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# ELECTRO OPTIC SYSTEMS – COMPANY OVERVIEW

MAY 2017

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*Electro Optic Systems (EOS) develops and produces products incorporating advanced electro-optic technologies for the global Defence and Space markets.*

*EOS products are based on core technologies in software, lasers, electronic optics, gimbals, telescopes, beam directors, optical coatings, precision mechanisms and highly ruggedised assemblies.*

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## EXECUTIVE SUMMARY

# Company Overview



*EOS is an Australian technology company with leading positions in the application of advanced electro-optic technologies for the global Defence and Aerospace markets*

- Founded in 1983 from the privatisation of Commonwealth of Australia space activity
- Listed on the ASX in 2003, with current market capitalisation of c. A\$195m
- An established defence and aerospace player serving niche markets globally and providing leading industry technology
- Long history of research and development and product innovation
- Global presence with operating entities established in Australia (30+ years), USA (21 years), Germany (12 years) and Singapore (7 years)
- Strong strategic partnerships with some of the world's largest aerospace and defence companies including Northrop Grumman, Lockheed Martin, Singapore Technologies Kinetics and Hyundai-Wia
- Largest shareholder is the US aerospace and defence company Northrop Grumman, holding c.8.2%
- Operations are divided into two main business divisions: Defence Systems and Space Systems
- Major competitive advantages based on ISO9001:2008 customer feedback are:
  - Customer trust and confidence – most EOS business is repeat business
  - Advanced technology – EOS is renowned for its leading edge technology
  - Commitment – achievement of mutually agreed objectives is a hallmark of Company culture

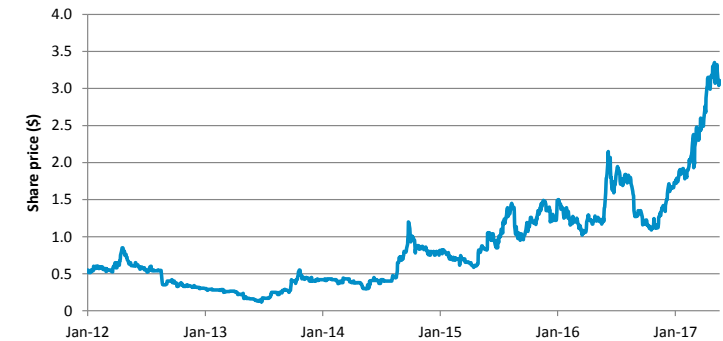
# Company Background



*EOS has re-positioned itself and can again address multi-billion dollar programs, with more resilient products, processes and management than ever before*

- In 2004 EOS began production as the sole contractor for a US Army \$5.0b requirement. \$600m into the program, this contract was rebid and then awarded to a sovereign competitor.
- Over the past five years the Company has completely re-positioned for even stronger growth. Without debt or new capital, the Company has made significant achievements, including:
  - Development of three new products (replacing one), each addressing a different and major market (>\$2b) and with one product launching each year from 2017.
  - Diversification of customer base.
  - Strong customer buy-in to each product development cost, without compromising EOS IP ownership.
  - Establishment of rapidly scalable execution processes, including major investments in outsourcing and supply chain.
  - Strong strategic partnerships with some of the world's largest aerospace and defence companies including Northrop Grumman, Lockheed Martin, Singapore Technologies Kinetics and Hyundai-Wia.

## Recent Share Price Performance



## Key Partners



# EOS Business Divisions Summary



*EOS' leading edge technologies are applied to global defence and aerospace markets through its two business divisions*

## EOS Defence Systems

- The EOS Defence Systems division specialises in technology for weapon systems optimization and integration, as well as intelligence, surveillance and reconnaissance (ISR) for land warfare.
- This technology either replaces or reduces the role of a human operator for a wide range of existing and future weapon systems.
- Key products are next-generation armoured vehicle remote weapon systems (RWS) and unmanned turrets.
- FY16A segment revenue of \$16.0m and profit of \$0.4m.
- Growth surge from 2018 from contract awards in 2017.



