

SECRETARIAT

COUNTER UNMANNED AERIAL SYSTEM (C-UAS) EQUIPMENT

Secretariat Issue Paper # 02 - Mandated Study

1. ISSUE PAPER THEME: Major Equipment

2. SUMMARY / BACKGROUND / PREVIOUS HISTORY

The 2023 Contingent-Owned Equipment (COE) Working Group requested the Secretariat to conduct a study on C-UAS. The working group recommended that study should include sensors, effectors, and the Command and Control (C2) system. The Member States requested the study takes into consideration the UN Peacekeeping intelligence policy and the UN Intelligence, Surveillance and Reconnaissance (ISR) manual.

The issue paper on C-UAS equipment was presented by Denmark during COE Working Group 2023. Based on the issue paper, COE Working Group requested the Secretariat to conduct a study on C-UAS and present it during the COE Working Group 2026.

3. DETAILED PROPOSAL

Introduction

The proliferation of UAS, particularly Class I (micro, mini and small categories) UAS, among hostile elements has increased due to several factors, including advancements in technology, reduced costs, and weak regulatory oversight. This growing accessibility poses significant risks in conflict zones worldwide, including threats to UN peacekeeping missions. Hostile elements utilize UAS for intelligence gathering, direct attacks, indirect attacks, smuggling, disruption of air operations, propaganda, etc. Such of these threats have been demonstrated against various UN missions, including MINUSMA in Mali and MONUSCO in the Democratic Republic of the Congo (DRC). This emerging challenge necessitates the development of counter-UAS capabilities to effectively mitigate the rising threat posed by potential hostile kinetic and non-kinetic Class I (micro/ mini/ small) UAS against UN missions.

C-UAS System

A C-UAS system is set of technologies, strategies, and measures designed to detect, track, identify, mitigate and report threat posed by unauthorized or potential hostile UAS.

Components of C-UAS System

To effectively counter the evolving threats posed by UAS, a C-UAS system consist of multiple components that provide a comprehensive defence mechanism. These components work together to detect, track, identify, and mitigate UAS threats. A C-UAS system consists of following three major components: -

- **Detection and Tracking System:** The foundation of any effective C-UAS system is its ability to detect and provide early warning of potential UAS threats. Detection systems can operate across multiple spectrums to enhance accuracy and reduce false alarms. Once a UAS is detected, accurate tracking and identification of unauthorized or hostile UAS are essential to determine intent and select an appropriate response. The detection system may consist of one or multiple following sensors: -
 - **Radar Systems:** They provide wide-area surveillance and track aerial objects based on size, shape, composition, speed, and trajectory. Specialized low-RCS (Radar Cross Section) radars are needed to detect Class I UAS. Radar Systems are not dependent on active emissions by UAS or operator ground stations and are suited to detect autonomous systems. Automatic Target Recognition (ATR) capabilities, such as micro-doppler signature and speed/ trajectory analysis, could be used for better

