RAJANT

CASE STUDY

A2D Geoscan uses **Rajant Kinetic Mesh®** to Enable Swarm Functionality on its Helicopter UAV Range

Unmanned Aerial Vehicles (UAVs) have undergone a remarkable transformation in the past five years. Marked by rapid advancements in technology and expanding applications across multiple market verticals, UAVs are positioned as essential to providing insights into an array of operational functions. New uses in precision agriculture and tactical surveillance have shown that UAVs are not just a tool for aerial photography anymore but have become integral to innovation solutions among various industries, mainly due to the expanded payload of multispectral cameras and sensors. This advancing evolution is fueled by wireless communication, AI, and robotics breakthroughs, leading to more autonomous, efficient, and versatile UAV systems.

The Challenge

A2G Geoscan's Helicopter UAV concept distinguishes itself in this competitive drone industry through its innovative design and capabilities. Unlike the more common multi-rotor airframes, its use of a helicopter-style design offers enhanced stability and maneuverability. These are crucial for complex aerial tasks. The integration of liquid fuel engines is a game-changer, significantly extending flight times and enabling a much larger payload capacity. This unique combination of a helicopter airframe and liquid fuel propulsion positions A2G Geoscan's UAV as a versatile and powerful solution for a range of applications. These include detailed geographic surveys to extended aerial monitoring missions, setting them apart in a field dominated by electric-powered, multi-rotor drones. The issue is that commonly used wireless systems for controlling UAVs need more advanced peer-to-peer communication capabilities.

Partners

- **A2D Geoscan** - A South African based UAV services and development company.
- **Rajant** - Pioneers of peer-to-peer radio communications enabling real-time voice, video, and data to connect machines, robots, and people everywhere as part of a secure, private, fully mobile network.

Kinetic Mesh Components

- Cardinal AG1-5250 BreadCrumb®

Typical Applications

- The credit card-sized **Cardinal BreadCrumb** enables **A2D Geoscan's Helicopter UAVs** to work in swarm formation for tactical or survey applications

Outcome/Income Statistics

- The credit card-sized **Cardinal BreadCrumb** enables **A2D Geoscan's Helicopter UAVs** to work in swarm formation for tactical or survey applications

The Solution

For tactical or larger scale swarm functionality, Rajant wireless radios overcome the issues associated with other wireless UAV controlling systems. Other inferior systems typically focus on pure point-to-point (controller-to-UAV) communication. Rajant does not. It is also important to mention most large-scale UAV swarm demonstrations use pre-programmed timing and flight paths to accomplish synchronized flight.

Enabling real-time UAV swarming coordination requires a robust, flexible, all-to-all connected wireless system designed to support direct UAV-to-UAV communication. Further, the limited weight and power payload considerations of UAVs must be taken into account. Rajant offers a solution for both.

Launched in 2023, Rajant's Cardinal AG1-5250 BreadCrumb wireless module brings Kinetic Mesh capability to highly integrated applications like drones and robotics where space, weight, and power consumption are at a premium. With a compact footprint, no larger than a business card, the Cardinal's small form factor has quickly become popular with integrators and manufacturers of robotic and drone platforms. With a CPU capable of handling up to 160Mbps of usable TCP throughput, the Cardinal module provides reliable wireless capacity to enable innovative applications like video, telemetry, and swarm coordination.

Using a Cardinal combined with low-profile multi-band antennas, A2D Geoscan deployed the system on their Shrike Helicopter UAVs and connected it to the onboard systems. Given that Rajant BreadCrumbs provides applications with a manageable Layer 2 network, an essential factor of the integration and connection of the Rajant Cardinal is that it was achieved simply by making an Ethernet connection to the onboard systems.

The Results

Multiple tests were performed and factors like distance, usable capacity, and linear meshing were tested. During testing no pre-programmed timing and flight paths where used, all the navigation functionality was relayed by the wireless mesh between UAV's and back to the control point in real-time.

> "Dissatisfied with the existing market offerings, our team at A2D set out to develop our range of Helicopter-style UAVs, driven by our innovative spirit to challenge and transform the status quo. Seeing the Rajant technology performing exactly as promised, connecting all our devices in real-time opens up a number of flexible deployment capabilities we could not previously have addressed."
>
> **— Stefan Timmerman**
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> Owner and Founder – A2D Geoscan

> "Seeing ourselves as subject matter experts in the field of disruptive technology, we saw a reflection of our own pioneering essence in the development of A2D's Helicopter UAVs – a kindred spirit of ingenuity. It's truly gratifying to see true Kinetic Mesh capability proven in this creative way."
>
> **— Karel Venter**
>
> Rajant Sales Engineering Director EMEA

At shorter ranges (sub 300m), actual TCP throughput was observed between 60 and 130Mbps. After optimizing the video encoding, successful tests of up to 1Km was achieved. Importantly, this distance was accomplished with relatively low gain Rajant standard ≤6dBi antennas.

The most impressive demonstration of the Kinetic Mesh concept was the testing of tactical swarming, without a pre-programmed route, as well as linear meshing where multiple UAVs were used to extend wireless connectivity range which can also be used for non-line-of-sight communication.

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