Holographic Radar – New Technology for Drone Detection

FEBRUARY 2019

DR DOMINIC WALKER
CEO, AVEILLANT

www.aveillant.com
Aveillant - Background

- Founded Oct-11, a spin out from Cambridge Consultants Limited (CCL)
- Core technology – configurable and scalable 3D staring radar – the Holographic Radar Platform
- Initial application – wind farm mitigation
- Refocussed in 2016 – detection and tracking of small UAS – Drones
- Acquisition by Thales November 2017
Holographic Radar Platform

3D Airport Primary Radar

3D Infill Radar

3D Drone Detection (strategic asset protection)
Holographic Radar Configurations

- Theia 16 (infill): 2kW, 64 channel, 1TF
- Gamekeeper C-UAS radar: 2kW, 64 channel, 1TF
- Theia 384 (PSR): 40kW, 1536 channels, 12TF
HR for Drone Detection
Key Application – Small Drone Detection

Typical size of target

Radar Cross Section (m²)

100 40 8 1

LARGE AIRLINER MEDIUM AIRLINER LIGHT AIRCRAFT PERSON LARGE BIRD LARGE INSECT
The Gamekeeper Radar

- Detection of 0.01m² target to 5km
- Full 3D location and tracking
- 90° sector coverage
- No moving parts
- Continuous staring at all targets, all the time
The Gamekeeper Radar
Target analysis: Drones, birds and micro-motion

- Standard Gamekeeper 16U tracks drones ~0.01m$^2$ at 5km
- Sensitivity sufficient for drones is sufficient for many bird species
- Differences may be detected in micro-motion signature
- Drones have propellers or rotors
- Birds flex and use reciprocating wings
- Doppler returns from different targets can be used for drone/bird discrimination

Birds have similar radar cross section to small drones
Target analysis: Drones, birds and micro-motion

Doppler signature from drone

- Propeller
- Airframe

Time axis at constant range
Target analysis: Drones, birds and micro-motion

Doppler signature of 2 birds in flight
Machine Learning Classification Algorithm

Without classification filter

With Machine Learning Classification
Summary

- HR technology looks over an entire volume of space, all the time.
- This allows characterisation of a target in a different way than traditional scanning radar.
- Aveillant’s embodiment of Holographic radar is flexible and scalable for different applications.
- Sensitivity to small drones at relatively long range.
- Ability to characterise the drone, differentiate from other targets.
- Ongoing developments – extended range, artificial intelligence classification.
Thank you