- identification, avoiding false alarms.
- **Radio Frequency (RF) Sensors:** The RF sensors detect and analyse UAS communication signals, allowing for passive monitoring of UAS activity. RF sensors help locate both the UAS and its operator if there are active emissions in the monitored spectrum by the UAS or the operator ground stations.
- **Acoustic Sensors:** They identify UAS threats by recognizing their unique sound signatures and are particularly useful in urban or cluttered environments although very short ranged and with low track accuracy.
- **Electro-Optical (EO) and Infrared (IR) Cameras:** They provide visual and thermal imagery for detection and identification. The image intensification devices are useful during night and thermal imaging devices are also useful in low-light conditions. However, both are affected by bad weather conditions like rain, snow or fog.
- **Command & Control (C2) System:** A centralized C2 system is required to integrate data from detection and tracking components, enabling operators to make informed decisions. The C2 system have following features: -
 - **Situational Awareness Dashboard:** A real-time interface providing mission personnel with a consolidated view of aerial threats.
 - **Threat Assessment:** Automated risk assessment tools to prioritize responses based on UAS type, behaviour, and proximity.
 - **Interoperability with Mission Networks:** Ensures smooth coordination with UN aviation, security forces, and host country authorities.
- **Mitigation Mechanism:** Once a threat is confirmed, countermeasures must be employed in accordance with operational requirements and rules of engagement. These measures fall into two categories:
 - **Soft-Kill (Non-Kinetic) C-UAS Measures:** Soft-kill C-UAS measures are non-kinetic methods used to neutralize hostile UAS without physically destroying them. These methods include (but are not limited to) RF jamming, GNSS spoofing, and cyber takeover techniques.
 - **RF Jamming:** It disrupts communication between the UAS and its operator, forcing the UAS to land or return home. This technique does not work if there is no RF link.
 - **Global Navigation Satellite System (GNSS) Jamming:** The GNSS jammers blocks satellite navigation signals and prevents UAS from following pre-programmed routes or maintaining stable flight. It causes UAS to drift, lose control or crash. This technique is mitigated by alternative navigation systems.
 - **GNSS Spoofing:** It sends false satellite signals to mislead the UAS's navigation system. It can redirect the UAS away from a protected area or make it land in a controlled location. This technique is also mitigated by alternative navigation systems.
 - **Cyber Takeover:** A sophisticated technique which exploits software vulnerabilities to gain control of the UAS. It allows to take command of the UAS, land it safely, or redirect it. This technique is only effective against commercial UAS with known communication protocols.
 - **Hard-Kill (Kinetic) C-UAS Measures:** Hard-kill C-UAS measures are kinetic methods used to physically destroy or disable hostile UAS. These methods include (but are not limited to) use of directed energy, kinetic interceptors, and high-power microwave techniques.: -
 - **Directed Energy Weapons (DEW):** These systems employ high-power microwave or laser systems to damage UAS structure and/or electronics.
 - **Projectile-Based Systems:** This system employs anti-aircraft missiles, rapid-firing guns, or autonomous turret systems to destroy UAS.
 - **Net-Based Capture Systems:** These systems deploy a net from a ground launcher or another UAS to physically entangle the hostile UAS. It allows for safe recovery and forensic analysis. It is useful in urban environments where explosives or projectiles pose risks.
 - **Interceptor UAS:** These are specialized UAS equipped with nets, ramming mechanisms, or explosives to neutralize hostile UAS mid-air. It offers high manoeuvrability and low collateral damage and is useful in scenarios requiring precision is critical.

C-UAS System Requirements

The required capabilities of C-UAS system and its components include: -

- **The System**
 - The system can have one of the following configurations incorporating soft-kill and/or hard-kill measures: -

- Handheld/ Manpack
- Mobile
- Fixed
- The system should preferably allow integration with existing UN Integrated Camp Security and Early Warning Systems (ICSEW), if already deployed.
- **Detection and Tracking System**
 - The system should be able to detect and identify UAS at minimum ranges given below with 360 degrees coverage under all weather conditions: -

System Configuration	Minimum Detection Range	Minimum Identification Range
Handheld/ Manpack	100 meters	50 meters
Mobile	500 meters	300 meters
Fixed	1000 meters	500 meters