## EOS Space Systems

- The EOS Space System division focuses on commercial and defence requirements for space situational awareness (SSA) information.
- EOS specialises in obtaining data using EOS-developed optical sensors to detect, track, classify and characterise objects in space.
- Key products and services include space surveillance, missile defence, satellite laser ranging, observatories and telescopes.
- FY16A segment revenue of \$9.6m and loss of \$2.1m.





# EOS Competitive Advantages



*EOS has a number of key competitive advantages that help provide a strong position in its niche markets of the global Defence and Space industries*

## Defence Systems

- **First-to-market with new technology** that addresses evolving customer requirements.
- **Advanced market research** allowing a narrow focus on few products with early customer buy-in.
- **Proven supply chain** and partnerships with global defence manufacturing leaders.
- Early commitment allowing **years of reliability testing** prior to production.
- Strong investment in production outsourcing over five years and **highly scalable operations.**
- Key differentiators of **technology, quality and user support** making it an industry leader.

## Space Systems

- **Unique, vertically integrated system** of sensors, infrastructure, operations, command and control, and support capabilities.
- **Proprietary technology** in low-cost space data sensors.
- **Exceptional management** with decades of experience in industry leading technology.
- Already a **major source of space data with customer recognition** and market momentum.
- **Australian location** extremely important to initial customers.

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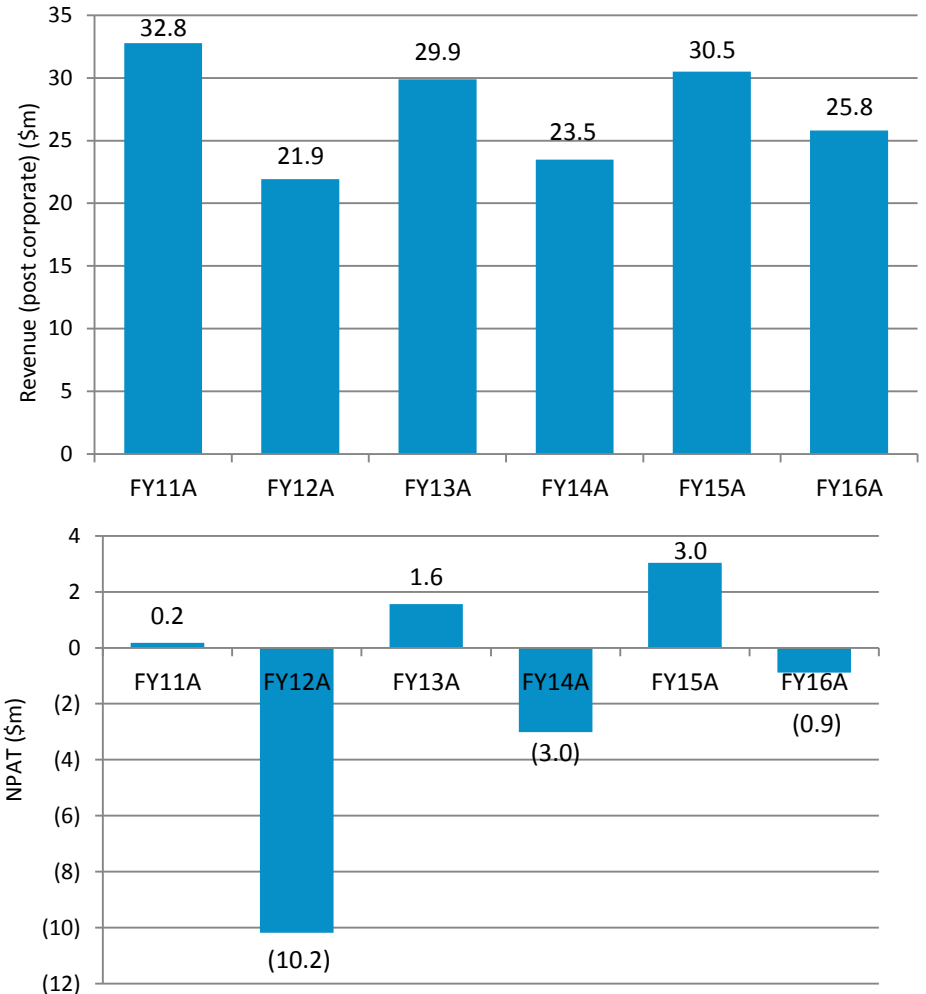
# EOS Financial Overview



