UAV SURVEY: A Q&A

***World Pipelines* interviews Aliaksei Sratsilatau, Founder and CEO, UAVOS about transforming UAV-based midstream, survey, and security operations.**

In energy and infrastructure, unmanned aerial systems (UAS) are rapidly becoming indispensable for inspection, monitoring, and security. Yet the effectiveness of a UAV is only as strong as the sensor payload it carries. For missions that demand clear visibility, accurate geolocation, and reliable performance in all conditions, a stabilised gimbal camera is not a luxury – it is mission-critical. In this Q&A, Aliaksei will give insight into UAV-based midstream, survey, and security operations.

What is the GOS-155 gimbal camera, and what specific gap or mission profile is it designed to fill when it comes to midstream applications?

The GOS 155D/T gimbal camera from UAVOS is a gyro-stabilised, two-axis electro-optical and infrared (EO/IR)

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payload designed primarily for intelligence, surveillance, and reconnaissance (ISR) missions.

Key features include:

- Dual sensors: a 30x optical zoom HD (RGB) camera plus a high-resolution LWIR thermal imager (1280 x 1024) – ideal for capturing precise day/night imagery.
- Compact SWaP design: lightweight (1.8 kg) and compact (approximately 157 mm in diameter), making it perfect for mid-sized VTOL and fixed-wing UAS platforms without compromising endurance.

Figure 1. UAVOS UVH 170: Enhancing wildfire response with unmanned aerial support.

Figure 2. UVH 170 delivers georeferenced insights with dual visible-light and thermal cameras.

Figure 3. UVH-170 conducts aerial imaging and multi-level magnetic surveys, delivering geodata for pipeline construction.

- Advanced capabilities: includes an embedded video processor with automatic stabilisation, video tracking, dry cartridge moisture protection, and integration with GPS/INS for real-time target localisation (accuracy approximately 5 m with UAVOS Ground Control Station).

In short, the GOS-155 is tailored for insightful midstream/UAS missions, offering real-time day/night imaging, GPS-aided tracking, and compact high performance – all while preserving platform endurance.

Why is a gimballed camera system important for UAV-based survey, surveillance, and rescue missions?

A gimballed camera system is a critical component for UAV-based survey and surveillance because it ensures stability, precision, and situational awareness under dynamic flight conditions. Here's why it matters:

Stabilised imaging

UAVs are constantly affected by vibration, wind, and sudden manoeuvres. A gimbal stabilises the payload, keeping the camera steady and ensuring clear, shake-free images and video. This is vital for reading small details (structural cracks, heat signatures) that would otherwise be blurred.

Flexible field of view

A gimballed system can pan, tilt, and rotate independently of the drone's flight path. This allows continuous tracking of a target without changing UAV trajectory – critical in surveillance, or inspections of linear assets like pipelines and power lines.

Day/night and multispectral capability

Many gimbals combine electro-optical (EO) and IR (infrared/thermal) sensors. This enables operators to conduct 24/7 operations: identifying overheating equipment in the night.

Georeferenced data and target tracking

Integrated GPS/INS in advanced gimbals allows real-time target localisation and precise geotagging of imagery.

Mission efficiency and safety

By enabling drones to gather accurate imagery from a safe altitude and distance, gimbals reduce risk to human teams. In security, it ensures covert, wide-area monitoring without exposing personnel.

What are the core technical specifications of the GOS-155: weight, size, and imaging capabilities?

Core technical specifications of the GOS-155D/T Gimbal Camera: The weight and size of the camera is approximately 1.8 kg. the dimensions of the camera are 157 mm in diameter and 200 mm in height.

It's imaging capabilities include a visible (EO) camera with HD resolution, 30x optical zoom (1280 x 720 at 30 fps), and 12x digital zoom (up to 360x combined with optical).

It has a thermal (IR) camera including a LWIR thermal imager, with 1280 x 1024 resolution.

These specifications make the GOS-155D/T a high-performance EO/IR payload with a compact and lightweight design. This is ideal for integration on medium-class UAV platforms where maintaining endurance and agility is crucial.

