Guns and frickin’ “laser” beams
Recommendation: Positive

Initiating with a Buy, $5.62 valuation

Electro Optic Systems (EOS) makes advanced weapon systems for the military and develops tracking systems for orbiting satellites and space debris. At the core of the company’s IP is laser technology and the ability to tackle problems from a science-based perspective. Demand for the weapons business is growing strongly (contract wins and new tenders), and the market is finally opening for the space business, after decades of development.

EAP Core Drivers

I. Defence contracts – the weapons business has an order backlog of more than $600m and it has tender submissions worth more than $2.5bn with existing customers. A large potential market is starting to develop in anti-drone defence systems, with EOS at the forefront.

II. Space contracts – EOS performs more than 15,000 space tracks per week and will soon commence live testing of high-power lasers to manoeuvre space debris in orbit. The main revenue opportunity for EOS is military, with management estimating the potential market to be worth $2bn over the next 10 years.

III. Quantum Communications – this involves control of entangled photons. While the world is focused on developing ultra-secure communication networks, EOS is exploring options to commercialise its technology for long-range, ultra-wideband optical communications (i.e. 20THz).

Earnings and Valuation

We forecast strong revenue and profit growth over the next three years, driven by the existing order book, with significant upside if the company is successful in some/all of $2.5bn of tenders in progress. Our blended valuation of the stock is $5.62 a share (range of $3.76 to $7.82).

Earnings Forecasts

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Valuation (blended) $5.62

Source: EAP Research
EXECUTIVE SUMMARY

EOS has developed cutting-edge technology in remote weapon systems and laser-based satellite tracking systems. At the heart of the company’s IP is laser technology, with almost every product containing an embedded laser. Also integral to the business is real time control software, with one million lines of code that has been in service in military applications for over 20 years.

Weapon Systems

War mongers have existed since Cain killed Abel, and the first war recorded in history took place in Mesopotamia in 2700BC between Sumer and Elam. While army size has always been important, having a technological edge on armaments has been the main determinant of military supremacy.

On the scale of technology advancements, the US military and space agencies are at the forefront, and EOS has deep longstanding connections, having sold more than $300m worth of weapon systems in the past 15 years. It also works with the military in Australia, and in recent years has added customers in Europe, the Middle East and Asia.

EOS invented Remote Weapon Systems (RWS) for the US Army, with them first deployed in the Iraq War in 2003. RWS allows ballistic weapons, such as machine guns and cannon, to be operated remotely, providing a protected environment for the gunner. Part way through the $5bn+ equipment purchase program in 2007, EOS was muscled out by Norway sovereign Kongsberg Defence Systems.

Just as great necessities call out great virtues, EOS returned to the drawing board. It cut costs, reorganised production capability and set about developing the next-gen RWS. EOS is now in an eminently stronger position, with production facilities in Australia and overseas, through partnerships with major defence contractors (Northrop Grumman, Hyundai-WIA and Singapore Technologies Kinetics).

Its next-gen RWS already has a backlog of $600m+ for non-US customers, with the next iteration of US’s RWS purchase program to come in 2020. Furthermore, the advent of drone attacks on key infrastructure has created a new market, for which EOS’s RWS is ideally suited – bids for $800m have already been submitted.

The current product range spans from systems that weigh 150lbs to 800lbs, to suit various vehicles, and provide a wide range of performance. EOS has also developed remote turrets.

Chart 1. Remote weapon systems
Source: Company reports
For the purposes of comparing effectiveness of weapons, the enemy is regarded as Russians or Russian-developed systems. EOS’s RWS have been tested against captured weapons and have proven to be far superior. In live fire tests involving driving a vehicle in a figure eight over 2km and hitting a fixed target at various intervals, it scored 100%.

Key to the effectiveness is sophisticated electronics that stabilise the gun and draw on the laser technology incorporated in the space business. While EOS does not make the gun, it gets the manufacture to make modifications (e.g. barrel length/twist rate).

EOS can sell weapon systems to Australia, the US and 14 allied countries. It already has contracts with eight. The US represents the major market and includes multiple military agencies (e.g. Army, Navy, Air Force, Marines, Military Police and Coast Guard).

**Space Systems**

The space business is essentially an intelligence business, providing data from sophisticated sensing systems. The role of these systems is to find, detect, track and classify objects in space, which are otherwise not trackable, not findable.

The very high value of space assets ($900bn), together with the increasing threat of collision and counter-space activities by provocateurs is expected to lead to a significant lift in space protection measures. Core to increasing protection is having accurate information about the space environment. EOS is confident that its sensors are more capable than legacy radar-based systems and significantly cheaper.

The main laser tracking facility is located at the Mount Stromlo Observatory in Canberra. A second facility was built at Learmonth in WA in 2018 (collaborative agreement with Lockheed Martin) and a third is planned for QLD. EOS is currently performing 15,000 space tracks per week.

EOS also has the capability of directing high power lasers at satellites and other objects in space. EOS will commence live testing for the manoeuvre of space debris in orbit in the Q4 2019.

Longer term, EOS intends to leverage its laser space tracking technology for laser-based communications (i.e. quantum communications), in particular long-range, ultra-wideband optical communications (i.e. 20THz).

**Chart 2. Space debris management**

*Source: Company reports*
Investment thesis and Valuation

EOS is a unique business in the Australian market. Over the past 30 years it has invested heavily to create leading-edge technology, some of which is literally out of this world. Management looks to create new markets, not enter existing ones, using a scientific approach to find solutions – Founder/CEO Dr Ben Greene has a PhD in Quantum Physics.

While the risk with science-driven companies is that the commercialisation of technology can be on the never-never, EOS has a strong track record of execution. It has won multiple large contracts with the military in Australia, US, NATO, Asia and the Middle East.

But it has not always been smooth sailing, with it losing a multi-billion contract for the US Army in 2007 for a product it had invented. Management learnt from the experience, and the company was restructured to avoid a repeat in the future.

Momentum is again strong. EOS’s next-gen RWS has already won more than $600m of orders, and bids for more than $2.5bn of tenders have been lodged. The company has won all tenders in the last 18 months, so management is confident of winning a reasonable share. The most prospective near-term category is anti-drone defence, with EOS currently pitching for a $800m contract.

The Space business in the big unknown. It has been decades in the making, but now demand seems to be finally catching up with the technology. While the Australian Government has foreshadowed spending from 2021 on the delivery of space data, it is the US military that appears most likely to become EOS’s first major customer.

Earnings forecast for the next two years are largely underpinned by the existing backlog of orders. But being essentially a contract-based business, EOS needs to keep winning tenders. Investors therefore need to take the view it will.

Our blended valuation of EOS is $5.62 a share, with a range of $3.76 to $7.82. We initiate coverage with a Positive rating.

Chart 3. Revenue and EBITDA
Source: Company reports and EAP Research
BUSINESS OVERVIEW AND GROWTH STRATEGY

EOS was founded in 1983 from the privatisation of the Australian Government’s space activity, which had expertise in ground-based technologies and space-based sensors. It became a listed company in 2002 when it was backdoor listed into an investment company controlled by Fred Bart (Chairman).

Today, EOS comprises two business divisions:

- **Defence Systems** – specialises in technology for weapon systems optimisation and integration, as well as intelligence, surveillance and reconnaissance for land warfare.
- **Space Systems** – specialises in optical sensors to detect, track, classify and characterise objects in space.

**Chart 4. Earnings history**

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**DEFENCE SYSTEMS**

- **Remote weapon systems**

The company’s core competency is the development of remote weapon systems (RWS). Over the past 15 years it has delivered over 2,000 systems worth more than $1bn to military customers in Australia, US, NATO, Saudi Arabia, Korea and Singapore.

The genesis of EOS’s foray into weapons began in the 1980s when the US military was looking to mount special sensors on weapons to create the next generation of smart weapons. This involved putting cameras, laser range finders and thermal cameras directly on to weapons to do real time fire control for land warfare.

While most military vehicles can mount some sort of weapon, manning them can be hazardous, especially in urban areas where gunners are exposed to enemy sniper fire and counterfire.

At the time, EOS was the only company with sensors robust enough to be placed directly on to weapons. This was because they had been developed for space launch where they are subject to very high shock and vibration conditions. EOS added to its capability in 1992 with the acquisition of a weapon control systems business from Boeing (Electro-optic Fire Control Systems). The business had developed a system that incorporated a range of sensors, including an advanced thermal imager, laser rangefinder, and imaging systems.

After several years of R&D and testing, EOS created the first prototypes for a RWS. In accordance with the rules of engagement for western armies that outlaw the deployment of robots on the battlefield, a human is always in control of the trigger, be it an operator using a joystick and screen inside the vehicle or kilometres away.
In 1999, EOS partnered with US-based Recon Optical for the further development of RWS for the US Army. The program was called CROWS (Common Remotely Operated Weapon Station), and the objective was to mount advanced weapon system on lightly armoured or unarmoured vehicles (e.g. Humvee).