## Commentary

- Company's loss of its \$5b US Army weapon system program to a state-owned entity triggered a long-term strategic re-positioning from FY11.
- The re-positioning was funded by profitable underlying RWS business. Operations have been run on a break-even, cash maintenance basis after all investments expensed.
- Key elements in annual losses averaging \$2.3m over five years:
  - Significant re-structure and downsizing costs (FY12A).
  - Investment in scalable RWS outsourcing with global partners.
  - Investment, with majority funding from customer co-contributions, in R&D for three new products for launch from 2017.
  - Expenses related to employee option plans.
- All R&D is fully expensed and EOS now has three qualified military products with market launches from 2017 to 2019, with each addressing not less than \$2b markets.

## Financials



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## EOS DEFENCE SYSTEMS



# Highly Mobile Cannon Concept – We Do It Far Better



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*EOS Defence Systems develops, markets, manufactures and supports remote weapon systems (RWS) and related products for global military and defence*

## What Is A Remote Weapon System?

- RWS products involve “below-armour” control systems linked to “above-armour” mounting and cabling, providing a fully stabilised, remotely operated weapon (or weapons) and a sensor system which provides cutting edge detection, tracking and engagement of targets.
- Key to battlefield survivability and success is the protection of personnel and the capability to generate accurate firepower which accurately engages military targets with minimised impact on non-combatants.
- RWS can be located on vehicles, vessels and aircraft, as well as static emplacements.
- RWS replace or reduce the role of a human operator, improving survival and greatly increasing target engagement accuracy.
- EOS RWS products build on over 25 years of developing electro-optic fire control platforms for defence environment and military platforms.

## Features and Benefits of RWS

- Reduced need for “at risk” personnel and improved personnel survivability.
- Superior accuracy and high first round hit probability.
- Recognised weapon system reliability.
- Ease of use for front line personnel.
- Flexible installation across multiple platforms including canon, machine gun and automatic grenade launcher.
- Cost effective force multipliers.
- Designed with a high level of commonality and modularity to increase utility and ease of support.



# RWS Applications



Over 1,500 EOS remote weapon systems have been mounted on over 20 platforms, including those below. Advanced (next-generation) RWS will be fitted to the same classes of vehicles and vessels

Mounted to US Army Stryker



Mounted to US Army JLTV



Mounted to US Riverine Craft



Mounted to US Army M1A1



Mounted to Australian Bushmaster



Mounted to US M-ATV



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# EOS Defence Systems Products



*EOS expects significant growth during 2017-2019 to come from Advanced RWS orders*

