p 16

This article focuses on best practices and lessons learned from the 101st ‘s Air Defense staff officers during WFX 20-01. Their analysis of previous warfighter exercise results helped them develop more effective ways to ensure early engagement and defense in depth against enemy UASs during the exercise.

<https://sill-www.army.mil/ada-journal/archive/ada-journal/2020/adaj-2020-3.pdf>

Center for Army Lessons Learned: Maneuver Leader’s Guide to Stinger

Today’s operational environment presents threats the Army has not faced in nearly 20 years. Against peer competitors, the joint force may face air parity or even localized enemy air overmatch, challenging the assumption of air superiority the joint force has held since the Korean War. This will make maneuver forces vulnerable to air attack by fixed- and rotary-wing aircraft, unmanned aircraft systems, and cruise missiles. Maneuver forces lack capacity and capability to address these threats and the Army requires a speedy response. The Chief of

Staff of the Army directed the Army to execute a plan to increase short-range air defense (SHORAD) capability. The immediate solution is to train and arm teams of Soldiers organic to select brigade combat teams with Stinger missiles. This directive is one line of effort as the force structure for a dedicated maneuver SHORAD capability increases. Stinger missiles provide a key capability for maneuver forces to defend themselves from aerial observation and attack.

<https://call2.army.mil/toc.aspx?document=17649&filename=/docs/doc17649/18-16.pdf>

I MEF: Task Force Ellis FY 20 Capabilities Testing SkyView-MP [Man-Packed] Commercial Unmanned Aircraft System Detection System AAR (14 Jan 2021)

From 14 to 18 October 2020, Task Force Ellis conducted capabilities testing of the SkyView-MP (man-packed) commercial unmanned aircraft system detection system. This was conducted at sea while embarked on MK VI patrol crafts and the USS COMSTOCK. This AAR is broken down into three sections: Capabilities, Limitations, and Employment Considerations. (CAC Required)

<https://www.jllis.mil/cfc/Services/JLLISFileRemote.cfc?method=JLLISFileDownloadByGUID&GUID=0C949997-91ED-7FC4-B1C3-DE45DE71CAA5>

AWG Non-Kinetic UAS Countermeasures (DroneDefender) Tactical Pocket Reference (CAC Required)

[https://www.milsuite.mil/book/servlet/JiveServlet/downloadBody/265909-102-4-471330/TPR_NonKinetic-UAS-Countermeasures-DroneDefender_\(UFOUO\)_AWG_20160131.pdf](https://www.milsuite.mil/book/servlet/JiveServlet/downloadBody/265909-102-4-471330/TPR_NonKinetic-UAS-Countermeasures-DroneDefender_(UFOUO)_AWG_20160131.pdf)

Reference Collection: Counter Unmanned Aerial Systems (C-UAS) Reference Documents

Joint Lessons Learned Site C-UAS reference site. Some of the documents contained in this catalog are linked to the Joint Lessons Learned Information System (JLLIS). This system is only available to authorized users. In order to access the site, you must establish a JLLIS account through the Joint Staff J-7 JLLIS Help Desk at 757-203-5820. (CAC Required)

<https://www.jllis.mil/?doit=view&disp=cdview&cdrid=110308>

C-sUAS JKO Training Modules

These are links to the Joint Knowledge Online C-sUAS training course materials. They provide insight into the basics of UAS, as well as some of the capabilities that exist to counter UAS. (CAC Required)

https://jkodirect.jten.mil/html/COI.xhtml?course_prefix=JCSUAS&course_number=A-US1402
https://jkodirect.jten.mil/html/COI.xhtml?course_prefix=JCSUAS&course_number=-US1403
https://jkodirect.jten.mil/html/COI.xhtml?course_prefix=JCSUAS&course_number=-US1404