EOS supplied the sensors, operator interface, software, and weapon control and aiming systems. Recon Optical provided weapon system gimbals, the mechanical devices for moving and pointing the weapons.

The first contract with the US Army was won in 2003 with a US$0.5m purchase of three units for testing. At the time, the CROWS program had funding from 2004 onwards for up to 6,500 vehicles. The US Army deployed CROWS in limited numbers in Iraq in late 2003. It proved very effective and according to a US defence publication “the reliability is 100% and soldiers love it...they want more”.

**Chart 5. EOS weapon system operationally deployed in Iraq**

Source: Company reports

EOS/Recon Orbital received follow up orders in October 2004, and by June 2006 they had delivered 300 systems (model R-400, weighs 400lbs). Based on expected volumes, EOS was at looking at an eventual contract worth $5bn.

In August 2006 the US Army announced plans to procure the first 1,200 units of a forecast requirement of 6,500 units for the CROWS 2 program under a four-year contract (worth A$1.5bn). In accordance of policy on large orders an open tender was called. By December 2006, EOS/Recon Orbital had received contracts for another 300 units so understandably they were confident of winning the tender.

But in a major blow, the contract was awarded to Norway’s Kongsberg Defence Systems in August 2007, for a product that was similar in size and capability to the EOS’s R-400. Kongsberg had litigated during the process and apparently lobbied hard to members of Congress. The production scale of Kongsberg and competitive pricing are also likely to have contributed to the Army’s decision.

The scale of the lost opportunity is highlighted by the fact that CROWS 2 ended up being more than 10,000 units.
While EOS/Recon Optical continued to sell R-400 units to NATO and other customers, and maintain those with US Army units in Iraq, the big opportunity had been lost. The company was forced to downsize its operations. It closed its US production facility and cut staff by 50%.

- **Reset of weapons business**

Just as great necessities call out great virtues, EOS returned to the drawing board. In anticipation of the next iteration of the CROWS program, EOS overhauled the business and set about developing a next-gen weapon system.

Fixed costs were cut by outsourcing a major portion of production to major partners with existing capacity, and it sought to address its vulnerability by diversify the customer base, with emphasis on Asia and the Middle East.

The company also shored up its IP by acquiring the remote weapon systems business of Recon Optical. This was completed in two stages, with the assets acquired in December 2007 and the RWS technology in 2009 (US$3m). This gave EOS ownership of technology for the entire range of products and an increase in production capacity.

New features of EOS’s next-gen RWS included sniper detection, target auto-tracking, air burst ammunition, user interface, stabilisation, situation awareness, built-in testing and diagnostics, sensor technology and active defence against missiles.

The product range was expanded to include larger more capable RWS, as well as small, lighter RWS. The system called R-600 (weighs 600lb) includes features such as two automatic weapons at same time, integrated tracking, improved armour protection and missile launch capability. The weapon is optimised for US Army MRAP (Mine-Resistant Ambush Protected) vehicles and 6-8 wheeled combat vehicle weighing more than 12 tonnes.

**Chart 6. EOS range of RWS products**

*Source: Company reports*
In May 2010, EOS moved to further enhance its production capability by teaming up with Northrop Grumman (as prime contractor) to jointly bid for the US Army’s upcoming CROWS 3 program. Two months later, the US Army announced an intended procurement of up to 25,200 remote weapon systems, worth over US$8bn including spare parts and service.

The program was revised in February 2011 to include the manufacture of up to 18,000 units, the upgrade of existing units in the field (i.e. 10,000), and ongoing maintenance over five years. The initial contract was to be 3,000 units plus services/parts for a combined value of US$970m.

After initially announcing the intention to award contracts to at least two contractors, this was revised in September 2011 to making a single award to one company. Unfortunately for EOS, the contract was awarded to the incumbent CROWS 2 contractor, Kongsberg in August 2012.

While missing out on CROWS 3 was another blow, the financial impact was less than 2007, due to the earlier restructuring of EOS’s production capability. This included relocating its US plant from Tucson Arizona to Huntsville Alabama, to be alongside Northrop Grumman’s facility (December 2011).

As it turned out, the full value of CROWS 3 did not materialise and it essentially became a repair and maintenance contract. Kongsberg already had the most units in the field.

Next-gen RWS (R-400S)

EOS’s development program continued with the new version being the next-gen R-400S. It has dramatically increased lethality, mobility and intelligence. The system also has an extended the scale of application to all military vehicles regardless of size (Land Cruisers to tanks), including fixed sites.

The original CROWS program involved deploying weapons only on medium-size combat vehicles, with 7.62mm and 12.7mm calibre firepower and 40mm grenade launchers. The next-gen RWS includes cannon up to 30mm and scope to deploy missiles.

The R-400S integrates advanced surveillance capabilities including stabilised long-range sensors and integrated battlefield sector scanning, with up to 200 programmable target reference points. It also has video/audio recording options, sophisticated ballistic correction for conditions, and plug-and-play integration with battle management systems. The weapon is half the weight of all previous configurations and is kept steady by axis-stabilised mounts.
EOS won its first contract for the next-gen RWS in March 2017 from Orbital ATK (USA, acquired by Northrop Grumman in 2018). The initial contract is valued at $170m for deliveries over 2017-2020.

This win was followed by another contract in January 2018 worth $410m (later upgraded to $450m) for delivery over 2018-2022 for the UAE Armed Forces.

EOS has also developed a smaller lightweight RWS (R-150) for mounting on light vehicles and transport vehicles. The system includes most 5.56mm, 7.62mm and 12.7mm weapons.

Chart 9. R-150 remote weapon system mounted on a ADF Hawkei
Source: Company reports

- **Short Range Air Defence (SHORAD)**

Attacks by drones is becoming an increasing threat to airports and critical infrastructure. In recent months, airports and oil facilities in Saudi Arabia have been hit by drone attacks, with Yemen’s Houthi rebels claiming responsibility (links to Iran). EOS has an integrated product that includes:

- Advanced tracking systems to enhance the performance of lightweight Stinger surface-to-air missiles.
- Cannon fire from a R-400S Mk2 can lock airborne targets and deliver air-burst round at ranges up to 2km.
- High-power lasers (developed for space applications) to disable or destroy the drone.

Chart 10. Drone defence
Source: Company reports
Turrets

In early 2019, EOS launched a next-gen unmanned turret (30-40mm cannon) for armoured vehicles, the T2000. It was developed in conjunction with Israeli defence company Elbit Systems (Israel), costing more than $30m.

Traditionally, turrets have included accommodation for operators in a cylindrical cage that is slung under the exposed parts of the turret and rotates with the turret inside the vehicle. The requirement for a large hole in the top of the armour of the vehicle to insert the cage creates a weak point and is the most common point of attack. The large and heavy size of conventional turrets also requires an equally large vehicle, which is easier to detect.

Chart 11. Conventional manned tank turret
Source: Company reports; the three crew all rotate with the gun position

EOS’s turret does not require a cage, and operators can be located remotely from the turret (including remote from the vehicle). It weighs 50% less (1,300kg), frees up space inside the vehicle, it has a lower profile and it is cheaper. The turret can be used for 30-40mm cannon firing from a moving vehicle to a target beyond 4kms. The T2000 uses the EOS common user interface, meaning those trained on its RWS can directly transition to the T2000.

EOS believes the global market is worth more than $4bn. The company has already submitted for over $2bn of tenders. EOS has partnered with Hanwha Defence (Korea), as prime contractor, to tender for a contract worth more than $1bn over six years for the Australian Army.

Chart 12. EOS T2000 turret
Source: Company reports

Chart 13. Mounted EOS T2000 turret and RWS
Source: Company reports
SPACE SYSTEMS

Space Systems is the original business of EOS. Much of its history has been spent developing capabilities for the measurement and management of orbital space, with an emphasis on space debris.

Australia has relevance in space-related activities for two main reasons:

- Space surveillance data for the Southern Hemisphere is needed to provide good orbital solutions.
- It has access to a range of longitudes in the Eastern Hemisphere that have strategic value (i.e. China).

The first successful laser tracking of space debris was conducted in 2002, well before the satellite industry thought there was a meaningful threat. The wake-up call came in 2009 when an active Iridium Communications satellite collided with a defunct Russian satellite, creating a cloud of debris that will remain in orbit for many years.

The Space Systems business derives revenue from the sale of equipment (mainly telescopes) and providing tracking data services to members of the Five Eyes (Australia, Canada, NZ, UK and USA). EOS has to date not sold integrated space tracking sensors due to issues around IP protection.

The telescopes produced by EOS are large (>$5m cost) and encompass adaptive optics and large-scale synthetic aperture optics. EOS has built telescopes for government and research customers in Australia, China, Thailand and the US.

**Synthetic aperture** optics allow large systems to be synthesised by aggregating many small systems, providing substantial savings. **Adaptive optics** is primarily used to overcome the optical distortion of the atmosphere, allowing ground-based systems to approach the ideal performance of space-based systems such as the Hubble Space Telescope.