Conventional RWS	Advanced RWS	Remote Turrets
<ul style="list-style-type: none"> <li>Launch date: 2004 (legacy product)</li> </ul>	<ul style="list-style-type: none"> <li>Launch date: Q1 2017</li> </ul>	<ul style="list-style-type: none"> <li>Launch date: 2018</li> </ul>
<ul style="list-style-type: none"> <li>Weapons: Small arms</li> </ul>	<ul style="list-style-type: none"> <li>Weapons: Cannon, missiles</li> </ul>	<ul style="list-style-type: none"> <li>Weapons: Cannon, missiles</li> </ul>
<ul style="list-style-type: none"> <li>Market size and share: After almost 20 years only 15-20% market share is retained in \$105m market</li> </ul>	<ul style="list-style-type: none"> <li>Market size and share: \$4.6b to 2025, market share 100% to 2018 with \$2.1b cumulative sales by 2025 (management estimate)</li> </ul>	<ul style="list-style-type: none"> <li>Market size and share: Size &gt;\$11b to 2025, 20% market share (management estimate)</li> </ul>
<ul style="list-style-type: none"> <li>Competition: Market now saturated with copiers and competitors</li> </ul>	<ul style="list-style-type: none"> <li>Competition: Competition from Q4 2018</li> </ul>	<ul style="list-style-type: none"> <li>Competition: Competition already here</li> </ul>
<ul style="list-style-type: none"> <li>Outlook: Legacy product being replaced with Advanced RWS</li> </ul>	<ul style="list-style-type: none"> <li>Outlook: Awards from Q2/17 expected</li> </ul>	<ul style="list-style-type: none"> <li>Outlook: Awards from 2019 expected</li> </ul>
<ul style="list-style-type: none"> <li>Product example - EOS R-600</li> </ul>	<ul style="list-style-type: none"> <li>Product example - EOS R-400S</li> </ul>	<ul style="list-style-type: none"> <li>Product example - EOS R-2000</li> </ul>



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## Market Segments

### Conventional RWS

- Conventional RWS were developed by EOS under US Army contract from 1994 to 2004. Production commenced in 2005.
- Weapons include 7.62mm, 12.7mm and 40mm AGL.
- Global market size has fallen from US\$690m in 2010 to c. US\$80m pa (management estimate based on tenders).
- EOS retain 20% market share, positioned at the high performance, higher cost end of a commodity market.
- When foreign partners win RWS contracts, EOS revenue will be made up of royalty plus Australian work share (typically 35%).

### Advanced RWS

- Advanced RWS were developed by EOS to meet new needs for accurate and lightweight 30mm firepower.
- Global market size of US\$800m pa for >five years (management estimate).
- EOS is the first to market and is meeting strong demand.
- Competing products are >18 months from qualification. EOS should capture the first \$1b of orders, and take 40% of the remaining \$4b over the next five years.

## EOS Key Competitors

### Conventional RWS (new international sales)

- Rafael Advanced Defense Systems Ltd (Israel).
  - RWS Samson product family has 25% market share
- Elbit Systems Ltd (Israel).
  - RWS product family has around 20% market share.
- Aselsan A.S. (Turkey).
  - RWS STAMP has around 15% market share.
- Kongsberg Gruppen ASA (Norway).
  - RWS PROTECTOR has around 5% market share.

### Advanced RWS

- No qualified competing product exists.
- Competitors will likely emerge from 2018 from:
  - Moog Inc. (USA) with its RIWP weapon platform.
  - Kongsberg Gruppen ASA (Norway).
  - Rafael Advanced Defense Systems Ltd (Israel).
  - Aselsan A.S. (Turkey).



# EOS R400S: The Next Generation Remote Weapon System



*R400S (below) deploys 30 mm firepower at 50% of the weight of all previous configurations, and with higher accuracy*

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# EOS R400S: Key Features



*The R400S is EOS' most advanced remote weapon system and incorporates dual weapon and cannon capability*

- **Twin automatic weapon configurations** including canon up to 30mm and missiles can be deployed.
- Fully stabilised, flexible configuration **capable of housing two weapons** for maximum firepower, mission flexibility and responsiveness in operation.
- Integrates **advanced surveillance capabilities** including **stabilised long-range sensors** and **integrated battlefield sector scanning** with up to **200 programmable target reference points** for rapid engagement of possible targets directly from surveillance mode.
- **Integrated video tracker** with video and audio recording options.
- **Sophisticated ballistic solution** takes account of weapons, ammunition, range, atmospheric environment, vehicle attitude and target motion to create an exceptional first-round hit probability.
- **'Plug-and-play'** compatible and quickly integrated with battle management systems.
- Integrated **firing inhibit zones** with user adjustment.
- **Module commonality** with all EOS remote weapon systems.
- Small dispersed modules allow integration into **small internal vehicle spaces**.