 - The system should preferably be able to identify and differentiate between friendly and unauthorized or hostile UAS.
 - The system should be able to detect and identify whether UAS is carrying payload or otherwise.
 - After successful detection and identification, system should be able to track the UAS in real time to determine the intent.
 - The system should be upgradable to incorporate the latest library of UAS signatures and profiles.
- **C2 System**
 - The C2 system should provide real-time graphical situational awareness dashboard of the UAS environment over and close to the UN camp.
 - The system should be able to provide early warning on detection of a UAS.
 - The system should allow manual and automatic control of detection and tracking system.
 - The C2 system should be able to analyse the threat in real time and suggest prioritized mitigation measures to the operator.
 - The system should allow manual and automatic control of mitigation measures (soft-kill and hard-kill).
 - The system should allow periodic software and firmware updates.
 - The system should be scalable to allow integration of additional sensors and mitigation measures.
- **Mitigation Mechanism**
 - The system should ensure a minimal latency (time between threat identification and mitigation action) to enable timely and effective response.
 - The system should allow simultaneous tracking and neutralization of multiple UAS within a short time interval.
 - The systems shall not interfere with normal aviation operations unless the threat is deemed sufficient to warrant a temporary seizure of normal aviation operations.
 - The system shall operate effectively in a high intensity, cluttered and dense EM environment while ensuring non-interference with frequencies widely used by host nation such as communication networks, mobile phones, television, and navigation aids.
 - The systems should enable UN and UN member-state owned RF equipment to operate while the system selectively targets hostile or suspicious UAS.
 - The soft-kill system should allow employment of one or more non-kinetic methods to mitigate the threat posed by unauthorized or hostile UAS.
 - The hard-kill system should preferably mitigate the threat of unauthorized or hostile UAS by means other than destructive force to avoid collateral damage.

4. FINANCIAL IMPLICATIONS

The reimbursement rate for different configurations of C-UAS equipment are annexed. The cost to United Nations will depend on the operational requirements.

The table at the annex presents a structured financial framework for nine configurations of Counter UAS, categorized by deployment type (handheld/ manpack, mobile and fixed) and counter measure mechanism (soft-kill, hard-kill and

hybrid - soft & hard-kill). These figures are based on military-grade benchmarks and realistic market assumptions. Generic fair market value reflects expected procurement costs derived through market research, including analysis of comparable commercial and military-grade systems. Estimated useful life is set at 7 years for handheld, 10 years for mobile, and 12 years for fixed systems, corresponding to their durability and technological longevity. A uniform annual maintenance rate of 5% has been applied, while non-fault incident rates are tiered by system type i.e. 0.4% for handheld, 0.3% for mobile, and 0.2% for fixed systems reflecting differing operational complexities. The monthly dry/ wet lease rates have been worked out based on the guideline given in the COE Manual.

5. PROPOSED 2026 COE MANUAL TEXT

The annexed table is recommended to be included in Chapter 8, Annex A. Add text in bold.

Annex A

Reimbursement rates for major equipment under a wet lease or dry lease arrangement

(United States dollars)

<i>Category of equipment</i>	<i>Type of equipment</i>	<i>Generic fair market value</i>	<i>Estimated useful life in years</i>	<i>Maintenance rate</i>	<i>Monthly dry lease rate</i>	<i>Monthly wet lease rate</i>	<i>No-fault incident rate (percentage)</i>	<i>Monthly non-United Nations POL</i>	<i>Painting rate</i>	<i>Repainting rate</i>
Counter Unmanned Aerial System Equipment	Handheld/ manpack soft-kill	40 000	7	166.67	489.52	656.19	0.4			
	Handheld/ manpack hard-kill	85 000	7	354.17	1 040.24	1 394.41	0.4			
	Handheld/ manpack soft and hard-kill	110 000	7	458.33	1 346.19	1 804.52	0.4			
	Mobile soft-kill	350 000	10	1 458.33	3 004.17	4 462.5	0.3			
	Mobile hard-kill	650 000	10	2 708.33	5 579.17	8 287.5	0.3			
	Mobile soft and hard-kill	850 000	10	3 541.67	7 295.83	10 837.5	0.3			
	Fixed soft-kill	750 000	12	3 125	5 333.33	8 458.33	0.2			
	Fixed hard-kill	1 000 000	12	4 166.67	7 111.11	11 277.78	0.2			
	Fixed soft and hard-kill	1 500 000	12	6 250	10 666.67	16 916.67	0.2			