The services arm of the business is focused on commercial and defence requirements for space situational awareness information. It obtains data using optical sensors to detect, track, classify and characterise objects in space, which has applications in space surveillance, missile defence and satellite laser ranging.

Commercial applications for space tracking include navigation, banking transaction security, mapping, surveying and climate change monitoring (i.e. measurement of ice mass and sea levels).
Service revenue has been derived from the provision of space tracking data to the Australian and US governments. So far, they have essentially used it to evaluate the quality of the data and make comparisons with radar tracking systems. EOS believes it is now at the stage of transitioning to operational data delivery contracts from commercial and government customers.

The Australian Government is expected to spend $500m from 2021 on the delivery of space data. There are currently no competitors for this activity, so EOS is well placed to win a large share of the contract.

EOS space sensors are fully automated and have built-in test capabilities for reduced maintenance. They can identify and monitor the orbits of space debris and other small space objects, down to 10cm in diameter. There are over 300,000 uncontrolled objects of 1cm size or larger orbiting Earth.

A key feature of the EOS network is the ability to use laser ranging for very rapid orbit determination, which has applications when an event in space generates many new space objects and orbits must be quickly determined.

The main laser tracking facility is located at the Mount Stromlo Observatory in Canberra. The rebuild of the facility following the Canberra bushfires included a major upgrade. A second facility was built at Learmonth in WA in 2018 and a third is planned for QLD. EOS is currently performing 15,000 space tracks per week.

The company’s facilities are regarded as most advanced private facilities in the world. The world’s leading facilities are government owned: Starfire in New Mexico (US Air Force), Russian Space Agency, and China (three sites).

**Chart 16. EOS tracking facility at Learmonth (WA)**

*Source: Company reports*

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**Laser** is an acronym for light amplification by stimulated emission of radiation. A laser is created when the electrons in atoms in special glasses, crystals, or gases absorb energy from an electrical current or another laser and become “excited.” The excited electrons move from a lower-energy orbit to a higher-energy orbit around the atom’s nucleus. When they return to their normal or “ground” state, the electrons emit photons (particles of light). These photons are all the same wavelength, so the light is one specific colour.
Crowded space

The first satellite was launched in 1957 by the Soviet Union (Sputnik 1). Now more than 40 countries own/operate satellites, and most countries depend on space-based capabilities for civilian applications, such as weather forecasting and navigation.

There are currently ~5,000 satellites orbiting the Earth, of which 382 were launched in 2018 (total launches of 8,387 since 1957). Of these, only 1,957 are active satellites, implying that over 3,000 inactive satellites are still orbiting. EOS launched its own satellite in 1998 (EOSCOM). The EOSCOM satellite carries optical retro-reflectors to facilitate laser tracking with low power laser beams.

Every space launch typically produces ~100 pieces of debris, from launch vehicles which remain in orbit, to smaller fragments produced by pyrotechnic devices used to separate the satellite from the launch vehicle. At present most fragmentation debris is produced by explosions that result from stored energy in launch vehicles and defunct satellites. Orbital velocity in low-Earth orbit is around 7-8 km/sec.

Space is becoming increasingly crowded and the risk of collision continues to rise. There are over 44,000 objects above 10cm in diameter currently orbiting the Earth.
The value of satellites currently orbiting the earth is estimated at $900bn. The current approach of monitoring by radar only provides 90% coverage and has limited accuracy in tracking small objects.

EOS believes its systems are not only highly effective at tracking all meaningful debris but also cost effective. It claims to be able to provide large data sets for less than 10% of the industry average per space track (fully-calibrated and meeting military standards of reliability and quality).

Management estimate the potential market is worth over $2bn for 2019 to 2029. But EOS is faced with somewhat of a chicken and egg scenario. The customers will not commit to contracts from a network that is not fully operational – EOS’s two sites are be equivalent to 10% of the required capacity.

Further expansion of the network is therefore likely, but not necessarily to a full build-out. Funding options for EOS could include selling the equipment and retaining a service agreement, or simply raising the capital itself and keeping full control.

**Space Situation Awareness (SSA)**

SSA is the development and maintenance of a comprehensive knowledge of the location and nature of objects in Earth orbit.

**Chart 20. Components of Space Situation Awareness**

Two events catapulted the concept of Space Situation Awareness to the fore:

- In January 2007, China successfully fired a missile at a non-functional Chinese weather satellite. In doing so, China became the third nation with anti-satellite (ASAT) capability, behind Russia and the USA. But the event created a large cloud of 3,000 pieces of space debris that will remain in orbit for hundreds of years.

- In February 2009 a collision occurred between an active Iridium Communications satellite and a defunct Russian satellite. This also created a debris cloud that will last many years.

ASAT activities pose a problem not only to the targeted spacecraft, but also to the entire orbital population through the generation of large amount of space debris. The debris from the 2007 and 2009 incidents account for more than a third of the recorded debris.
The chart below highlights the frequency of near misses for satellites.

**Chart 21. Near misses**

*Source: Company reports*

The US North American Aerospace Defence system primarily uses radar to track larger objects, with orbit predictions generated from these tracks used to assess likely collisions. If feasible, active satellites are moved to avoid collision. But shortcomings were exposed in by Iridium collision.

In August 2014, EOS signed a collaborative agreement with Lockheed Martin to provide space tracking services to the space industry. This involved the establishment of a second tracking site at Learmonth (Western Australia) that uses laser and sensitive optical systems to detect, track and characterise man-made debris objects. A US optical space surveillance telescope has been relocated to the site, and it has been joined by a space surveillance C-band radar.

The co-invested program has been used to deploy a particular type of sensor and test for its usefulness and utility in a military environment. The motive is to allow the US military to gain and maintain space superiority across the spectrum of conflict. This includes not only the knowledge of the space segment, but also the ground-based capabilities that enable the knowledge.

**Space Debris Mitigation**

In 2012, EOS was designated by the Western Pacific Laser Tracking Network (WPLTN) as the planning and coordinating centre for space debris tracking for collision avoidance. Member countries of WPLTN are Russia, China, India, Korea, Australia and Saudi Arabia.

In addition to tracking orbiting objects, EOS has been developing the capability to move objects that are on a collision course. EOS will initiate the manoeuvre of space debris in orbit from the ground using very high-power lasers in the Q4 2019.

Firing lasers into space with accuracy is difficult, to say the least. The Earth is surrounded by a layer of dust 90km above the surface that has been created by the evaporation of extra-terrestrial particles as they hit the atmosphere. It is called the sodium layer, because sodium is the easiest to detect. This layer distorts the laser beam as it passes through, so EOS has to first measure the thickness of the sodium layer and then makes the necessary adjustments to the laser beam.
Military applications

Satellites are the soft underbelly of the US’s security. US space systems and military satellite communications (MILSATCOM) systems are vulnerable to physical attack, electronic attack, and cyberattack. The main revenue opportunity for EOS’s Space business is therefore military applications.

The 1991 Gulf War marked a substantial shift in the way the US military uses space systems. The combination of space-based capabilities with conventional weapon systems greatly enhanced the success of reconnaissance strikes.

The military now relies on space-based systems for a number of core enabling capabilities. They collect images and intercept electronic signals to provide intelligence, surveillance, and reconnaissance on a global scale. Global Positioning Systems (GPS) provide precision navigation and timing services for a wide range of military and civilian users. Satellites are also used for missile launch warning and weather forecasting.

To illustrate the increased reliance on satellites: in the 1991 Gulf War the peak demand for MILSATCOM was 100Mbs; in the Serbian conflict the US consumed 250Mbs of satellite bandwidth; and in the Iraq War demand grew to 2,400Mbs for a deployed force that was less than half the Gulf War’s 500,000 troops.

Here lies the risk to the US. Potential adversaries are less reliant on space-based capabilities, so counter-space capabilities are likely to figure prominently in future conflicts. As space has become more crowded and contested, military space systems have not evolved to keep pace with the potential threat.
There are currently 31 active US-controlled GPS satellites orbiting the earth, with each believed to be shadowed by 2-3 Russian/Chinese satellites. In the event of war, these ASAT weapons can be manoeuvred closer for detonation. They typically hide among the crowded band of space debris, where it is difficult to be tracked by radar. EOS’s laser-based tracking system is not hindered by the debris.

The movement of individual ASATs toward a GPS happens occasionally, in what is believed to be an attempt to listen or simply to practice the manoeuvre. The US responds by moving its satellite. Given that the movement of several ASATs at the same time could be a prelude to war, close monitoring is necessary.

The advantage of directed energy weapons, such as lasers and high-powered microwave systems, is they can target space systems quickly and create effects that may not be immediately evident. A high-powered laser, for example, can damage critical satellite components such as solar arrays and sensors.

A jammer must operate in the same frequency band and within the field of view of the antenna it is targeting. Unlike physical attacks, jamming is reversible—once the jammer is disengaged, communications can be restored.

**Global Positioning System (GPS)** is a satellite-based navigation system that is owned by the US Government and operated by the US Air Force. It was launched in 1973, became fully operational in 1995 and was allowed free for civilian use in the 1980s. Separate systems are operated by Russia (GLONASS), the European Union (Galileo), China (BeiDou) and Japan (QZSS).

