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EMASS Announces Updated ECS-Dot Drone Flight Results

Crazyflie selected as primary testbed following more than 50 percent endurance improvements in simulation

LOS ANGELES (Oct. 8, 2025) – EMASS, a Nanoveu subsidiary with next-generation semiconductor technology, has begun live endurance validation of its ECS-DoT edge-AI processor on Crazyflie nano-drones, transitioning from simulation to real-world testing. Phase 2 results showed endurance gains averaging 60 percent for quadcopters, 58 percent for hexacopters, and 57 percent for octocopters, with some tests showing even higher improvements, achieved without any changes to battery, propulsion or airframe. More than 300 hardware-in-the-loop (HIL) simulations on Gazebo and ArduPilot tested varied payloads, wind profiles and flight geometries to confirm vitality.

The live testing phase will also benchmark GPS-free navigation and obstacle avoidance using ECS-DoT's ultra-low-power AI processing for visual-inertial odometry (VIO), depth perception and real-time path planning. Results will support a multi-chip-per-drone architecture spanning control, perception and navigation for commercial, industrial, defense and surveillance applications.

Crazyflie's modular architecture and open-source ecosystem make it ideal for controlled endurance trials. The goal is to confirm 50 Hz closed-loop control at less than 1 milliwatt and verify endurance uplift in real-world flight conditions. In tandem with the live trial program, EMASS will engage with drone OEMs and system integrators to evaluate ECS-DoT on larger airframes and mission profiles.

Figure 1: Image of the Crazyflie 2.1+ drone, a versatile open-source flying development platform that weighs 29g to be used in the upcoming live drone testing

Advancing from Simulation to Real-World Testing

EMASS has commenced live flight trials to validate the endurance and control performance of its ECS-DoT ultra-low-power AI system-on-chip in real-world environments. The trials build upon Phase 2 simulation results that demonstrated substantial endurance improvements without altering drone hardware.

The initial validation platform, Crazyflie 2.1+, provides a lightweight and modular environment ideal for testing ECS-DoT's energy-aware flight control and perception algorithms. The goal is to replicate ECS-DoT's sub-milliwatt closed-loop control in natural flight conditions and verify the endurance uplift observed in simulation.

In parallel, EMASS will benchmark GPS-free indoor autonomy using only a monocular camera and IMU, fully powered by ECS-DoT. These tests include VIO, AI-based obstacle avoidance and adaptive path planning, demonstrating ECS-DoT's ability to deliver reliable perception and control without external positioning or cloud compute.

"Moving from lab to live flight is the natural next step for EMASS. We've validated our control stack in simulation at sub-milliwatt power — now we're building real-world evidence to show how AI-optimized control and perception can extend endurance and autonomy on even the smallest airframes," said Mark Goranson, CEO of EMASS. "The ultimate goal is to give manufacturers and operators a clear path to deploy reliable, low-power intelligence across drone classes and mission types."

Focus Area	Platform	Sensors	ECS-DoT Role	Key Measures
AI-optimised control for endurance	Crazyflie-class open-source nano-drone (modular; optional AI-deck if required)	Single monocular camera + 6-axis IMU	Learn/adapt propeller speed/attitude in real time to reduce energy per metre and extend mission duration without hardware changes	• Validate endurance uplift vs. PID baseline • Target up to ~60% improvement (to be confirmed on-platform) • Track energy-per-metre and mission time
Indoor navigation with minimal sensors	Same platform	Same baseline sensors	Run lightweight neural nets for visual-inertial odometry (VIO), obstacle detection + avoidance, and path planning within a sub-watt power budget	• Stable VIO tracking indoors (low drift) • Real-time avoidance with low latency • Deterministic control loop timing

Table 1: To illustrate the expanded live testing program focusing on endurance validation and indoor navigation

Phase 2 Results: Energy-Optimized AI Control

Phase 2 testing used high-fidelity hardware-in-the-loop simulations to evaluate endurance gains across multiple drone configurations. ECS-DoT maintained deterministic 50 Hz control cycles while drawing less than 1 milliwatt, achieving the following average endurance improvements:

- 60 to 65 percent for quadcopters
- 75 percent under load for hexacopters
- Up to 85 percent for octocopters

These gains translate directly into extended mission duration, higher operational efficiency and reduced cost per flight – all achieved through software-defined control optimization rather than hardware changes.

