

CASE STUDY: Taking fixed wing UAVs to new heights

At [Steatite](#), we love to see how our technology is employed by our customers to deliver innovation and efficiency so when UAVE approached us about communications for their pioneering Prion Mk3 drone, we were delighted to be heavily involved in designing and testing a reliable, robust and secure networking solution with them.

[UAVE](#) first developed the Prion Mk3 in 2008 and the aircraft conducted its first commercial survey for mineral exploration purposes in 2011. In 2017, the platform was adapted to support client intelligence, surveillance and reconnaissance (ISR) applications, providing tactical surveillance for day and night operations.

Welsh-based UAVE has now created a full cycle business comprising design, manufacturing, servicing, pilot training and surveying using Prion Mk3.

The payload for the Prion Mk3 was supplied by another a British company, [CRFS](#), specialising in design, build, and deployment of systems and solutions for RF spectrum monitoring, management and geolocation. With customers in both the defence and civilian regulatory sectors, CRFS are experts in COTS boards and modules for OEM and integrator partners for SWAP constrained, mission critical, deployed defence and aerospace platforms.



[Caption] Prion Mk3 with CRFS SIGINT receiver prior to installation

The Challenge

UAVE needed to prove that their system had a consistently reliable communication network to connect air and ground assets for military and defence applications. The payload, provided by CRFS, included a Signals Intelligence (SIGINT) RF receiver, the RFeye Node. The RFeye Node collected data on signals of interest in the surrounding area and monitored rogue transmissions. These signals were then geolocated to identify the position of source. This data had to be available in real-time to ground control in order to avoid or neutralise threats.

Furthermore, all equipment had to be integrated into the fixed-wing drone in six weeks to meet the deadline required to demonstrate the platform at the Army Warfighting Experiment ([AWE](#)) – the British Army’s showcase for informing future military and defence force development decisions.

The Solution

In 2020, UAVE developed the Dragon D15 variant of the Prion Mk3. The D15 was built specifically for the MoD under the guidance of the Royal Artillery Trial and Development Unit (RATDU). As a versatile aerial utility vehicle, the D15 is equipped with a surveillance camera, telecommunication rebroadcast facility, signals intelligence monitor, a package delivery system and a new 12 litre fuel tank.

Steatite worked with CRFS and UAVE engineers to install our market-leading [Embedded Module](#) into the D15. The module encompasses Persistent Systems’ [MPU5 radio](#) which uses Wave Relay® to broadcast data to remote units and the ground station, enabling the most advanced, scalable and efficient Mobile Ad Hoc Networking (MANET) system in the world.



[Caption] Embedded Module aboard the UAV

With an onboard computer, the Embedded Module provides unmanned systems with minds of their own, able to run swarming algorithms and use the peer-to-peer Wave Relay® MANET for optimised coordination. Sensor data is processed at the source to transmit knowledge instead of just a raw data stream.

For this project, Steatite, CRFS and UAVE engineers rose to the time constraint challenge and succeeded in integrating the Embedded Module, camera and SIGINT payload in just 6 weeks.

In February 2021, at the AWE trials on Salisbury Plain, UAVE’s Dragon D15 launched successfully as an airborne node using Wave Relay® to scan for other signals in flight, and sent real-time information to ground control.

The deployment required a team of 3 experts to meet the CAA regulations for operating an unmanned platform and conduct these functions:

- Monitoring the computer at the ground station and read the incoming data
- Safety pilot who can take over control of the UAV if the autopilot functions fail
- Supervisor overseeing these two personnel



[Caption] RF signal data received from the Prion Mk3

Technical capability

COVID restrictions meant that there wasn't enough manpower on the ground to have additional MPU5 radios on this occasion, so only signal data was used for this trial. However, the UAV has the capability to broadcast image data to remote units and ground stations.



[Caption] Prion Mk3 and launcher

One of the ground-breaking features of the D15 is its ability to take off and land with no formal runway required. Therefore, it's deployment is not limited to location by the need for an airfield or runway. Only a flat area approximately the size of a football pitch is needed, and the drone can fit in a transit van to be launched remotely. This makes the UAV an extremely flexible and readily-available resource for military and civilian applications.

UAVE's current UK airspace permissions enable Beyond Visual Line Of Sight (BVLOS) flights out to 90km and up to a 10,000ft ceiling, at which height it can't be seen or heard. The composite body means it has no radar signature making it a covert asset.

UAVE's Grahame Grover commented that "the success of this project can be greatly attributed to the technical skills of the teams from UAVE, CRFS and Steatite, who were able to work together seamlessly to deliver additional benefits to the flight capability of the D15."

Seb Leaver from Steatite explained the advantages of using the MPU5 for this application: "The MPU5 is unique in the robustness of the network it offers in RF restricted environments. Because it's able to self-form and self-heal, the MPU5 routes your data around obstacles by using multi-path propagation, maximising network performance, agility and mobility. At the same time, its low SWaP ratio means that the unit is lightweight and compact."

Want to know more? UAVE have comprehensive footage of their outstanding Prion Mk3 drones on their [YouTube channel](#), and you can read more about the market-leading Embedded Module on our website.



www.uave.co.uk



www.crfs.com



www.steatite.co.uk