Destroying satellites of another country in a conflict could seriously hinder military operations. But shooting down satellites is difficult. While some have been successfully intercepted at low orbiting altitudes, GPS and communications satellites orbit at much higher altitudes, out of range of intercontinental ballistic missiles.

Furthermore, the tracking of military satellites for a length of time could be complicated by defensive measures such as changing the inclination of the orbit. The interceptor would also have to pre-determine the point of impact while compensating for the satellite’s lateral movement and the time for the interceptor to climb and move.

The constellation of 31 GPS satellites provides redundancy where at least four satellites can be received in six orbital planes at any one time, so an attacker would need to disable at least six satellites to disrupt the network.
**High Altitude Nuclear Explosions** (HANE) have the potential to cripple large numbers of active satellites through the electromagnetic pulse (EMP) produced and the increased hazard of trapped radiation. Although space-faring states are unlikely to resort to HANE in any war, rogue states may view this as a way to equalize warfare capabilities. Ground and space-based interception and jamming of signals has already been encountered by some space operators. The US military has set up a system to rapidly determine and locate interference to space assets.

- **ET phone home**

Space communication today is predominately via microwave technology, which is limited to a bandwidth of ~500GHz. This range is expected to hit capacity in the next few years, creating the need for a higher bandwidth. While optical communication can provide 40 times more at 20THz, it requires point-to-point fibre.

The EOS satellite (EOSCOM) is the only optical communication satellite capable of testing transmit-receive bandwidths of 20THz in space. Furthermore, its reflectors work at all possible relative velocities, and can simultaneously link with all on-orbit or ground-based transmitters.

The control of entangled photons is fundamental to the development of optical quantum communications. In 2017 a team of Chinese physicists sent intertwined quantum particles from the Micius satellite to ground stations separated by 1,200km (10x the previous record). This was viewed as a stepping stone to ultra-secure communication networks and, eventually, a space-based quantum internet.

The EOSCOM satellite was designed to allow entanglement testing over 2,500km. It is currently exploring options to commercialising its technology for long-range, ultra-wideband optical communications. On a more futuristic bent, this has applications for communication for deep space missions.

**Chart 24. Quantum tests by China’s Micius satellite**

*Source: Science*
**REVENUE MODEL AND COST STRUCTURE**

The revenue model for products sold by EOS is typically based on fixed prices, with scope for variances over the term of the contract. The profitability is therefore determined by scale and production efficiency.

The price of a standard RWS unit is $200k to $250k (gimble, control system and sensor) plus A$300,000-400,000 for the cannon (supplied by Northrop). There is scope to add features to the product.

**Chart 25. Standard price list**
*Source: Company reports; as at Jan’18*

<table>
<thead>
<tr>
<th>Product</th>
<th>Launch date</th>
<th>Approx. Price ($'000)</th>
<th>EBIT Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Weapon Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-400</td>
<td>2004</td>
<td>200</td>
<td>10%</td>
</tr>
<tr>
<td>R-600</td>
<td>2010</td>
<td>225</td>
<td>9%</td>
</tr>
<tr>
<td>R400S-Mk2</td>
<td>2017</td>
<td>250</td>
<td>10%</td>
</tr>
<tr>
<td>Remote Turrets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-2000</td>
<td>2018</td>
<td>1,500</td>
<td>10%</td>
</tr>
</tbody>
</table>

The largest costs are COGS and wages, which together account for ~75% of the cost structure. The manufacture of components is largely outsourced, but the assembly of the final product is by hand. There is limited scope for automation, so capacity expansion requires head count additions. EOS expenses all development costs.

EOS production capacity is enhanced by partnership arrangements with three major defence contractors:

- Northrop Grumman (US) – produces EOS weapons for sale to various US defence agencies, as well as exports.
- Singapore Technologies Kinetics (Singapore) – markets EOS weapons under the ADDER product name in multiple countries. It also provides depot support in Singapore and for the SE Asian region.
- Hyundai-Wia (Korea) – markets EOS weapons under the Hyundai brand, with sales restricted to the Korean military. It also provides depot support.

EOS also has a production facility in the UAE.
EARNINGS AND VALUATION

The historical profit performance has been somewhat volatile, reflecting the lumpy nature of contracts and long lead times. Along the way, the company has continued to invest in improving its technology and operating efficiency. The benefits are now being reaped, with an order book of $600m+ and potential contracts worth over $2.5bn in the offing.

The company has forecast Revenue for FY19-21E of $150m/$230m/$350m and EBIT forecasts for FY19-20E of $20m/$29m, based on the current backlog. Our forecasts are broadly similar. Tax losses are expected to be exhausted in FY20E.

Chart 28. Earnings forecasts
Source: Company reports and EAP Research

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Defence</td>
<td>85.0</td>
<td>148.5</td>
<td>242.2</td>
<td>335.4</td>
<td>355.4</td>
<td>362.3</td>
</tr>
<tr>
<td>- Space</td>
<td>1.4</td>
<td>2.2</td>
<td>5.6</td>
<td>10.6</td>
<td>20.7</td>
<td>40.7</td>
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<tr>
<td></td>
<td>86.3</td>
<td>150.7</td>
<td>247.8</td>
<td>346.0</td>
<td>376.1</td>
<td>403.0</td>
</tr>
<tr>
<td>Gross profit</td>
<td>43.1</td>
<td>74.2</td>
<td>118.7</td>
<td>164.1</td>
<td>179.9</td>
<td>196.3</td>
</tr>
<tr>
<td>...margin</td>
<td>50.0%</td>
<td>49.2%</td>
<td>47.9%</td>
<td>47.4%</td>
<td>47.8%</td>
<td>48.7%</td>
</tr>
<tr>
<td>Operating EBITDA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Defence</td>
<td>10.6</td>
<td>21.2</td>
<td>28.4</td>
<td>47.4</td>
<td>49.2</td>
<td>47.3</td>
</tr>
<tr>
<td>- Space</td>
<td>-2.1</td>
<td>-1.4</td>
<td>0.2</td>
<td>2.8</td>
<td>7.8</td>
<td>17.8</td>
</tr>
<tr>
<td>- Corporate</td>
<td>-1.2</td>
<td>-1.3</td>
<td>-1.4</td>
<td>-1.5</td>
<td>-1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.2</td>
<td>18.5</td>
<td>27.3</td>
<td>48.8</td>
<td>55.5</td>
<td>63.5</td>
</tr>
<tr>
<td>...margin</td>
<td>8.4%</td>
<td>12.3%</td>
<td>11.0%</td>
<td>14.1%</td>
<td>14.8%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Other</td>
<td>7.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>15.0</td>
<td>18.5</td>
<td>27.3</td>
<td>48.8</td>
<td>55.5</td>
<td>63.5</td>
</tr>
<tr>
<td>D&amp;A</td>
<td>0.6</td>
<td>0.8</td>
<td>1.2</td>
<td>1.7</td>
<td>2.1</td>
<td>2.6</td>
</tr>
<tr>
<td>Net Interest</td>
<td>0.8</td>
<td>1.5</td>
<td>1.3</td>
<td>0.6</td>
<td>0.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Tax</td>
<td>0.0</td>
<td>0.0</td>
<td>8.0</td>
<td>14.3</td>
<td>16.2</td>
<td>18.7</td>
</tr>
<tr>
<td>Minorities</td>
<td>-0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reported NPAT</td>
<td>15.3</td>
<td>19.2</td>
<td>19.4</td>
<td>33.4</td>
<td>37.8</td>
<td>43.6</td>
</tr>
<tr>
<td>Core NPAT</td>
<td>9.9</td>
<td>19.2</td>
<td>19.4</td>
<td>33.4</td>
<td>37.8</td>
<td>43.6</td>
</tr>
</tbody>
</table>

While maintenance revenue will build as more EOS systems are deployed in the field, the company is essentially a contract-based business and therefore needs to keep winning tenders.

In this regard, EOS is currently pitching on several very larger tenders over the next two years:

- R-400S – US Army, $300m a year for 10yrs
- R-800 – US Army (Stryker program), $1bn
- RWS for Light Reconnaissance Vehicle – US Army, $400m
- RWS for Drones – multiple customers, $800m
- Remote Turret – Australian Army, $1bn

Management is confident of winning a sizeable share of these contracts.
Cash flow

Free cash flow is forecast to remain negative until FY22E, reflecting the working capital requirements on large contracts (~10% of value). The production lead time on RWS is typically six months. But because requirements from customers can be urgent, EOS maintains an inventory of weapon systems that can be completed and delivered within 2-3 months.

We have not assumed any capital raising, but note that EOS has in the past raised funds after winning major contracts.