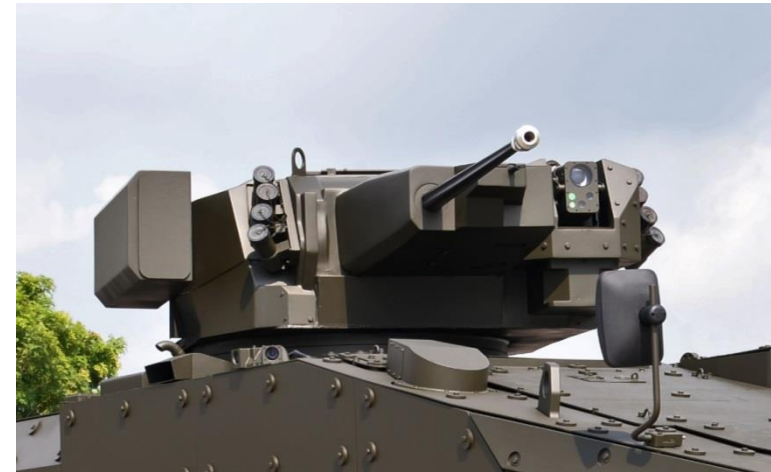


# EOS R2000: Remote Turret System



*EOS Remote Turret Systems will be launched in 2018 and are another example of EOS' leading product development*

- Completed \$30m development program aimed at new global market requirements for new turret technology.
- Turret is unmanned, using highly reliable technology to replace human operators in the turret.
- All customer performance and reliability specifications met, exceeding current turret products in all respects.



- Global market size > \$11b from 2018-2025 (management estimate).
- Product launch 2018.
- Competition from several sources from the outset.
- Performance and technology discriminators expected to secure 20% market share.

# EOS Defence Systems Product Sales



Product	Product Launch date	Current order book	Total number sold	Total number still operational	Approx. price per product	Approx. production cost per product
<b>Remote Weapon Systems</b>						
R-400	▪ 2004	▪ 20	▪ 1200	▪ 470	▪ \$200k	▪ \$180k
R-600 Dual	▪ 2010	▪ 0	▪ 460	▪ 460	▪ \$225k	▪ \$205k
R-400S-Mk2	▪ 2017	▪ TBC	▪ TBC	▪ na	▪ \$250k	▪ \$225k
<b>Remote Turrets</b>						
R-2000	▪ 2018	▪ 0	▪ 2	▪ 2	▪ \$1.5m	▪ \$1.35m

- EOS has a successful sales track record backed by a culture of research and development and product enhancement
- EOS' sales history includes close to 2,000 conventional RWS to both Australian and foreign government customers
- Future orders of Advanced RWS are to be confirmed and EOS is confident of strong demand for this latest product



# EOS Defence Systems Market Barriers to Entry



*The Government defence nature of the RWS product creates multiple barriers of entry involving political and legislative hurdles in addition to technological and manufacturing barriers*

- “Known entity” to military users
- National security issues around products, technology, customer needs
- Statutory restrictions such as export licenses, end-user verification, US ITAR
- Industry offset requirements and non-tariff barriers protecting local industry
- Environmental specifications well beyond normal industrial limits
- Familiarity with over 1,000 military compliance standards
- Technological expertise specific to military applications
- Military product requirements
  - Quality assurance appropriate for 30-year lifetime
  - Supply chain qualification and reliability
  - Component traceability to erase failures
  - Surge capability for war-time response
  - Security clearances for key staff
  - Staff qualifying periods

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# Key Partnership Arrangements



*EOS enters into partnership agreements with major aerospace entities globally to gain market access and to acquire qualified suppliers with high-quality production capacity and support systems*