Component	Details
Simulation Environment	High-fidelity hardware-in-the-loop (HIL) and software-in-the-loop (SIL) frameworks. ECS-DoT
Control Cycle Performance	ECS-DoT achieved stable 50H (20ms) closed-loop control cycles while consuming <1 milliwatt of power
Surrogate Power Models	AI models trained on real propulsion and telemetry data to dynamically predict and optimize energy usage per flight conditions
Test Campaign Scale	Over 300 unique campaigns across multiple drone types, each with 100+ distinct flight paths and mission variations
Flight Profiles Simulated	• Waypoint navigation and loiter • Climb/descent under wind
Evaluation Metrics	• Energy consumed (Joules) • Distance per Joule • Mission endurance (minutes of flight time)
System Validations	Demonstrated real-time control, energy efficiency, and flight adaptation without modifying battery or propulsion hardware

Table 2: Phase 2 Sim testing and its components

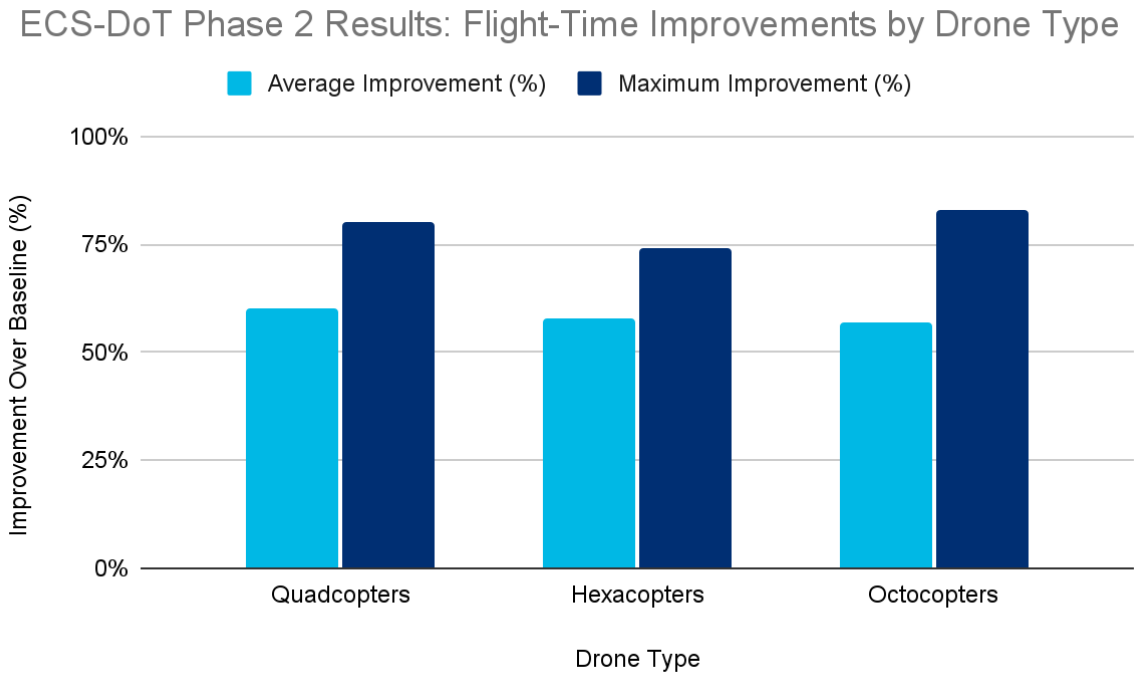

Figure 2: Results from Gazebo testing highlight the average and maximum improvements

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Expanding Toward Multi-Chip Autonomy

As the program transitions into live validation, EMASS is exploring a multi-chip deployment model, where each ECS-DoT operates as a dedicated AI accelerator for key drone functions:

- One ECS-DoT: endurance-optimized control (less than 1 milliwatt closed-loop)
- Two ECS-DoTs: adds GPS-free VIO for indoor autonomy
- Three or more ECS-DoTs: expands to obstacle avoidance and real-time path planning

This scalable design allows mission-specific performance enhancements without increasing system complexity or energy demand, enabling both retrofits and new-generation UAV designs.

For more information, visit nanoveu.com/emass.

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About EMASS

EMASS – a subsidiary of Nanoveu Ltd (ASX: NVU) – is an advanced semiconductor company specializing in ultra-low-power AI system-on-chip (SoC) solutions for edge computing. The company's flagship ECS-DoT chip delivers high-performance AI processing for vision, audio, and sensor data directly on-device, maximizing energy efficiency through its RISC-V architecture and non-volatile memory technologies. This always-on intelligence solution is optimized for power- and space-constrained applications including drones, wearables, healthcare devices and industrial IoT systems. For more information, visit nanoveu.com/emass.

About Nanoveu

Nanoveu is a listed company advancing human–machine experiences at the edge through a portfolio that spans ultra-low-power AI and glasses-free 3D technologies. Its subsidiary EMASS designs advanced system-on-chip (SoC) solutions that deliver efficient, scalable on-device AI for smart devices, IoT applications and 3D content transformation – enhancing Nanoveu's reach across rapidly growing AI, edge computing and 3D content markets. EyeFly3D™ is Nanoveu's end-to-end platform for glasses-free 3D, uniting proprietary screen technology with sophisticated content processing software and, now, EMASS's ultra-low-power SoC to bring immersive 3D to a wide range of devices and industries. The Company also develops and markets an advanced range of self-disinfecting and hydrophobic films and coatings under the Nanoshield™ brand, designed for applications including large-scale CSP and photovoltaic solar installations. Together, Nanoveu's businesses deliver practical innovation that makes devices smarter, environments safer and experiences more immersive.

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