Chart 29. Cash flow
Source: Company reports and EAP Research

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash EBITDA</td>
<td>16.7</td>
<td>18.5</td>
<td>27.3</td>
<td>48.8</td>
<td>55.5</td>
<td>63.5</td>
</tr>
<tr>
<td>Working capital</td>
<td>-33.1</td>
<td>-25.7</td>
<td>-40.7</td>
<td>-33.5</td>
<td>-11.5</td>
<td>-11.3</td>
</tr>
<tr>
<td>Interest &amp; Tax</td>
<td>0.8</td>
<td>1.5</td>
<td>-5.9</td>
<td>-13.1</td>
<td>-15.4</td>
<td>-17.1</td>
</tr>
<tr>
<td>Capex</td>
<td>-3.2</td>
<td>-3.0</td>
<td>-3.5</td>
<td>-3.9</td>
<td>-4.4</td>
<td>-4.9</td>
</tr>
<tr>
<td>Free cash flow</td>
<td>-18.9</td>
<td>-8.7</td>
<td>-22.8</td>
<td>-1.7</td>
<td>24.3</td>
<td>30.3</td>
</tr>
<tr>
<td>Acquisitions/Disposals</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Dividends</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Share issues</td>
<td>58.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Other</td>
<td>-0.1</td>
<td>1.5</td>
<td>1.0</td>
<td>0.8</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>(Inc./Dec. net debt</td>
<td>39.5</td>
<td>-7.2</td>
<td>-21.8</td>
<td>-0.9</td>
<td>24.5</td>
<td>30.3</td>
</tr>
</tbody>
</table>

Balance sheet

EOS’s balance sheet primarily consists of working capital. The company expenses all R&D, so there are no intangibles. Fixed assets are relatively low because most manufacturing is outsourced, and premises are leased (including peppercorn rent on government owned sites housing the Space business). The ESCOM satellite is in the books at zero value.

Chart 30. Balance sheet
Source: Company reports and EAP Research

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>49.5</td>
<td>42.3</td>
<td>20.5</td>
<td>19.5</td>
<td>44.0</td>
<td>74.3</td>
</tr>
<tr>
<td>Receivables</td>
<td>26.2</td>
<td>41.3</td>
<td>67.9</td>
<td>94.8</td>
<td>103.0</td>
<td>110.4</td>
</tr>
<tr>
<td>Inventories</td>
<td>26.5</td>
<td>43.3</td>
<td>71.3</td>
<td>99.5</td>
<td>108.2</td>
<td>115.9</td>
</tr>
<tr>
<td>Fixed assets</td>
<td>4.0</td>
<td>6.2</td>
<td>8.4</td>
<td>10.6</td>
<td>12.9</td>
<td>15.2</td>
</tr>
<tr>
<td>Intangibles</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Prepayments</td>
<td>15.0</td>
<td>25.2</td>
<td>35.6</td>
<td>38.4</td>
<td>40.4</td>
<td>43.3</td>
</tr>
<tr>
<td>Other assets</td>
<td>7.7</td>
<td>10.6</td>
<td>14.0</td>
<td>16.8</td>
<td>17.6</td>
<td>18.2</td>
</tr>
<tr>
<td>Total assets</td>
<td>128.9</td>
<td>169.0</td>
<td>217.7</td>
<td>279.7</td>
<td>326.1</td>
<td>377.3</td>
</tr>
<tr>
<td>Creditors</td>
<td>11.3</td>
<td>20.6</td>
<td>33.9</td>
<td>47.4</td>
<td>51.5</td>
<td>55.2</td>
</tr>
<tr>
<td>Borrowings</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Unearned revenue</td>
<td>9.7</td>
<td>16.8</td>
<td>27.7</td>
<td>38.7</td>
<td>42.0</td>
<td>45.0</td>
</tr>
<tr>
<td>Other liabilities</td>
<td>11.7</td>
<td>16.0</td>
<td>21.2</td>
<td>25.4</td>
<td>26.5</td>
<td>27.4</td>
</tr>
<tr>
<td></td>
<td>32.6</td>
<td>53.5</td>
<td>82.8</td>
<td>111.4</td>
<td>120.0</td>
<td>127.7</td>
</tr>
<tr>
<td>Shareholders Funds</td>
<td>96.3</td>
<td>115.5</td>
<td>134.9</td>
<td>168.3</td>
<td>206.1</td>
<td>249.7</td>
</tr>
</tbody>
</table>
Valuation

Our blended valuation of EOS is $5.62 a share, with a range of $3.76 to $7.82. At the low end is our DCF, which is impacted by the negative free cash flow in the early years. We have used a discount rate of 11%, incorporating a Risk Free Rate of 5%, Equity Risk Premium of 6% and Beta of 1.0. At the upper end of the range is our PER valuation, which is based on a multiple of 22.5x earnings for FY21E.

Chart 31. Valuation
Source: EAP Research

<table>
<thead>
<tr>
<th>Valuation method</th>
<th>Per share</th>
<th>Disc rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCF</td>
<td>$3.76</td>
<td>11.0%</td>
</tr>
<tr>
<td>EV/EBITDA (y+2)</td>
<td>$5.28</td>
<td>10.0</td>
</tr>
<tr>
<td>PER (y+2)</td>
<td>$7.82</td>
<td>22.5</td>
</tr>
<tr>
<td>...average</td>
<td>$5.62</td>
<td></td>
</tr>
</tbody>
</table>

The table below shows the current trading multiples for the major defence contractors, as well as the Australian-based Austal.

Chart 32. Comps
Source: Bloomberg

<table>
<thead>
<tr>
<th>Revenue (US$m)</th>
<th>FY18</th>
<th>FY19F</th>
<th>FY20F</th>
<th>PER</th>
<th>FY18</th>
<th>FY19F</th>
<th>FY20F</th>
<th>EV/EBITDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAE Systems</td>
<td>24,575</td>
<td>23,859</td>
<td>25,148</td>
<td>13.9</td>
<td>12.4</td>
<td>11.7</td>
<td>10.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Raytheon</td>
<td>27,058</td>
<td>29,032</td>
<td>30,925</td>
<td>16.5</td>
<td>15.5</td>
<td>13.9</td>
<td>10.0</td>
<td>10.5</td>
</tr>
<tr>
<td>General Dynamics</td>
<td>36,193</td>
<td>39,105</td>
<td>41,062</td>
<td>16.1</td>
<td>15.5</td>
<td>14.0</td>
<td>12.2</td>
<td>12.2</td>
</tr>
<tr>
<td>Lockheed Martin</td>
<td>53,762</td>
<td>58,821</td>
<td>62,335</td>
<td>17.6</td>
<td>17.3</td>
<td>14.4</td>
<td>12.2</td>
<td>12.3</td>
</tr>
<tr>
<td>Northrop Grumman</td>
<td>30,095</td>
<td>34,038</td>
<td>36,158</td>
<td>16.2</td>
<td>17.7</td>
<td>15.5</td>
<td>13.7</td>
<td>14.8</td>
</tr>
</tbody>
</table>

| Average | 16.1 | 15.7 | 13.9 | 11.6 | 11.8 | 10.8 |
| Avg Austal (A$m) | 1,392 | 1,873 | 1,828 | 36.9 | 25.6 | 21.8 | 11.3 | 10.3 | 9.5 |
MARKET DYNAMICS AND COMPETITIVE ADVANTAGE

Global military expenditure totalled US$1,727bn in 2018, with the US spending the most at $649bn, followed by China at $250bn. EOS has sold RWS units to the military in Australia, Korea, NATO, Singapore, Saudi Arabia and the US.

The US is expected to become EOS’s single largest customer over the next five years. The US defence budget has risen and fallen in irregular cycles in response to changes in the economic and security environment.

The chart below shows the sizeable drawdowns following the Korean and Vietnam Wars and 1980s Build-up. Also accompanying these was a large reduction in the size of the military force (-1.1m, -1.5m and -0.8m respectively). The military force remained relatively constant at around 1.5m during Iraq/Afghanistan.

Chart 35. US spending on procurement, operations/maintenance  
Source: US DOD
The charts below show the breakup of spending in the 2020 US defence budget.

**Chart 36. US major weapon systems budget (2020, US$bn)**  
*Source: US DoD*

**Chart 37. US spend by component and category (2020)**  
*Source: US DoD*

The 2020 budget is 61% greater than the low point in FY2015, and represents a major move to modernize and increase the overall lethality of the U.S. military force. The chart below shows the breakup of spending on major weapon systems.

**Chart 38. US spending on major weapon systems (US$bn)**  
*Source: US DoD*

EOS estimates the market for the next-gen manned RWS is $7bn. The company has already won $0.8bn, submitted tenders for $2.2bn, and is pre-tender qualified for another $2.1bn. The remaining $2bn is expected to come to market in the next three years. No competitor has so far won any contracts.

EOS estimates there is at least another $9bn of contracts for unmanned RWS exploiting the full architecture of its new technology, including defence against drones.
The T2000 turret will commence live fire trials in late 2019. It was co-developed by EOS and Elbit Systems. It is adaptable to a wide range of wheeled and tracked platforms, and combines the mechanical structure of the Elbit UT30 Mk 2 turret with the fire control systems and sensors developed by EOS.

