

# **Fortem Technologies**

## **DroneHunter Counter-sUAS Solution**

### **Company Overview**

Fortem Technologies is a small business that designs and manufactures COTS equipment for DoD and commercial applications. The company formed in April 2016 and has grown significantly over the past 2 years. Fortem Technologies is participating on multiple DoD related projects for C-UAS initiatives. Our core technology is based on advanced radars that offers ultra-small, lightweight, low-power and low-cost solutions for air-to-air and ground-to-air applications. The company is offering end-use solutions and/or services based on the advanced radar and related software development to enable C-UAS solutions.

### **Solution Overview**

Fortem Technologies is pleased to provide a response to the Border Security Technology Consortium – BSTC requirement. Our goal is to offer a viable solution for Border Security challenges.

This white paper includes technical details of the DroneHunter, a solution in development at Fortem Technologies that provides Counter Unmanned Aerial System Capabilities (C-UAS), enabling Border Control to detect, identify, and defeat Group I-III UAS. Fortem Technologies' DroneHunter consists of a UAV, Pixhawk Autopilot, GPS navigation system, DAA-R20 radar, dual shot net gun, and ground monitoring station.

A notification of a sUAS threat can come from any source, human intelligence, ground-based radar, and E/O sensors. Upon notification, the DroneHunter is cued to the approximate location of the threat, takes flight towards the threat, and the on-board tracking radar is used to guide the UAV close enough to the threat sUAS to fire the hard-kill projectile. The automated capture and defeat of a sUAS threat builds on the threat detection and threat identification technical objectives. A tracking algorithm has been implemented for real time on board detect and track to follow and defeat sUAS threats.

To capture rogue sUAS, the DroneHunter's radar seeker continuously detects and tracks the target sUAS while guiding the DroneHunter, then the radar seeker holds an optimum distance from the target sUAS so the designated net capture can be successfully activated (autonomous). Two fire options are possible: a fully automatic fire, based on target lock, and or, a first-person camera view that allows a human to see the target sUAS and make the decision to fire. Once the target is captured by the net, it can either be dropped with a parachute or physically hauled by tether to a known safe location.

The DroneHunter is built for short duration and high speed flights, enabling rapid overtake of the sUAS target. A 2 shot net (with a range of up to 30 ft.) is mounted on the underside of the DroneHunter and the tracking radar seeker is mounted on the front of the DroneHunter. The system can operate on an unclassified network and does not have a long lead clearance requirement.

The radar requires a temporary spectrum license to operate at 15 GHz and the DroneHunter requires a licensed UAS pilot for demonstrations.

## **Subsystems Introduction**

The DroneHunter Ground Station can integrate a long-range radar into the solution for a complete monitoring and remediation capability. The solution can be deployed in diverse environments for long periods within an environmentally protected charging station for long term continuous 24/7 monitoring. The DroneHunter can operate autonomously or with other sensors, wireless communication links, and network via cloud-based IP server to provide a remote human interface offering situational awareness. The R20 radar seeker consists of phased array antennas with digital beam scanning, RF transmitter and receiver, including digital control boards for processing raw data and providing detects. Software algorithms enable details regarding detects and tracks with location, trajectory and velocity. Machine learning Neural networks are used to autonomously classify objects.

## **Mitigation**

The Aerial Netting System is a high-powered net launcher able to effectively hit a target up to 30 feet away and designed to minimize recoil so that negative effects to flight are minimized on the DroneHunter airframe carrying the system. The complete aerial netting system currently is comprised of a UAV equipped with an FPV camera, and a net-firing gun. The system is autonomously launched when a sUAS threat target has been identified, and then is flown to intercept the target. When the DroneHunter has reached the threat target, it fires a net upon the sUAS target when commanded by the radar or system operator. Once the target has been “netted”, it can either release the net with the neutralized target ensnared (utilizes a small drag chute to slow the fall of the neutralized target), or keep the net tethered to the system for relocating the net and neutralized target to a desired location before releasing them to the ground.

## **CONOPS**

Rapid reaction time to a UAS threat is of the essence. Fast reaction translates into reduced notification time, availing shorter range and more cost-effective solutions. Multiple sUAS threat detection or defeat systems are coordinated by the DroneHunter Ground Station, which records threats, issues defeat and capture commands, and provides a map based configuration and monitoring of the overall sUAS threat management system.