How does the dual EO/IR system enhance visibility and performance across day and night operations?

The dual EO/IR (Electro-Optical/Infrared) setup is exactly what makes gimbaled payloads like the UAVOS GOS-155 so powerful for all-weather, round-the-clock missions. Here's how it enhances visibility and performance:

Full spectrum coverage: day and night

EO (visible spectrum) provides high-resolution, color imagery with 30x optical zoom which is perfect for daytime surveillance, inspections, and mapping where detail is critical.

IR (thermal imaging) can detect heat signatures rather than light, allowing operators to 'see' in total darkness, smoke, fog, or dust.

Together, they ensure the UAV delivers actionable intelligence 24/7, regardless of lighting.

Improved target detection and tracking

EO cameras excel at identifying and classifying objects (recognising shapes). IR cameras excel at detecting presence and movement, even when visual camouflaging is used. Combining both means operators can first detect with IR, then identify with EO, reducing false positives and improving mission reliability.

Mission flexibility across environments

Infrastructure monitoring: EO captures detailed surface images; IR detects overheating or energy leaks invisible to the eye.

Enhanced performance with integrated processing

Systems like UAVOS' GOS-155 integrate video stabilisation, tracking, and geolocation across both sensors. This allows real-time fusion of EO and IR data, automatic tracking of moving targets, day or night, and accurate geotagging for situational awareness and reporting.

What smart features are embedded in the GOS-155?

The GOS 155D/T gimbal camera from UAVOS comes equipped with a range of intelligent embedded features that significantly enhance its performance and mission capabilities:

- Onboard processing and tracking which keeps targets in view without needing extensive operator input.
- GPS/INS fusion enables accurate, actionable geospatial intelligence.
- Large removable storage simplifies data transfer in remote operations.
- Robust design ensures reliability across challenging environmental conditions.

In essence, the GOS-155D/T isn't just a gimbal – it's a miniature ISR command centre, combining advanced automation and robust endurance to support day/night, long-duration unmanned missions.

How does the system calculate and deliver real-time target locations across different environments?

The system combines global positioning system/inertial navigation system (GPS/INS) navigation, gimbal orientation, and advanced geo-pointing software to continuously calculate and stream target coordinates in real time – ensuring operators can act on precise, georeferenced intelligence in any environment.

Sensor data collection

The gimbal carries EO (visible) and IR (thermal) sensors plus an internal inertial measurement unit (IMU). It also integrates with the UAV's GPS/INS. This combination lets the system know both the UAV's exact position in 3D space and the gimbal's precise orientation.

Line-of-sight targeting

When the operator or auto-tracker locks onto a target, the gimbal records its azimuth (horizontal angle), elevation (vertical angle), and zoom level. Using trigonometry and the UAV's altitude from GPS/INS, the system calculates the target's approximate coordinates on the ground.

Georeferencing algorithms

Advanced geo-pointing algorithms fuse the UAV's GPS data with the gimbal's angular measurements. These algorithms correct for aircraft motion, roll/pitch/yaw drift, and environmental factors to generate an accurate latitude/longitude fix of the target.

Real-time data delivery

The processed target coordinates are overlaid on the video feed and transmitted to the Ground Control Station (GCS). Depending on the configuration, accuracy can be:

- Approximately 20 m under standard conditions.
- Approximately 5 m when paired with UAVOS' integrated GCS software and calibrated INS.

Environmental adaptability

- Day/night: assess EO in daylight and IR in darkness/fog/smoke.
- High-altitude/long-range: automatic air pressure compensation maintains accuracy of sensors.
- Dynamic flight: the gimbal's stabilisation and embedded video processor keep the target lock stable, even during UAV manoeuvres or turbulence.

What's the accuracy range when paired with UAVOS' Ground Control Station?

The GOS 155D/T gimbal sends stabilised EO/IR imagery and real-time telemetry – including live video feed, target coordinates, and sensor data – to the PGCS.4. The operator monitors everything seamlessly via the station's advanced interface.

The video-tracker software, integrated into PGCS.4, facilitates automated object tracking and overlays target coordinates onto the live view – allowing quick detection, tagging, and response.