**Chart 39. US ground systems budget (2020, US$bn)**  
*Source: US DoD*

Since EOS developed the first RWS unit for the US Army there has been an influx of competitors. Kongsberg has sold the most conventional RWS units (>10,000, c.f. 2,000 for EOS). The global market for conventional RWS peaked at US$690m in 2010, as Kongsberg delivered the CROWS 2 contract to the US Army. The market since fallen to ~US$80m a year.

The next-gen RWS (Advanced RWS) is more accurate, weighs less and delivers 30mm cannon fire. EOS was first to market, but other competitors will emerge.

**Table 1. RWS market competitors**  
*Source: Company reports*

<table>
<thead>
<tr>
<th>Conventional RWS</th>
<th>Advanced RWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rafael Advanced Defense Systems (Israel)</td>
<td>Moog (US)</td>
</tr>
<tr>
<td>Elbit Systems (Israel)</td>
<td>Kongsberg (Norway)</td>
</tr>
<tr>
<td>Aselsan (Turkey)</td>
<td>Rafael Advanced Defense Systems (Israel)</td>
</tr>
<tr>
<td>Kongsberg (Norway)</td>
<td>Aselsan (Turkey)</td>
</tr>
</tbody>
</table>
RISKS

EOS defence products are exported from Australia to allies and coalition partners of Australia and the USA, and access is subject to simultaneous formal approval by both those countries. This dual restriction renders those products amongst the most highly controlled in the world, since both the USA and Australia closely observe the laws of armed conflict and apply high standards for human rights.

The common theme when dealing with military customers is long lead times on decisions and production. This provides earnings risk.

The Space business has been decades in the making, and while management believes that sizeable contracts are in the offing, there is a risk that the process drags on and losses continue.

While earnings forecast for the next two years are largely underpinned by the existing backlog of orders, EOS is essentially a contract-based business, so it need to keep winning tenders.

Technology is constantly evolving, so EOS needs to keep ahead of the curve and continue to successfully develop new products.

BOARD AND KEY MANAGEMENT

The Board comprises three executive and three non-executive directors.

- Fred Bart (Chairman) – extensive experience with companies specialising in manufacturing, property, technology and marketable securities. Chairman of Immunovative Therapies (Israel), chairman of Audio Pixels, and director of Weebit Nono.

- Dr Ben Greene (CEO) – PhD in Applied Physics, established laser space tracking in Australia and the US Army remote weapon programs, and is the founding CEO of EOS. He is published in the subject areas of weapon system design, laser tracking, space geodesy, quantum physics, satellite design, laser remote sensing, and the metrology of time. Deputy Chair of the Western Pacific Laser Tracking Network.

- Ian Dennis (Exec. Dir. and Company Sect.) – Chartered Accountant with experience as director and secretary in various public listed companies and unlisted technology companies in Australia and overseas. Extensive experience in the investment banking and stockbroking industry, and prior to that with KPMG. Director of Audio Pixels.

- Lt Gen Peter Leahy (Non-exec Dir.) – Retired from the Australian Army in 2008 as a Lt Gen in the position of Chief of Army. BA (Military Studies) and a Master of Military Arts and Science. Director of Codan, Citadel Group and a member of the advisory board to Warpforge Limited. Member of the First Principles Review of the Department of Defence, a member of the Advisory Council of China Matters and the Strategic Defence Advisor.

- Air Marshal Geoff Brown (Non-exec Dir.) – Retired from the Royal Australian Air Force in July 2015 as Air Marshal in the position of Chief of Air Force. BEng (Mech) and Master of Arts (Strategic Studies). Director of Lockheed Martin (Australia) Pty Limited, Chairman of the Sir Richard Williams Foundation and Chairman of the Advisory Board of CAE Asia Pacific.
The Hon Kate Lundy (Non-exec Dir.) – Former Senator representing the ACT from 1996 to 2015, holding various front bench positions in both Government and Opposition, including the Minister for Sport, Multicultural Affairs and Assisting on Industry and Innovation and the Digital Economy. Non-exec director of the Australian Grand Prix Corporation, NRMA, Cyber Security Research Centre and the National Youth Science Forum. Member of ACT Defence Industry Advisory Board and ACT Defence Industry Ambassador.

Senior executives include:

- Craig Smith (CEO Space Systems) – joined in 1998 as Head of R&D and appointed CEO of Space Systems in 2003. Previously a Senior Research Fellow at the Australian Defence Force Academy, and lecturer in Physics, Electronics and Military Ballistics. Holds Bachelors and PhD degrees from the University of Melbourne.

- Grant Sanderson (CEO Defence Systems) – joined EOS in 2018 but worked as a consultant during 2016 and 2017. Military veteran of 25 years. Prior to joining EOS was the VP Strategy and Business Development in Australia for the Israeli defence technology company Elbit Systems. Previously GM Strategy for the Thales Australia Land Division and was instrumental in the major product and manufacturing reforms that brought the Hawkei, Steyr F90 rifle and ammunition products to market, including the international sales drive for the Bushmaster PMV.

- Warwick Holloway (Pres. Defence Systems, Aust.) – joined in 2011 and appointed CEO of Defence Systems in 2014. He is responsible for management of the business, control of manufacturing activities, coordination of programs and projects and business development activities. He holds a BSc and a Bachelor of Electrical & Electronic Engineering from Monash University, and a PhD in Electrical and Electronic Engineering from the University of Melbourne.

- Scott Lamond (CFO) – joined in 2006 and was appointed CFO in 2012. Past experience in SME manufacturing, particularly agricultural machinery. CPA and started career in insolvency and reconstruction.
ELECTRO OPTIC SYSTEMS HOLDING (EOS.ASX), Positive, VALUATION $5.62

EAP CORE DRIVERS

- Defence contracts – the weapons business has an order backlog of more than $600m and it has tender submissions for more than $2.5bn with existing customers. A large potential market is starting to develop in anti-drone defence systems, with EOS at the forefront.

- Space contracts – EOS performs more than 15,000 space tracks per week and will soon commence live testing of high-power lasers to manoeuvre space debris in orbit. The main revenue opportunity for EOS is military, with management estimating the potential market to be worth $2bn over the next 10 years.

- Quantum Communications – this involves control of entangled photons. While the world is focused on developing ultra-secure communication networks, EOS is exploring options to commercialise its technology for long-range, ultra-wideband optical communications (i.e. 20THz).

INVESTMENT THESIS

- Electro Optic Systems (EOS) makes advanced weapon systems for the military and develops tracking systems for orbiting satellites and space debris. At the core of the company’s IP is laser technology and the ability to tackle problems from a science-based perspective. Demand for the weapons business is growing strongly (contract wins and new tenders), and the market is finally opening for the space business, after decades of development.
## Stock Focus – ELECTRO OPTIC SYSTEMS HOLDING (EOS.ASX)

### FINANCIAL SUMMARY

**ELECTRO OPTIC SYSTEMS HOLDING**  
As at: 6/08/2019  
Recommendation: **Positive**  
Share Price: $3.87

<table>
<thead>
<tr>
<th>Year end</th>
<th>June 2018A</th>
<th>2019E</th>
<th>2020E</th>
<th>2021E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INCOME STATEMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales revenue</td>
<td>$m 86</td>
<td>151</td>
<td>248</td>
<td>346</td>
</tr>
<tr>
<td>EBITDA</td>
<td>$m 7</td>
<td>19</td>
<td>27</td>
<td>49</td>
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<tr>
<td>Depreciation</td>
<td>$m (1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>EBIT (ex associates)</td>
<td>$m 7</td>
<td>18</td>
<td>26</td>
<td>47</td>
</tr>
<tr>
<td>Equity accounted profits</td>
<td>$m 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EBIT (incl associates)</td>
<td>$m 7</td>
<td>18</td>
<td>26</td>
<td>47</td>
</tr>
<tr>
<td>Net interest</td>
<td>$m 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pre-tax profit</td>
<td>$m 7</td>
<td>19</td>
<td>27</td>
<td>48</td>
</tr>
<tr>
<td>Tax expense</td>
<td>$m 2</td>
<td>0</td>
<td>(8)</td>
<td>(14)</td>
</tr>
<tr>
<td>Net profit</td>
<td>$m 10</td>
<td>19</td>
<td>33</td>
<td>66</td>
</tr>
<tr>
<td>Oth./Outside equity interests</td>
<td>$m 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NPAT attributable to s'hers</td>
<td>$m 10</td>
<td>19</td>
<td>33</td>
<td>66</td>
</tr>
<tr>
<td>Net EBIT (incl normal items)</td>
<td>$m 10</td>
<td>19</td>
<td>33</td>
<td>66</td>
</tr>
<tr>
<td>Reported NPAT</td>
<td>$m 15</td>
<td>19</td>
<td>33</td>
<td>66</td>
</tr>
</tbody>
</table>

### BALANCE SHEET

**Assets**  
Cash $m 50 | 42 | 20 | 20 |
Working Capital $m 53 | 85 | 139 | 194 |
PP&E $m 4 | 6 | 8 | 11 |
Intangibles $m 0 | 0 | 0 | 0 |
Investments $m - | - | - | - |
Other $m 23 | 36 | 50 | 55 |
**Total Assets** $m 129 | 169 | 218 | 280 |

