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ASX: NVU

Nanoveu Achieves Landmark in Drone Energy Efficiency Using EMASS Edge-AI Chip

300+ Simulated Drone Trials Overcome #1 Industry Bottleneck, Averaging 60% Extended Flight Times with Sub-1mW AI Control

Highlights

- ECS-DoT ultra-low-power AI Chip ("ECS-DoT") has delivered exceptional improvements in drone flight endurance in its Phase 2 evaluation program, across the full spectrum of commercial, industrial, and tactical drone classes.
    - **Quadcopter platform**: The most common drone design typically featuring four rotors, suitable for both consumer and enterprise drone markets. Achieved up to **80%** improvement in mission endurance, with a **60%** average extended flight time over baseline.
    - **Hexacopter**: Featuring six rotors for enhanced stability and higher payload capacity, widely used in agriculture, logistics, and terrain mapping. Delivered up to **75%** improvement in flight endurance under payload-intensive stress testing.
    - **Octocopter**: Heavy-lift drones with eight rotors used in industrial inspection, defence, and professional cinematography. Delivered consistent flight endurance **up to 85% with an average 57% improvement**—proving viable even in large-scale, complex UAV systems with high inertia and mission-critical requirements.
- Results are based on **over 300 total simulation scenarios executed under varied payloads, wind profiles, and mission conditions**, validating ECS-DoT's robustness across operating environments. Performance gains align directly with real-world demands without changing batteries, rotors, or propulsion systems.
- ECS-DoT delivered real-time AI control at sub-milliwatt power (<1 mW), executing 50Hz closed-loop control cycles enabling smarter onboard decision-making without latency or cloud reliance.
- Simulations and testing were built on Gazebo with ArduPilot, a widely adopted open-source robotics simulator used by NASA[1], DARPA[2].
- Nanoveu advancing to directly engage with global drone OEMs and avionics manufactures with regards to embedding ECS-DoT into next generation flight platforms targeting the UAV market projected to grow to over USD$163-165Billion by 2030. [3]
- Planned real-world flight trials to validate the ECS-DoT's performance in live operational conditions, paving the way for advanced autonomous UAV platforms with significantly improved drone endurance.
- Patent filings are now in progress to protect ECS-DoT's AI-powered energy modelling framework, embedded flight control stack, and chip-level architecture laying the foundation for global licensing and strategic defensibility. Disruptive early ECS-DoT drone results have prompted the Company to commence a review of additional synergistic drone-based technologies.

[1] https://ntrs.nasa.gov/citations/20230012864

[2] https://spectrum.ieee.org/darpa-robotics-challenge-simulation-software-open-source-robotics-foundation

[3] TS2 Global Drone Market Outlook (2025-2030) 2 June 2025.

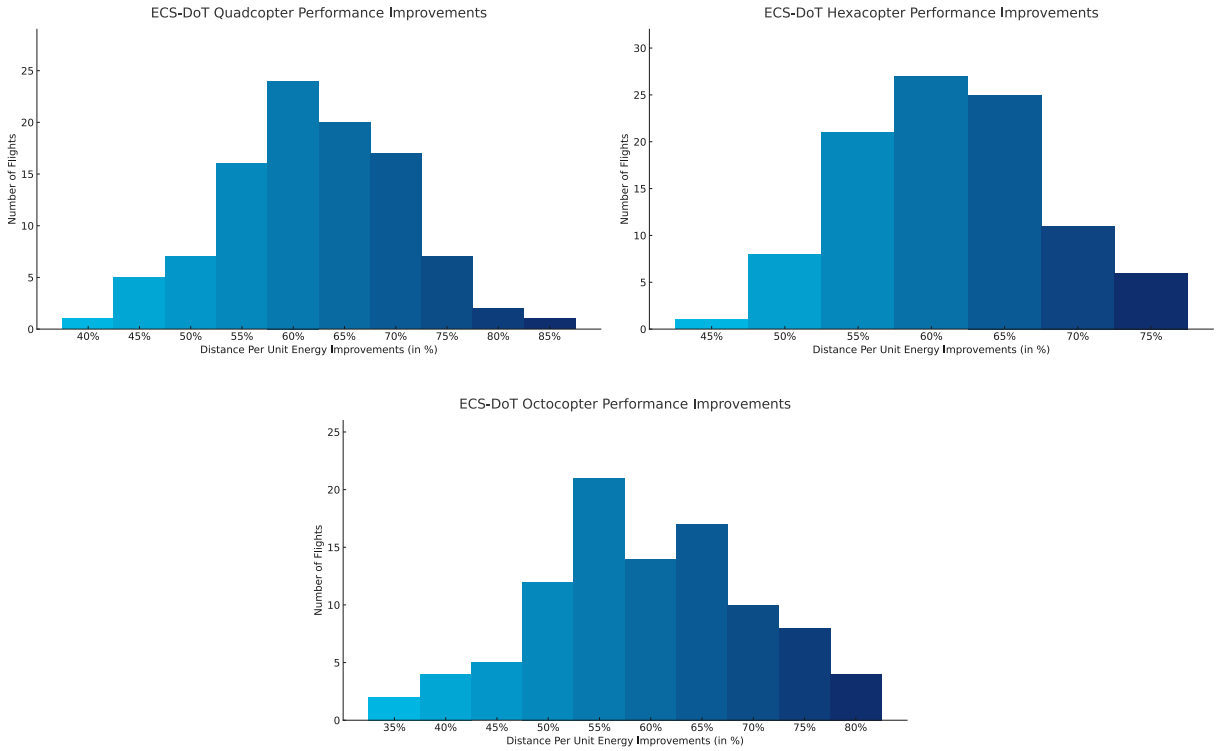
Nanoveu Limited (ASX: NVU, OTCQB: NNVUF) ("Nanoveu" or the "Company"), through its wholly owned subsidiary, Embedded A.I. Systems Pte Ltd ("EMASS"), is pleased to announce landmark results from its Phase 2 drone evaluation program. The findings highlight significant gains in drone flight endurance, widely recognised as the biggest constraint on UAV performance and commercial adoption. ECS-DoT extends flight times without requiring larger batteries or heavier hardware, directly tackling this limitation and opening new possibilities for scale in delivery, agriculture, defence, and inspection markets.

