Defence-related Research Action - DEFRA

ACRONYM: RAVN

Title: Rapid Aerial Vehicle Neutralisation

Duration of the project: 01/12/2025 - 01/03/2029

Key words: C-UAS swarm NoRA radar interception mothership microdrone vision UWB mesh

Budget: 2 677 000 €

of which RHID contribution: 1 999 000 €

PROJECT DESCRIPTION

Project Description

The RAVN project tackles the rapidly growing threat posed by small unmanned aerial systems (sUAS), including fast-moving swarms capable of overwhelming traditional defensive layers. In many cases—and especially in a small, densely populated country like Belgium—a hostile swarm may reach critical infrastructure in minutes, leaving little time for reaction. RAVN addresses this challenge by deploying a multi-layered, autonomous C-UAS architecture capable of operating far ahead of the defended asset as well as directly above sensitive infrastructure. Five core technologies—non-rotating AESA radar, airborne computer vision, UWB mesh networking, intelligent mothership drones, and interceptor micro-drones—combine into a unified defensive ecosystem that can intercept threats both early and close-in.

General Objectives

The project aims to deliver a modular, scalable kill chain in which each partner contributes a key technological pillar:

- Long-range detection by Intersoft's Non-Rotating Array (NoRA) AESA radar, enabling rapid 360° search and continuous tracking even of low-RCS drones at distances far beyond current systems.
- High-fidelity identification through computer-vision-based refinement and radar–EO fusion developed by RMA and Sol.One.
- GNSS-independent positioning and resilient communication through Agilica's UWB mesh networking knowhow, ensuring robust operation in heavily jammed environments.
- Autonomous mothership drones by Sol.One, acting as intelligent airborne coordinators capable of operating both far from and directly above critical infrastructure.
- Interceptor micro-drones, developed by Sol.One with Agilica and RMA technologies, able to execute precise collision-based neutralisation using visual-inertial-UWB guidance.

Methodology

The RAVN system is developed through a layered methodology that integrates long-range sensing, airborne refinement, autonomous coordination, and precise interception. The process begins with Intersoft's NoRA AESA radar, which provides wide-area 360° surveillance and continuous tracking of low-RCS drones. These radar cues feed into Sol.One's ground control station, which predicts trajectories and dispatches autonomous mothership drones toward the threat corridor or directly above critical infrastructure when required.

Upon arrival in the engagement zone, the mothership becomes the airborne coordinator. Using EO sensing and advanced radar–vision fusion algorithms developed by RMA with Sol.One, the mothership refines the initial radar detections, improves classification confidence, and continuously updates the threat picture. This close-range airborne refinement enables early interception far away from the asset as well as accurate last-moment engagement if a swarm is over critical infrastructure.

When neutralisation is required, the mothership deploys multiple micro-interceptor drones. These micro-drones use visual–inertial tracking complemented by Agilica's UWB mesh technology for robust relative positioning with respect to the mothership and within their own swarm. This enables precise guidance even in severely jammed or communication-denied environments. Each micro-drone autonomously homes in on its assigned target and performs collision-based neutralisation, with the mothership monitoring engagements and deploying additional interceptors if necessary.

Throughout the project, extensive simulation and field trials will validate the full kill chain—early detection, airborne refinement, cooperative coordination, and autonomous interception—ensuring robustness, modularity, and interoperability with NATO-aligned defence architectures.

Potential Impact on Defence

RAVN significantly enhances national and allied defence capabilities by extending detection and interception far beyond current ranges while also enabling dependable over-infrastructure protection. In light of recent incidents involving drones over Belgian airports and military facilities — which illustrate how quickly a hostile UAS can threaten critical airspace or sensitive sites — this system offers a timely and robust defence response. By providing earlier warning, resilience in GNSS-denied environments, and the ability to counter large or fragmented drone swarms, RAVN improves the security of both civilian and military infrastructure. Its modular, interoperable architecture supports layered air-defence concepts, enhances protection of critical national assets, and helps ensure rapid, sovereign response to emerging aerial threats.

Expected Final Results and Valorisation

The project will deliver a system prototype demonstrated in a relevant operational environment, showcasing the full RAVN kill chain: long-range multi-sensor detection, airborne refinement, autonomous mothership coordination, and micro-drone interception. The results will include validated sensor-fusion models, an operational scenario supported by field-tested prototypes, and software modules for tracking, classification, decision-making, and collision-based neutralisation, as well as scientific publications and technical reports.

Sol.One, as UAV OEM and system integrator, will lead the industrialisation trajectory needed to bring the kill chain to market, while partners continue advancing radar, UWB, and sensor-fusion components. Short- and medium-term valorisation includes Defence demonstrations, contributions to capability development roadmaps, alignment with upcoming NATO and EU C-UAS initiatives, and publication of research outcomes.

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https://www.sol.one/defra/RAVN