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EOS successfully tests directed energy drone defence

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Electro Optic Systems Holdings Limited ("EOS" or "Company") (ASX: EOS) today announces the successful qualification of its directed energy ("DE") drone defence system.

EOS' DE system uses a powerful laser as the directed energy source and has now successfully disabled Group 1 drones at an effective rate of 20 drones/minute at ranges beyond 1,000 metres, establishing a new benchmark for neutralising swarm drone attacks. This level of performance, for the first time, meets all current customer requirements for defence against emerging threats from swarms of lightweight drones.

The DE system has been developed as a key element of the EOS Titanis™ drone defence system, specifically to disable drones in Group 1, 2 and 3 and to neutralise sensors on all drones at very long range. Safety protocols at the testing facility and its associated airspace limited this qualification to Group 1 drones. Testing will be extended to Group 2 and 3 drones at a different location in Q3 2022.

The US Department of Defense classification for Uninhabited Aerial Systems ("UAS" or "drones") is tabled below for the five drone categories ("Groups") currently in use.

UAS Group	Weight (kg)	Ceiling (ft)	Speed (kts)	Example	Defence
Group 1	<9	<1,200	<100	Black Widow, Raven, WASP	DE, kinetic
Group 2	9-25	<3,500	<250	ScanEagle, Skylark, DH3, Aladin, Strix	DE, kinetic
Group 3	25-600	<20,000	<250	Shadow, Bayraktar	DE, surface-to-air-missile
Group 4	>600	<20,000	Any	Predator, Sky Warrior, Fire Scout	Surface-to-air-missile
Group 5	>600	>20,000	Any	Global Hawk, Reaper	Surface-to-air-missile

Table 1: UAS Classification (Source: US Department of Defence)

Of immediate concern for tactical manoeuvre, operations or defending assets, are drones from Groups 1, 2 and 3. These drones are now having a major impact on military operations and there are no deployed defences against them. Groups 4 and 5 represent strategic applications that can be countered by existing air defence systems.

Titanis is now a proven, integrated defence capability against all drones, providing a seamless integration of command and control, radar detection, tracking, target selection and real-time allocation of a kinetic weapon, DE or surface-to-air missile to neutralise each drone.

To engage Group 1 and 2 UAS up till now Titanis has used kinetic weapons, such as guns and cannon, leveraging the performance of EOS weapon systems for the extreme accuracy and responsiveness required to engage airborne manoeuvring targets.

Titanis performance has been honed over four years of regular testing with real drones and live ammunition so it can reliably disable a wide range of small drones using kinetic weapons.

However kinetic defence against drones has limitations including:

- Use of kinetics is constrained by collateral damage considerations associated with rounds which can fly beyond the target;
- Kinetic weapons can each neutralise 5-6 drones per minute, but drone swarm numbers can reach 20 drones per minute;
- Kinetic weapons are not effective against drones attacking or operating directly overhead; and
- Kinetic weapons, unless specifically designed for Counter UAS (CUAS) roles, cannot neutralise Group 3 drones, which cannot be cost-effectively engaged with current surface-to-air missiles (SAM).

DE capability was developed by EOS to overcome all these limitations, and to operate alongside kinetic defences to provide a complete defence system against drones from Groups 1-3 as required by current customers.

In the recent test and qualification program, an operational DE system was transported to a remote site using a normal military transport process and was fully operational on site within the specified time of four hours.

Figure 1: An operational DE beam director installed on a standard 20' container

The system operated over a wide variety of atmospheric conditions, neutralising a large number of drones under realistic but safe test conditions. The drones were disabled or destroyed at a rate of up to 20 drones per minute, including the time required to switch targets, establish target tracking, lock the laser beam onto and bring down each drone. The system uses only reduced power for Group 1 drones.

Figure 2: Group 1 “medium” drones were rapidly neutralised by the DE system

No other drone defence system has claimed comparable results. After the trials the DE system was relocated to another site and quickly restored to full operation, in a further demonstration of a robust capability not normally associated with powerful lasers.

The next step in the qualification of the Titanis DE system for CUAS operations will be the establishment of its effect against Group 2 and 3 drones. Group 2 drones present similar challenges to Group 1.

Group 3 drones are substantially larger and operate higher and faster than Groups 1 and 2. An example of a Group 3 UAS is the Bayraktar drone which has been successfully deployed by Ukraine in high profile operations recently. No changes are required to the EOS DE system for engaging Group 2 and 3 drones, but a larger and more remote test area must be used for the longer-range and higher-power engagements to be used for qualification.

Figure 3: Bayraktar armed drone

At the completion of the recent DE qualification trials the Chief Executive of EOS Defence Systems, Grant Sanderson, said:

> "The introduction of the DE capability provides the Titanis drone defence system with multiple options for dealing with each type of drone threat. EOS DE systems have already demonstrated the ability to disable or degrade a drone's sensors to prevent intelligence gathering or precision engagement with lethal force by drones. These latest results show that large numbers of drones can be directly neutralised by EOS defensive systems.
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> The test and qualification procedures used by EOS are provided by current and prospective customers to ensure the developed capability will meet their operational requirements. Those procedures include up-to-date profiles of successful drone attacks against military assets and critical infrastructure so these can be prevented or mitigated in future.
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> During 2022 a vast amount of military equipment has been destroyed in Ukraine by drones of the type that the Titanis DE drone defence system was developed to protect against. Drones are highly likely to be used at some time in offensive roles against Australia and its allies, and there is now strong demand for drone defence from customers with current weapon system delivery contracts with EOS.
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> For EOS customers no CUAS system has demonstrated superior operational flexibility, maturity, and affordability to Titanis. Two major end-users that are existing EOS customers are already co-funding trials and qualification efforts."

This announcement has been authorised for release to ASX by Dr Ben Greene, Group CEO.

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ABOUT ELECTRO OPTIC SYSTEMS (ASX: EOS)

EOS operates in two divisions: Defence Systems and Space Systems

- Defence Systems specialises in technology for weapon systems optimisation and integration, as well as ISR (Intelligence, Surveillance and Reconnaissance) and C4 systems for land warfare. Its key products are next-generation remote weapon systems, vehicle turrets, counter-UAS and C4 systems.

- Space Systems includes all EOS space and communications businesses, and operates as three entities – SpaceLink, EM Solutions and Space Technologies. SpaceLink is developing a constellation of Medium Earth Orbit satellites to create the communications superhighway for the space economy. EM Solutions provides global satellite communications services and systems. Space Technologies specialises in applying EOS-developed optical sensors to detect, track, classify and characterise objects in space and remains integral to research and development across the group.

This announcement may contain certain "forward-looking statements" including statements regarding EOS' intent, belief or current expectations with respect to EOS' business and operations, market conditions, results of operations, financial condition, and risk management practices. The words "likely", "expect", "aim", "should", "could", "may", "anticipate", "predict", "believe", "plan" and other similar expressions are intended to identify forward-looking statements. Indications of, and guidance on, future earnings, financial position and performance, establishment costs and capital requirements are also forward-looking statements. Forward-looking statements including projections, guidance on future earnings and estimates are provided as a general guide only and should not be relied upon as an indication or guarantee of future performance. This announcement may contain such statements that are subject to risk factors associated with an investment in EOS. Forward-looking statements involve known and unknown risks, uncertainties and assumptions and other important factors that could cause the actual results, performances or achievements of EOS to be materially different from future results, performances or achievements expressed or implied by such statements. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date of this announcement.