Phase 2 Testing: Real-World Scenarios at Scale

The **Phase 2 evaluation program** was designed to test ECS-DoT's ability to extend flight endurance in mission-critical drone applications. Over **300 hardware-in-the-loop (HIL) campaigns** were executed on **Gazebo/ArduPilot**, simulating a wide spectrum of mission conditions including varied payloads, wind profiles, and flight geometries. ECS-DoT ran **real-time closed-loop control cycles at 50 Hz** while consuming **less than 1 milliwatt of power**, demonstrating that meaningful endurance gains can be delivered without altering batteries, propulsion systems, or airframes. These tests confirm ECS-DoT's ability to unlock new levels of efficiency across the most widely used drone platforms.

Key Result Highlights:

- **Quadcopters**: Up to **80% increase in mission endurance**, with **60% average flight time extension**
- **Hexacopters**: Robust gains under payload stress; up to **75% improvement**
- **Octocopters**: Consistent energy optimization despite high mass and complexity; **up to 85% improvement**, with 57% average improvements.



Figures 1, 2 and 3: Improvements in Quadcopters, Hexacopters, and Octocopters with majority of runs clustering above the 50% gain level

These improvements were achieved without changing batteries or propulsion hardware and purely through smarter, AI-driven control using ECS-DoT's energy-efficient AI engine, which consumes <1 milliwatt of power during operation. The result is extended missions that translate into greater range, improved efficiency, and higher utility per battery cycle.

Dr. Mohamed M. Sabry Aly, Founder and CTO of EMASS, commented: *"We've achieved what many thought impossible, flying significantly longer with radically less power. ECS-DoT doesn't just extend drone flight time but it redefines the role of edge AI in aerospace. These results demonstrate that endurance is no longer defined by battery size. With ECS-DoT's sub-milliwatt AI engine, every electron is turned into range. We are not simply adding flight minutes—we are redefining the efficiency frontier of autonomous aviation."*

Methodology: Flight-Critical Simulation at Scale

The Phase 2 evaluation program was structured to rigorously assess ECS-DoT's **real-time energy optimization** in flight-critical scenarios. The objective was to prove that endurance gains could be achieved **without altering batteries, propulsion systems, or payload hardware**, but solely through intelligent control on ECS-DoT's ultra-low-power AI core.

Testing was conducted on **Gazebo with ArduPilot**, the same robotics environment relied on by **NASA, DARPA, and global autonomy leaders**. The simulator provided high-fidelity **aerodynamic dynamics, sensor noise modelling, and atmospheric disturbance profiles**, allowing ECS-DoT to be stressed under realistic operating conditions.

