

CASE STUDY

CAMERA POINTING

Octopus ISR Delivers Precision Geo-Lock

INTRODUCTION

Octopus ISR Systems is a division of UAV Factory Ltd. that specialises in the design and development of miniature gyro-stabilized gimbals. The Octopus Epsilon 140 is a rugged and lightweight stabilized dual-sensor UAV gimbal used for long-range intelligence, surveillance and reconnaissance (ISR) applications. It features an industry leading 30x (1.3° vertical field of view) usable optical zoom with onboard image processing and target tracking.

The Epsilon 140 features Precision Geo-Lock, a geo-location capability that allows the customer to provide the gimbal controller with a latitude, longitude and altitude and have the payload (camera, laser, and or other device) point at the location regardless of the platform motion. For example, as an aircraft circles the camera will remain trained on a specific location or could be retargeted with new coordinates regardless of the aircraft attitude or position.

Due to the small form factor of miniature UAV gimbals the standard industry approach is to use the attitude and position data from the aircraft autopilot system for gimbal geo-pointing. This approach requires precise installation and calibration of the combined system to ensure there is no misalignment between gimbal and autopilot measurement axes. Integrators must also develop custom cabling, communication interfaces, and software in order to support the wide range of autopilot systems operating on varying UAVs. One of the key features of the Epsilon 140 is that it is a plug and play solution, only requiring the customer to provide power, a serial connection for control and optional network connection for the video feed.

CHALLENGES

Given the narrow 1.3° field of view of the Epsilon 140 camera and in order to provide customers with a completely plug and play solution, Octopus engineers needed to break from industry standard practice and find a creative new solution for onboard attitude and position data. The 1.3° field of view required that the onboard inertial measurement solution be capable of providing a dynamic heading accuracy better than 0.5° and a pitch/roll accuracy of less than 0.1°. These accuracies would ensure that the geographical coordinates of the target location would remain within the image frame of the camera.

COMPANY PROFILE



Octopus ISR Systems, a subsidiary of UAV Factory Ltd., was created in 2016 to provide NON-ITAR controlled, cutting-edge gimbal solutions to both manned and unmanned industries. UAV Factory is among the world's leading developers and manufacturers of fixed wing composite small unmanned aircraft and subsystems for the 55 lbs. and under class UAS.

APPLICATION

Camera Pointing

VECTORNAV PRODUCT

VN-200 GPS-Aided Inertial Navigation System

OCTOPUS ISR SYSTEMS PRODUCT

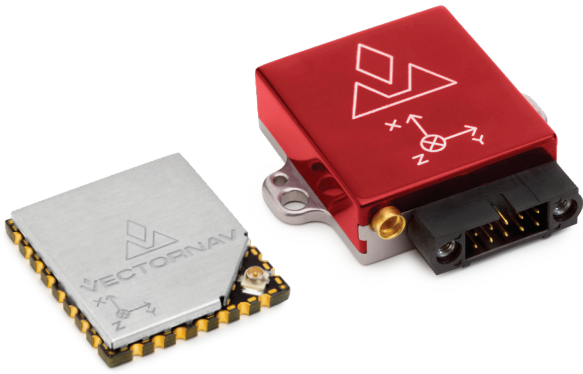
Epsilon 140z Gyro Stabilized Gimbal



Octopus ISR Systems' Epsilon 140z Gyro-Stabilized Gimbal



VN-200 GPS-Aided INS



KEY SPECIFICATIONS

NAVIGATION & IMU

Heading (INS)	0.3 ° RMS
Pitch/Roll (Dynamic)	0.1 ° RMS
Accelerometer Range	±16 g
Gyroscope Range	±2000 °/s
Gyro In-Run Bias Stability	5 °/hr typical
Max Output Rate	800 Hz

PHYSICAL & ELECTRICAL

Dimensions (Rugged)	36 x 33 x 9.5 mm
Dimensions (SMD)	24 x 22 x 3 mm
Weight (Rugged)	16 g
Weight (SMD)	4 g
Max Power Usage (Rugged)	500 mW
Max Power Usage (SMD)	445 mW

CHALLENGES (continued)

The wide range of customer UAV operating requirements and environmental conditions presented additional challenges to the Octopus team. An INS solution that could provide robust performance in high vibration environments, throughout dynamic maneuvers, and under varying thermal conditions was required. As with all UAVs, small size, low weight, and low power consumption (SWaP) were also critical to customer payload requirements. Finding a high-performance INS that could perform under such conditions but meet the SWaP requirements would be a challenging endeavor.

HOW VECTORNAV HELPED

After considering several solutions, Octopus engineers turned to the VectorNav VN-200 GPS/INS, which features high range 16 g accelerometers and 2000°/s gyros in a postage stamp sized Surface Mount Device (SMD) package. "VectorNav's VN-200 was the only product on the market that offered a high-level of performance and small enough form factor that it could be integrated directly into the optical bench of the gimbal" said Konstantins Popiks, CTO at UAV Factory. "When the product delivered that level of accuracy despite the high vibrations, accelerations and temperature fluctuations of our application, the choice was obvious."

VectorNav's VN-200 is available in both SMD and Rugged packages, which enabled Octopus to not only provide an integrated OEM solution but also a retrofit solution for existing in-market systems. Additionally, Octopus was able to benefit from the common footprint, pin compatibility and shared interface protocol of the Industrial Series to integrate the VN-300 Dual Antenna GNSS/INS with minimal changes to the system. The VN-300 enables highly accurate static heading estimation using GPS-Compassing.

ADDITIONAL RESOURCES

About Octopus ISR Systems:

www.octopus.uavfactory.com

About VectorNav Technologies:

www.vectornav.com

About the Epsilon 140z:

<http://octopus.uavfactory.com/uav-payloads-equipment/epsilon-140>

About the VN-200:

www.vectornav.com/products/vn-200

RESULTS, RETURN ON INVESTMENT AND FUTURE PLANS

The team at UAV Factory are pleased with the results, as Popiks explains: "Integration of the VN-200 was much quicker than expected, due in part to the excellent customer support and documentation provided by VectorNav. Our questions were sorted out quickly even though we're located on different continents. We also found that the price to performance ratio of the VectorNav products is very good, and we are integrating these sensors into our future products." Epsilon gyro-stabilized turrets will be available with both VectorNav's VN-200 single GPS-based INS solution, as well as the VN-300 dual GPS-based INS. A single GPS/INS solution is suitable for dynamic platforms such as manned and unmanned aircraft, while dual GPS/INS is a necessity for platforms with low dynamics, such as aerostats, ships and helicopters.

ABOUT VECTORNAV

VectorNav Technologies is a leading developer and manufacturer of high performance inertial navigation systems using the latest in MEMS sensor and GPS/GNSS technology. Since its founding in 2008, VectorNav has provided systems integrators in the Military, Aerospace, Marine, and Robotics industries with inertial navigation solutions with best-in-class price to performance ratios.

Contact us for product details and pricing

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