DENMARK

COUNTER DRONE EQUIPMENT

1. ISSUE PAPER THEME: Major Equipment

2. SUMMARY / BACKGROUND

The threat to UN units from drones is increasing, and Denmark therefore proposes the implementation of Counter Drone Equipment against Class I unmanned aircraft systems.

3. DETAILED PROPOSAL

Introduction
A counter drone system serves to detect and in its ultimate configuration to defeat a drone perceived to be a threat.
With system is understood a combination of sub-systems that in an integrated manner is capable of carrying out the counter drone task, and thus protect UN personnel and facilities.
A drone is in other places described as an unmanned aircraft system (UAS) or unmanned aircraft vehicle (UAV) – an unmanned flying object, that is either remotely controlled (active control via live communication), or travels along a pre-planned route (no active control, and no communication).
In this document the described counter drone system is meant to counter Class I drones as defined in the 2020 UN COE Manual A-75-121, section 26 (a).
Counter drone system description
An integrated or complete counter drone system consists of three main elements: Sensor(s), a Command & Control platform (C2) and effectors.
The sensors serve to detect drones, classify an object as a drone, identify the type of drone, and even identify the drone as being weaponized and thus a confirmed/identified threat. Sensors can be of various types, that can be alone and in combination, e.g.:

- Electro-optical sensors (daylight, IR, Thermal, used for electro-optical scanning of "the sky" or for visual identification of drone type and/or payload).
- Radio Frequency Scanners (passive sensors searching for the communication between a drone and its operator).
- Radars (actively scanning/transmitting system detecting the drone independently of control communication).

The C2 system integrates the sensors with the effectors and enables the operators to perform drone wise air space surveillance, to control the sensors, potentially warn the protected area, cue or even operate the effectors.
The effectors are both non-kinetic or kinetic – and a counter drone system may have one or more effectors complimenting each other;

- Jammers that block the communication between the operator and the drone, and makes it land or return to its place of origin.
- Gun systems, that defeats the drone through projectile impact, air burst fragment impact or similar kinetic effects.

- High-energy laser systems that either blinds the camera on the drone used by the operator for navigation or destroys the drone through laser burning.
- High-energy power weapons the through e.g., high effect microwave energy destroys the electrical components making at crash land.
- "Drone catcher drones" that are cued to hunt the hostile drone, and capture it with nets, webs or similar.
- Net guns, that at close ranges fires a net or similar capturing the drone and drags it to the ground.

Counter drone system requirements

The counter drone system's obligatory and desired capabilities are described below:

System

- The overall system must be able to be installed in fixed installations. The fixed installed system may require infrastructure to be constructed prior to its installation.
- The overall system may be deployable installed on vehicles, in containers or similar. The deployable system must not require actual infrastructure to be constructed prior to it deployment.

Sensors

- The sensors must be able to detect drones of all types (i.e., multirotor, flying wing, single rotor, micro, mini and small).
- The sensors must be able to classify whether a flying object is a drone and thus separate the drones from other types of flying objects.
- The sensors may be able to identify the type of drone that is detected.
- The sensors may be able to positively identify whether a detected and classified drone is posing a direct threat (e.g., by carrying an explosive payload).
- The sensors must be able to detect a mini drone (controlled and uncontrolled) at a range of 5km, and at an altitude of up to 1500 feet.
- The sensors must be able to classify a detected mini drone as a drone at a range of 4km, and at an altitude of up to 1500 feet.
- The sensors may be able to detect a small drone (controlled and uncontrolled) at a range of 10km, and at an altitude of up to 5000 feet.
- The sensors must be able to classify a detected small drone as a drone at a range of 8km, and at an altitude of up to 1500 feet.
- The sensors may be able positively identify an explosive payload at a range of 1km, and at an altitude of 1000 feet.

C2

- The C2 must be able to provide a graphical user interphase depicting a real time air picture of the protected area and its surroundings.
- The C2 may be able to warn upon detection of incoming drones.
- The C2 may be able to cue effectors to counter incoming drones.
- The C2 may be able to operate the sensors
- The C2 may be able to operate the effectors
- The C2 may be able to use automated / rule-based functionalities to help the operator to prioritize drone threats for countering efforts, issue warnings, etc.
- The system must interact with the other system components through the use of the ASTERIX protocol.

- The C2 system may have an open architecture enabling integration with new/other sensors and/or effectors.

Effectors

- The system must be able to counter a drone threat through one or more of the effects described below. The described effects are listed in escalatory order, from least destructive to most destructive – the last and kinetic/high-energy destruction of the drone is the only one where the protected area is fully secured from the effect of a weaponized drone:
    - Mitigation/warning; when a drone is classified as a threat warn the protected area and its inhabitants through e.g., acoustic means to enable to take cover.
    - Neutralize; when a drone is classified as a threat through the use of a non-kinetic effector render the drone in-operable making it land or return to its operator.
    - Defeat; when a drone is classified as a threat, destroy the target through the use of a kinetic effector, high energy weapon or similar.

4. PROPOSED MANUAL TEXT

TBD