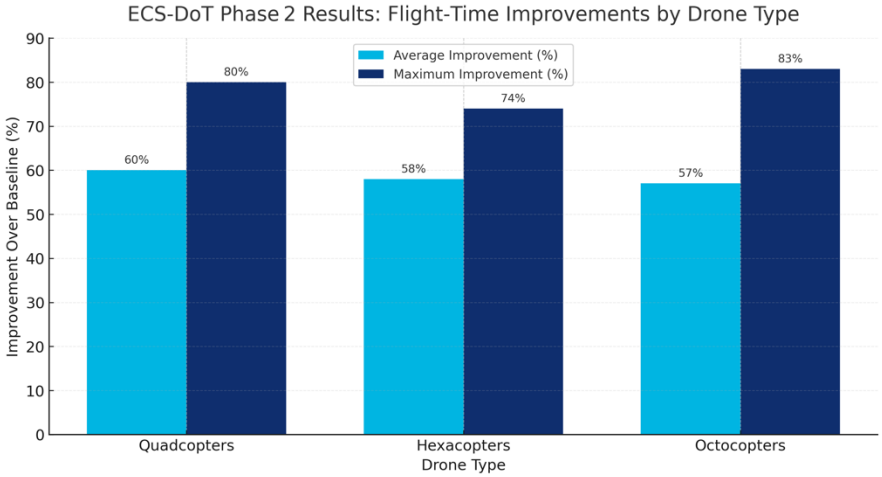


Figure 4: Results from Gazebo testing highlight the average and maximum improvements

ECS-DoT was placed directly **inside the control loop**, receiving live telemetry from **inertial measurement units (IMUs)**, **airspeed and altitude sensors**, and **powertrain monitors** capturing voltage, current, and motor command signals. In turn, ECS-DoT generated **motor control outputs** at **50 Hz**, closing the loop in real time. This setup confirmed the chip's ability to maintain **deterministic control cycles at <1 mW power draw**, while simultaneously managing **stability and energy efficiency**.

Over **300 campaigns** were executed, each with **100+ unique flight paths**, spanning waypoint navigation, climb/descent patterns, and manoeuvre-intensive paths. While Gazebo provides **robust dynamics and sensor realism**, EMASS acknowledges that minor discrepancies are inevitable when transferring to physical systems. As such, **Phase 3** will transition into **live drone integration and field trials**, where the same sensor-control loops validated in HIL will be applied directly to operational UAV platforms.

Component	Details
Simulation Environment	High-fidelity hardware-in-the-loop (HIL) and software-in-the-loop (SIL) frameworks. ECS-DoT processed real-time sensor data and flight control.
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 condition.
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

Phase 1 Foundations: Building Towards Validation

These Phase 2 outcomes build upon a successful Phase 1[4] validation. The first phase established proof-of-concept by integrating ECS-DoT into software-in-the-loop (SITL) and HIL simulations, demonstrating that the chip could perform closed-loop flight control at sub-milliwatt power levels.

Initial tests recorded up to **33%** increases in endurance, confirming ECS-DoT's ability to infer optimal control strategies in real-time. This early work was critical in proving:

- ECS-DoT's compatibility with industry-standard autopilot stacks
- Stability across altitude shifts, wind bursts, and mission irregularities
- Immediate inference from trained models across diverse flight profiles

Phase 1 also introduced a novel surrogate power model trained on empirical propulsion data, allowing ECS-DoT to predict and optimize energy consumption in milliseconds. These models formed the core AI logic extended in Phase 2.

Commercial Opportunity: Multi-Billion Dollar Drone Market Segments

The phenomenal technical performance of ECS-DoT puts EMASS in prime position to capitalize on a robust and expanding global drone market, projected to reach USD$163-165 billion by 2030. [5]

Application Sector	Market Size Forecast
Autonomous Delivery Drones	Estimated to grow to approximately **US$10.5 billion by 2030**
Agricultural Drones (Precision Farming)	Estimated to grow to approximately **US$22.5 billion by 2030**
Military / ISR Drones	Estimated to grow to approximately **US$88.0 billion by 2030**
Consumer	Estimated to grow to approximately **US$11.6 billion by 2030.**

Figure 5: Potential use cases for ECS-DoT in Precision farming, Autonomous Delivery and Surveillance

Why This Matters for EMASS

As drone platforms evolve to support more advanced capabilities, performance scaling is expected to require multiple ECS-DoT chips per unit. While a single ECS-DoT can manage core flight control, the chip also has potential for design-ins across additional functions such as navigation, stability enhancement, and system resilience. These expanded roles allow ECS-DoT to support a broader range of mission-critical tasks, positioning EMASS to capture greater value from the accelerating growth in global drone deployments, including

- **Delivery & Logistics:** ECS-DoT's flight endurance improvements align directly with the operational needs of e-commerce and urban delivery platforms.
- **Precision Agriculture**: Payload-constrained drones gain endurance and autonomy making it ideal for surveying, spraying, and monitoring large farmlands.
- **Defence & ISR**: Autonomous flight with limited battery capacity, and without cloud reliance, is mission-critical for unmanned military platforms.