**Liabilities**  
Debt $m 0 | 0 | 0 | 0 |
Working Capital $m 11 | 21 | 34 | 47 |
Other $m 21 | 33 | 49 | 64 |
**Total Liabilities** $m 33 | 53 | 86 | 117 |
Net Assets $m 96 | 115 | 135 | 168 |
Ordinary Equity $m 96 | 115 | 135 | 168 |
Minority Interests $m 0 | 0 | 0 | 0 |
**Total Shareholders’ Funds** $m 96 | 115 | 135 | 168 |
Capital Employed $m 47 | 73 | 114 | 149 |

### CASH FLOW

**EBITDA** $m 7 | 19 | 27 | 49 |
**Change in Working Capital** $m (33) | (26) | (41) | (34) |
**Other** $m 9 | 0 | 0 | 0 |
**Gross Operating Cash Flow** $m (16) | (7) | (13) | (15) |
**Net interest paid** $m 1 | 1 | 1 | 1 |
**Tax paid** $m 0 | 0 | (7) | (14) |
**Net Operating Cash Flow** $m (16) | (6) | (19) | (2) |
**Maintenance capex** $m 0 | (1) | (1) | (1) |
**Free Cash Flow** $m (16) | (6) | (20) | 1 |
**Dividends paid** $m 0 | 0 | 0 | 0 |
**Net acquisitions/Growth capex** $m (3) | (2) | (3) | (3) |
**Equity raisings/Buybacks** $m 58 | 0 | 0 | 0 |
**Net borrowings** $m 0 | 0 | 0 | 0 |
**Other** $m 0 | 2 | 1 | 1 |
**Net change in cash** $m 39 | (7) | (22) | (1) |
**GOCF/EBITDA** % (226.8) | (38.6) | (49.2) | 31.3 |
**Total Capex/Sales** % 3.7 | 2.0 | 1.4 | 1.1 |
**Total Capex/Depreciation** x 5.0 | 3.8 | 2.8 | 2.3 |

### FINANCIAL RATIOS

**Profitability**

<table>
<thead>
<tr>
<th>Year end</th>
<th>June 2018A</th>
<th>2019E</th>
<th>2020E</th>
<th>2021E</th>
</tr>
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<tbody>
<tr>
<td>EPS</td>
<td>$/sh 1.3</td>
<td>2.0</td>
<td>20.2</td>
<td>34.8</td>
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<tr>
<td>DPS</td>
<td>$/sh 0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Growth</td>
<td>% 11.0</td>
<td>29.1</td>
<td>72.4</td>
<td>39.6</td>
</tr>
</tbody>
</table>

**Valuation**

<table>
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<tr>
<th>Year end</th>
<th>June 2018A</th>
<th>2019E</th>
<th>2020E</th>
<th>2021E</th>
</tr>
</thead>
<tbody>
<tr>
<td>P/E</td>
<td>13.5</td>
<td>11.1</td>
<td>12.9</td>
<td>7.2</td>
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<tr>
<td>P/S</td>
<td>3.87</td>
<td>42.5</td>
<td>42.5</td>
<td>42.5</td>
</tr>
<tr>
<td>P/BV</td>
<td>3.9</td>
<td>2.8</td>
<td>2.2</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source: Company data, E&amp;P estimates</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
Stock Focus – ELECTRO OPTIC SYSTEMS HOLDING (EOS.ASX)

RESEARCH RECOMMENDATION DEFINITIONS

Positive Stock is expected to outperform the S&P/ASX 200 over the coming 24 months
Neutral Stock expected to perform in line with the S&P/ASX 200 over the coming 24 months
Negative Stock is expected to underperform the S&P/ASX 200 over the coming 24 months

Speculative Buy Stock has limited history from which to derive a fundamental investment view or its prospects are highly dependent on event risk, eg. Successful exploration, scientific breakthrough, high commodity prices, regulatory change, etc. Consequently, the stock is considered a high risk investment which may be prone to high volatility in share price movements, have a greater risk of capital loss and/or the stock may have low liquidity.

Suspended Stock is temporarily suspended due to compliance with applicable regulatory and/or Evans & Partners policies in circumstances where Evans & Partners is acting in an advisory capacity.

Not Rated Stock is not included in our investment research universe.

Research Criteria Definitions
Recommendations are primarily determined with reference to how a stock ranks relative to the S&P/ASX 200 on the following criteria:

Valuation Composite of Rolling 12 month prospective multiples and discounted cash flow (DCF), or DCF for resource stocks.

Earnings Outlook Forecast 2 year EPS growth.

Earnings Momentum Percentage change in the current consensus EPS estimate for the stock (rolling 1 year forward basis) over the consensus EPS estimate for the stock 3 months ago.

Shareholder Returns Composite of forecast ROE (rolling 1 year forward basis) and the percentage change in ROE over 2 years.

Debt Servicing Capacity Rolling 12 month EBIT Interest Cover ratio.

Cyclical Risk Qualitative assessment of the 2 year outlook for a stock/industry’s profit cycle.

Industry Quality Qualitative assessment of an industry’s growth/returns potential and company specific management capability.

Financial Transparency If we don’t understand it, we won’t recommend it.

For stocks where Evans & Partners does not generate its own forecasts, Bloomberg consensus data is used. Analysts can introduce other factors when determining their recommendation, with any material factors stated in the written research where appropriate.
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Stock Focus – ELECTRO OPTIC SYSTEMS HOLDING (EOS.ASX)

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<table>
<thead>
<tr>
<th>Security</th>
<th>Nature of Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>APOF</td>
<td>The Responsible Entity (RE) and Fund Manager of Fort Street Real Estate Capital Fund I (APOF), the Trustee of APOF’s primary underlying investment, the Australian Property Opportunities Trust I (APOF Trust) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. The Investment Manager (IM) of APOF is partially owned by a related body corporate of Evans and Partners. Each of the RE, Fund Manager, Trustee and IM will receive fees for services provided to APOF and/or APOF Trust. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE, Fund Manager, Trustee and/or IM of APOF and/or APOF Trust. Each individual receives remuneration from Evans Dixon and/or its related entities.</td>
</tr>
<tr>
<td>APOF II</td>
<td>The Responsible Entity (RE) and Fund Manager of Fort Street Real Estate Capital Fund II (APOF II), the Trustee of APOF II’s primary underlying investment, the Australian Property Opportunities Trust II (APOF Trust II) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. The Investment Manager (IM) of APOF II is partially owned by a related body corporate of Evans and Partners. Each of the RE, Fund Manager, Trustee and IM will receive fees for services provided to APOF II and/or APOF Trust II. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE, Fund Manager, Trustee and/or IM of APOF II and/or APOF Trust II. Each individual receives remuneration from Evans Dixon and/or its related entities.</td>
</tr>
<tr>
<td>APOF III</td>
<td>The Responsible Entity (RE) and Fund Manager of Fort Street Real Estate Capital Fund III (APOF III), the Trustee of APOF III’s primary underlying investment, the Australian Property Opportunities Trust III (APOF Trust III) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. The Investment Manager (IM) of APOF III is partially owned by a related body corporate of Evans and Partners. Each of the RE, Fund Manager, Trustee and IM will receive fees for services provided to APOF III and/or APOF Trust III. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE, Fund Manager, Trustee and/or IM of APOF III and/or APOF Trust III. Each individual receives remuneration from Evans Dixon and/or its related entities.</td>
</tr>
<tr>
<td>AGM</td>
<td>The Responsible Entity (RE) and Investment Manager (IM) of Australian Governance &amp; Ethical Index Fund (AGM) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. The RE and IM will receive fees for acting as RE and IM of AGM. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE and/or IM of AGM. Each individual receives remuneration from Evans Dixon and/or its related entities.</td>
</tr>
<tr>
<td>AUI</td>
<td>The Issuer has appointed Evans and Partners as Broker to an on-market buy-back. Accordingly, Evans and Partners is unable to give Sellers advice in respect to a sale of this security.</td>
</tr>
<tr>
<td>AXL</td>
<td>Evans and Partners has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.</td>
</tr>
<tr>
<td>AYL</td>
<td>Evans and Partners Pty Ltd and the Investment Manager (IM) of Australian Masters Yield Fund No 4 Limited (AYL) are wholly owned subsidiaries of Evans Dixon Ltd (Evans Dixon) and related bodies corporate. The IM will receive fees for acting as IM of AYL. A director of Evans and Partners is a director of AYL. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the IM and they each receive remuneration from Evans Dixon and/or its related entities.</td>
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<tr>
<td>AYZ</td>
<td>Evans and Partners Pty Ltd and the Investment Manager (IM) of Australian Masters Yield Fund No 5 Limited (AYZ) are wholly owned subsidiaries of Evans Dixon Ltd (Evans Dixon) and related bodies corporate. The IM will receive fees for acting as IM of AYZ. A director of Evans and Partners is a director of AYZ. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the IM and they each receive remuneration from Evans Dixon and/or its related entities.</td>
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<tr>
<td>BRG</td>
<td>A director of Evans Dixon Limited, the ultimate holding company of Evans and Partners Pty Ltd, is a director of Breville Group Limited.</td>
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<td>CARREV</td>
<td>Evans Dixon Corporate Advisory Pty Limited, a related entity of Evans and Partners Pty Limited, has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.</td>
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<tr>
<td>CBA</td>
<td>Evans Dixon Corporate, a division of Evans and Partners Pty Ltd, has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.</td>
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The Responsible Entity (RE) of CD1, other entities that provide services to Cordish Dixon Private Equity Fund I (CD1) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. Each of the RE and other related entities will receive fees for services provided to CD1. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE of CD1 and/or other related entities that provide services to CD1. A director of Evans and Partners Pty Ltd is a director of the Investment Manager of the Limited Partnership, the investment vehicle through which CD1 invests. Each individual receives remuneration from Evans Dixon and/or its related entities.