## **Northrop Grumman (NG, USA)**

- NG is a strategic partner of EOS, holding approx. 8.8% of EOS
- NG produces EOS weapon systems in the US for some contracts

## **Singapore Technologies Kinetics (STK, Singapore)**

- STK market EOS weapon systems under the STK “ADDER” product name, in multiple countries
- Through a subsidiary, STK also provide depot support in Singapore for the SE Asia region for EOS products
- Around 500 RWS have been fielded through STK

## **Hyundai-Wia (Republic of Korea)**

- Hyundai-Wia market EOS weapon systems under the Hyundai brand
- Hyundai-Wia provide depot support in Korea for EOS weapon system products

# EOS Defence Systems Financial Overview

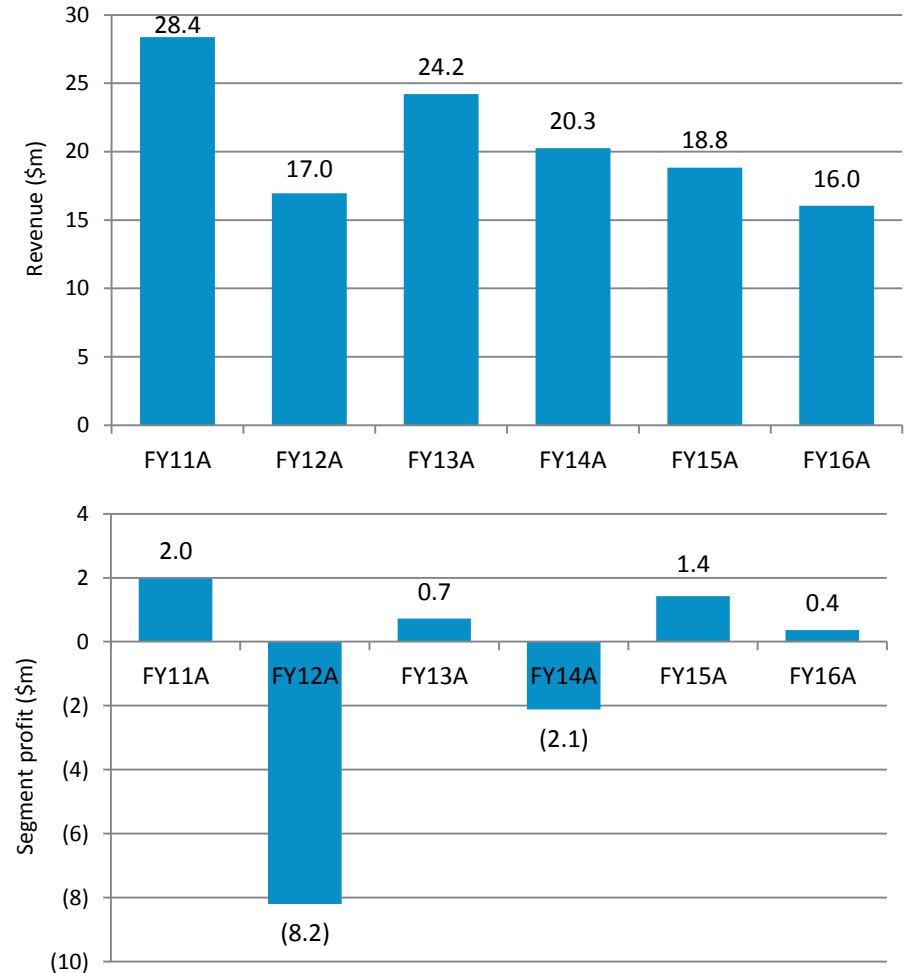


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## Commentary

- Confirmation of the Defence loss of its \$5b US Army weapon system program to a state-owned competitor triggered a long-term strategic re-positioning from 2011.
- Underlying (conventional) RWS business is profitable, but margins and market share have been under pressure as conventional RWS became commodities.
- Since FY12 when re-structure and downsizing costs were met, the Defence division has been break-even after significant R&D costs were fully expensed and corporate charges levied.
- Key customers provide most of the funds for product development to meet emerging demands, reducing both cost and risk.
- After five years of development, testing and qualification, EOS now has two new Defence products with market launch in 2017 and 2018.
- The new products are either first-to-market or equal first-to-market, and address not less than \$2b in accessible markets.