[4] Refer to ASX announcement dated 01 July 2025

[5] TS2 Global Drone Market Outlook (2025-2030) 2 June 2025.

- **Infrastructure Inspection & Surveillance**: ECS-DoT enables continuous, anomaly-powered monitoring where extending airborne duration increases coverage and cost-effectiveness.

Mark Goranson, CEO of Nanoveu's Semiconductor Division, commented: *"These results mark a defining milestone - ECS-DoT is now validated across hundreds of high-stress flight scenarios, and the performance speaks for itself. We're not just improving flight times but we're unlocking entirely new categories of mission endurance and AI-based control at the edge.*

What excites us most is the clear commercial pathway ahead. We're already engaging with leading OEMs to translate these results into commercial flight systems. As we scale into live drone trials and accelerate our sales efforts, EMASS is positioned to become the benchmark for energy-efficient Edge AI in next-generation autonomous platforms."

Next Steps: From Simulation to Market Adoption

With Phase 2 validation now complete, EMASS is rapidly advancing:

1. **OEM Engagement & Integration**

   EMASS has commenced direct engagement with global drone OEMs and avionics manufacturers to embed ECS-DoT into next-generation flight platforms, focused on autonomous systems and endurance-critical use cases.

2. **Live Flight Mapping & Physical Trials**

   Following the successful simulation campaign, ECS-DoT will be integrated into live drone platforms for real-world mapping trials. These trials will demonstrate energy optimization in uncontrolled environments and confirm transferability across hardware platforms.

3. **IP Protection & Licensing**

   EMASS will seek to file multiple patent families covering its proprietary energy optimization engine, surrogate power modelling framework, and AI flight control stack. These filings lay the foundation for long-term defensibility and global licensing and sales strategies.

This announcement has been authorised for release by the Board of Directors.

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About Nanoveu Limited

Further details on the Company can be found at https://nanoveu.com/.

EMASS is a pioneering technology company specialising in the design and development of advanced systems-on-chip (SoC) solutions. These SoCs enable ultra-low-power, AI-driven processing for smart devices, IoT applications, and 3D content transformation. With its industry-leading technology, EMASS will enhance Nanoveu's portfolio, empowering a wide range of industries with efficient, scalable AI capabilities, further positioning Nanoveu as a key player in the rapidly growing 3D content, AI and edge computing markets.

EyeFly3D™ is a comprehensive platform solution for delivering glasses-free 3D experiences across a range of devices and industries. At its core, EyeFly3D™ combines advanced screen technology, sophisticated software for content processing, and now, with the integration of EMASS's ultra-low-power SoC, powerful hardware.

Nanoshield™ is a self-disinfecting film that uses a patented polymer of embedded Cuprous nanoparticles to provide antiviral and antimicrobial protection for a range of applications, from mobile covers to industrial surfaces. Applications include *Nanoshield™ Marine*, which prevents the growth of aquatic organisms on submerged surfaces like ship hulls, and *Nanoshield™ Solar*, designed to prevent surface debris on solar panels, thereby maintaining optimal power output.

Forward Looking Statements This announcement contains 'forward-looking information' that is based on the Company's expectations, estimates and projections as of the date on which the statements were made. This forward-looking information includes, among other things, statements with respect to the Company's business strategy, plans, development, objectives, performance, outlook, growth, cash flow, projections, targets and expectations and related expenses. Generally, this forward-looking information can be identified by the use of forward-looking terminology such as 'outlook', 'ambition', 'anticipate', 'project', 'target', 'potential', 'likely', 'believe', 'estimate', 'expect', 'intend', 'may', 'mission', 'would', 'could', 'should', 'scheduled', 'will', 'plan', 'forecast', 'evolve' and similar expressions. Persons reading this announcement are cautioned that such statements are only predictions, and that the Company's actual future results or performance may be materially different. Forward-looking information is subject to known and unknown risks, uncertainties and other factors that may cause the Company's actual results, level of activity, performance, or achievements to be materially different from those expressed or implied by such forward looking information.