The Responsible Entity (RE) of CD2, other entities that provide services to Cordish Dixon Private Equity Fund II (CD2) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. Each of the RE and other related entities will receive fees for services provided to CD2. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE of CD2 and/or other related entities that provide services to CD2. A director of Evans and Partners Pty Ltd is a director of the Investment Manager who provides investment management services to the General Partner for the Limited Partnership, the investment vehicle through which CD2 invests. Each individual receives remuneration from Evans Dixon and/or its related entities.

The Responsible Entity (RE) of CD3, other entities that provide services to Cordish Dixon Private Equity Fund III (CD3) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. Each of the RE and other related entities will receive fees for services provided to CD3. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE of CD3 and/or other related entities that provide services to CD3. A director of Evans and Partners Pty Ltd is a director of the Investment Manager who provides investment management services to the General Partner for the Limited Partnership, the investment vehicle through which CD3 invests. Each individual receives remuneration from Evans Dixon and/or its related entities.

Evans and Partners has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.

The Trustee (Trustee) and the Investment Manager (IM) of CVC Emerging Companies Fund (Fund) and Evans and Partners Pty Ltd are wholly or partly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. The Trustee and IM will receive fees for acting as Trustee and IM of the Fund. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the Trustee and/or IM of the Fund. A director of Evans and Partners is a Portfolio Manager of the Fund. Each individual receives remuneration from Evans Dixon and/or its related entities.

The Issuer has appointed Evans and Partners as Broker to an on-market buy-back. Accordingly, Evans and Partners is unable to give sellers advice in respect to a sale of this security.

Evans Dixon Corporate Advisory Pty Limited, a related entity of Evans & Partners Pty Limited and a member of the Evans Dixon Group, has provided advisory services to the company in the past 12 months, for which it received a fee.

The Issuer has appointed Evans and Partners as Broker to an on-market buy-back. Accordingly, Evans and Partners is unable to give Sellers advice in respect to a sale of this security.

The Responsible Entity (RE) and Investment Manager (IM) of Evans and Partners Asia Fund (EAF), other entities that provide services to EAF and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. Each of the RE, IM and other entities will receive fees for services provided to EAF. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE and/or IM of EAF. The Portfolio Manager and Assistant Portfolio Manager of EAF are employees of Evans Dixon and/or its related bodies corporate. Each individual receives remuneration from Evans Dixon and/or its related entities.

The Responsible Entity (RE) and Investment Manager (IM) of Evans and Partners Australian Flagship Fund (EFF), other entities that provide services to EFF and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. Each of the RE, IM and other entities will receive fees for services provided to EFF. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE and/or IM of EFF. Directors or employees of Evans Dixon and/or its related bodies corporate are members of the EFF Investment Committee and/or Portfolio Managers of EFF. Each individual receives remuneration from Evans Dixon and/or its related entities.

The Responsible Entity (RE) and Investment Manager (IM) of Evans and Partners Global Disruption Fund (EGD) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. The RE and IM will receive fees for acting as RE and IM of EGD. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE and/or IM of EGD. Directors or employees of Evans Dixon and/or its related bodies corporate are members of the EGD Investment Committee and/or Portfolio Managers of EGD. Each individual receives remuneration from Evans Dixon and/or its related entities.

The Responsible Entity (RE) and Investment Manager (IM) of Evans & Partners Global Flagship Fund (EGF) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. The RE and IM will receive fees for acting as RE and IM of EGF. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE and/or IM of EGF. Employees of Evans Dixon and/or its related bodies corporate are Portfolio Managers of EGF. Each individual receives remuneration from Evans Dixon and/or its related entities.

The Responsible Entity (RE) and Fund Administrator of Fort Street Real Estate Capital Trust IV (FSREC IV), the Trustee of FSREC IV’s primary underlying investment, Fort Street Real Estate Capital Trust IV (the Trust) and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. The Investment Manager (IM) of FSREC IV is partially owned by a related body corporate of Evans and Partners. Each of the RE, Fund Administrator, Trustee and IM will receive fees for services provided to FSREC IV and/or the Trust. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE, Fund Administrator and/or Trustee of FSREC IV and/or the Trust. Each individual receives remuneration from Evans Dixon and/or its related entities.

Evans Dixon Corporate Advisory Pty Limited, a related entity of Evans & Partners Pty Limited and a member of the Evans Dixon Group, is currently providing advisory services to the company, for which it will receive a fee.

A director of Evans Dixon Limited, the ultimate holding company of Evans and Partners Pty Ltd, is a director of Investec Australia Property Fund.
**Stock Focus – ELECTRO OPTIC SYSTEMS HOLDING (EOS.ASX)**

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<tr>
<th>Company</th>
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<td>LE.US</td>
<td>A director of Evans Dixon Limited, the ultimate holding company of Evans and Partners Pty Ltd, is a director of Lands’ End Inc.</td>
</tr>
<tr>
<td>MQG</td>
<td>Evans Dixon Corporate Advisory Pty Limited, a related party of Evans and Partners, has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.</td>
</tr>
<tr>
<td>NAB</td>
<td>Evans and Partners has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.</td>
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<tr>
<td>NBI</td>
<td>Evans Dixon Corporate Advisory Pty Limited, a related party of Evans and Partners Pty Ltd, has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.</td>
</tr>
<tr>
<td>NEW</td>
<td>The Responsible Entity (RE) and the Investment Manager (IM) of New Energy Solar (NES), Evans and Partners Pty Ltd and Evans Dixon Corporate Advisory Pty Limited are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. The RE and IM will receive fees for acting as RE and IM of NES. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE and/or IM of NES. Each individual receives remuneration from Evans Dixon and/or its related entities.</td>
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<tr>
<td>PMV</td>
<td>A director of Evans Dixon Limited, the ultimate holding company of Evans and Partners Pty Ltd, is a director of Premier Investments Limited.</td>
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<tr>
<td>QRI</td>
<td>Evans Dixon Corporate, a division of Evans and Partners Pty Ltd, has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.</td>
</tr>
<tr>
<td>RF1</td>
<td>Evans Dixon Corporate Advisory Pty Limited, a related party of Evans and Partners, has been appointed Joint Lead Manager to an offering of securities of the company, for which it will receive a fee.</td>
</tr>
<tr>
<td>SOHS.US</td>
<td>A director of Evans Dixon Limited, the ultimate holding company of Evans and Partners Pty Ltd, is a director of Sears Hometown &amp; Outlet Stores Inc.</td>
</tr>
<tr>
<td>SUN</td>
<td>A director of Evans Dixon Limited, the ultimate holding company of Evans and Partners Pty Ltd, is a director of Suncorp Group Limited.</td>
</tr>
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<td>SWM</td>
<td>A director of Evans and Partners Pty Ltd is a director of Seven West Media Limited.</td>
</tr>
<tr>
<td>URF</td>
<td>The Responsible Entity (RE) and Investment Manager (IM) of US Masters Residential Property Fund (URF), other entities that provide services to URF and Evans and Partners Pty Ltd are wholly owned subsidiaries of Evans Dixon Ltd and related bodies corporate. Each of the RE, IM and other related entities will receive fees for services provided to URF. Directors or employees of Evans Dixon and/or its related bodies corporate are directors of the RE, IM of URF and/or other related entities that provide services to URF. A director of Evans and Partners Pty Ltd is a director of URF’s primary underlying investment, US Masters Residential Property (USA) Fund (US REIT). Each individual receives remuneration from Evans Dixon and/or its related entities.</td>
</tr>
<tr>
<td>VEA</td>
<td>Evans and Partners has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.</td>
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<tr>
<td>WBC</td>
<td>Evans and Partners has arranged, managed or co-managed an offering of securities of the company or its affiliates in the past 12 months, for which it received a fee.</td>
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I, Julian Mulcahy, hereby certify that all views expressed in this publication reflect my personal views about the subject theme and/or relevant company securities, and no attempt has been made by any other person to influence the views or themes contained within; and I am not in receipt of inside information and this publication does not contain any inside information. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

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