## Financials



## Expected New Advanced RWS Contracts



*EOS is close to securing a transformational contract for the company*

- EOS is presently engaged in negotiations for a significant contract to supply Advanced RWS to Orbital ATK.
- As announced on 3<sup>rd</sup> March and as updated on 27<sup>th</sup> March 2017, EOS has already received a firm order of US\$14m from Orbital ATK to support the purchase of long lead-time parts.
- As announced on 27<sup>th</sup> March 2017, the main contract, which is expected to be executed shortly, is determined to be in the range of A\$150-170m.
- This contract, when executed, represents a significant win for EOS and gives validation to its industry leading Advanced RWS technology.
- To support the early stage fulfilment of the Orbital ATK contract, EOS completed an institutional placement to raise A\$8.5m, per its announcement on 27<sup>th</sup> March 2017.
- Other Advanced RWS contracts are available and EOS is actively pursuing these opportunities.
- The Company expects that within the next two quarters contracts with an additional value of up to \$330m (beyond the Orbital ATK contract) could be signed.



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# EOS SPACE SYSTEMS



*After a long period of R&D, testing and sensor qualification, Space Systems is now focused on the design, manufacture and deployment of its space tracking and monitoring systems*

- The value of satellites in orbit is now around US\$900b. Space investment is increasing but space debris is now a serious threat to all space operations. Currently over US\$6b of western space tracking assets can track only a fraction of the debris.
- Most debris is not tracked and collision forecasts, when available, are not accurate or reliable enough to allow satellites to avoid debris collisions by manoeuvre. New data sources are required.
- EOS has developed new sensors that can very cost-effectively track all orbiting debris of concern. These sensors can contribute to debris risk mitigation, as well as addressing other unmet needs for commercial and military space information.
- The potential market for data is large (>\$2b from 2019-2029 based on customer budgets) but customers will not commit to data delivery contracts from a network which is not operational and proven, but commitment of capital for a network requires firm customer commitments to data purchase.
- EOS has addressed this issue by allocating modest resources (fully expensed) over a long period to achieve critical mass of capacity and reliability for initial customers. With multiple-sensor sites in WA and ACT, EOS already has the largest space data capacity in the southern hemisphere. Further network expansion is planned.
- EOS has also been investing in technology for value-adding its space data to provide additional customer services.

The EOS Space Systems tracking site in Western Australia, with 4 sensors



# EOS Space Systems Timeline



*Australia and EOS have leveraged climate, geography and innovation for 44 years of world leadership in laser tracking in space. EOS knows this business and the customer requirements*

- 1973: USAF space laser program relocated to Australia under Commonwealth control
- 1986: Commonwealth program activities offshore privatised under EOS: space laser facilities deployed globally
- 1998: EOS upgrades laser track power x1 million to track small space debris
- 2005-2014: USAF/RAAF capability demonstrations of accurate and sensitive space debris tracking
- 2016: Defence White Paper/IIP/DIIPS establish space requirements for new data

*Future expectations:*

- *2018: Full customer operational assessment of network operations under contract*
- *2018: 3<sup>rd</sup> Australian site comes online to provide sustainable and resilient network operations*
- *2019: Data products launch. Major revenue contracts commence.*

# Why Lasers & Why Australia?



*Most space data (90%) is collected by radar, but only lasers can provide the data inaccessible to radar.*

*Lasers are therefore a critical technology in Space Situational Awareness (SSA) and EOS is the industry leader in this field.*