The station also supports the preparation, upload, and logging of mission parameters. Operators can plan or modify mission profiles directly within PGCS.4 and then relay those commands to the UAV with confidence and ease.

How is the GOS-155 engineered to perform in high-altitude or harsh weather conditions?

The GOS-155 is engineered with pressure compensation, anti-moisture protection, robust construction, and advanced stabilisation. Together, these features allow it to deliver reliable ISR capabilities at high altitudes and in demanding weather conditions, where conventional payloads might fail.

What materials and design choices support its ruggedness and operational reliability?

The ruggedness and reliability of the UAVOS GOS-155D/T gimbal camera come from a combination of careful material selection and engineering design choices.

Aircraft-grade aluminium housing

The gimbal is built from aircraft-grade aluminium, which provides a high strength-to-weight ratio which keeps it light (approximately 1.8 kg) yet durable, and resistance to vibration and structural fatigue common in UAV operations. This ensures the gimbal remains stable and reliable even during long missions or turbulent conditions.

Environmental protection and sealing

Automatic air pressure compensation prevents stress or sensor drift at high altitudes. Drying cartridge (moisture protection) stops condensation or fogging inside the housing, vital for reliability in humid or freezing climates. Sealed design helps keep out dust, salt spray, and environmental contaminants.

Internal stabilisation systems

Two-axis gyro-stabilisation isolates sensors from aircraft vibrations. This reduces wear on components while maintaining image clarity and sensor longevity.

Integrated smart electronics

Embedded video processors reduce reliance on external systems, lowering cabling complexity and failure points. Internal modular design simplifies maintenance and increases operational uptime.

How does this system fit into UAVOS' broader portfolio of unmanned technologies?

The GOS-155 fits into UAVOS' portfolio as a core enabling technology that turns UAV platforms into powerful, mission-ready solutions. It reflects the company's philosophy of delivering complete, integrated systems – aircraft, payloads, ground stations, and supporting infrastructure – engineered for precision, reliability, and real-world demands.

Integrated payload for UAV platforms

UAVOS designs and manufactures multi-role UAVs such as the UVH-25EL and UVH-170 helicopters. The GOS-155 serves as a primary ISR payload, providing stabilised EO/IR imaging and geolocation that allows these UAVs to conduct missions in security, defense, environmental monitoring, and emergency response.

Seamless ground control integration

The gimbal is fully integrated with UAVOS' PGCS.4 Portable Ground Control Station, which means operators can control flight, payload, and data processing from one interface. This interoperability highlights UAVOS' systems approach – designing not just UAVs, but the complete ecosystem of sensors, software, and ground systems.

How does the GOS-155 reflect broader trends in ISR tech, UAV miniaturisation, or autonomous missions?

The GOS-155 reflects the future of ISR technology: lightweight, multi-sensor, intelligent, and autonomous-ready. It enables UAVOS platforms and third-party UAVs to deliver high-value intelligence with smaller systems, lower power consumption, and reduced operator input – aligning seamlessly with global defence and commercial UAV trends.

What does this mean for the future of unmanned aerial survey and security operations for pipelines?

For pipeline operators, systems like the GOS-155 represent a shift toward persistent, autonomous, and cost-efficient aerial monitoring. They extend operational reach, improve accuracy, and reduce reliance on manpower – ultimately reshaping how critical energy infrastructure is surveyed and secured.

Enhanced situational awareness

With its dual EO/IR system and real-time geolocation, the GOS-155 allows UAVs to monitor pipelines day and night, in varied weather conditions. This means operators can identify leaks, intrusions, or potential hazards far more effectively than with traditional patrols.

Precision in detection and response

The ability to calculate target coordinates with up to 5 m accuracy when paired with UAVOS' Ground Control Station ensures that anomalies along pipelines (tampering, vegetation encroachment, or damage) can be pinpointed quickly. That precision reduces false alarms and speeds up response time.

Lower costs and higher coverage

Traditional manned patrols (aircraft, vehicles, security teams) are expensive and limited in coverage. A UAV with a lightweight, rugged gimbal like the GOS-155 can fly longer missions.