## Why is laser technology critical in SSA?

- Range: Lasers can accurately track at much longer ranges than radars
- Accuracy: Laser accuracy uniquely meets all customer requirements
- Sensitivity: Lasers can track smaller objects at longer ranges
- Spectrum: Objects with small or negligible radar signals can usually be tracked with lasers
- Capacity: A responsive and robust laser “capacity” of even 30k space objects inexpensively meets many needs
- Information: Lasers can uniquely characterize a space object in size, shape and orientation
- Scalability: Laser trackers can be scaled to meet operational needs from low orbit to geostationary orbit



## Why is Australia uniquely positioned in SSA?

- Climate: Australia is ideally suited to laser operations due to its large, dry regions
- Geography: Space observations from Australia are uniquely valuable to complement northern hemisphere data
- Technology: Australia is the world leader in laser space tracking and several critical supporting technologies



EOS provides products and services for Space Surveillance, Satellite Laser Ranging, Observatories and Telescopes

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Product / Service	Description
<p><b>Space Surveillance</b></p> 	<ul style="list-style-type: none"> <li>EOS employs sophisticated satellite laser ranging technologies to carry out surveillance of space assets</li> <li>Space Debris – Space debris, or near earth object (NEO) pollution, is an enormous hazard to deployed satellites and spacecraft which cross the path of the orbiting debris. Using high powered ‘eye safe’ space laser systems EOS can track and catalogue the most potentially damaging pieces of debris. Once the debris is tracked it can be avoided. EOS proprietary laser tracking and astrometric techniques reduce conjunction volumes’ error budgets by a factor of 100-1000 (ref AMOS 2013)</li> <li>Space Ablation – Ablation is the process of generating forces on objects by means of surface interactions with energy projected from a distant point. Laser beams, directed from earth to intersect with objects in space, generate significant forces if the interaction is carefully controlled. Until now, the only way to avoid space debris was to manoeuvre away from it to prevent a collision, consuming fuel and reducing mission life. EOS is now fine-tuning technology that will allow pieces of space debris and other objects in space to be physically manoeuvred into a different orbit using long range high power plasma beam (ablation). By using Adaptive Optics (AO) techniques, EOS is developing new tools for enhanced capability for low earth orbit (LEO) space management using coupled laser energy to space debris objects. Laser guide stars, wavefront sensors and wavefront inversion tools are in development now to improve ground based imaging and to couple laser energy onto debris for orbital management of lighter debris approaching valuable assets</li> </ul> <p>Other technologies available from EOS include:</p> <ul style="list-style-type: none"> <li>CAN based servo control systems</li> <li>Servo control systems of any accuracy and precision</li> <li>LAN based control environments for observatory management</li> <li>Observatory Control System software for standardised modular automation of observatories (see AMOS 2013)</li> <li>Low cost remote control of COTS electro optics, such as Canon lenses</li> <li>Laser delay generators for control of multi stage pulse laser systems</li> <li>Digital Pound-Driver-Hall controls for advanced laser management</li> <li>Custom laser design for research or other activity sanctioned by Australian export controls</li> <li>Passive tracking of LEO objects without sunlight imaging (contact us)</li> <li>Observatory design support, especially automated systems</li> </ul>
<p><b>Satellite Laser Ranging</b></p> 	<ul style="list-style-type: none"> <li>The EOS satellite laser ranging facility at Mount Stromlo, Canberra is part of a global network of some 30 observatories using laser light to measure distances to orbiting satellites. EOS offers 24/7 autonomous tracking and orbit prediction of up to 200,000 objects</li> </ul> <p>System features:</p> <ul style="list-style-type: none"> <li>Eye safe operation even with high power lasers</li> <li>Automated or remote controlled</li> <li>Ranging to high and low satellites with millimetre resolution</li> <li>Picosecond timing systems</li> <li>High temporal resolution (kHz) tracking</li> <li>Network synchronized tracking and simultaneous tracking of multiple satellites</li> <li>Standard systems of 1m aperture with other sizes by negotiation</li> <li>Weatherproof in operation</li> <li>ISO9001:2008 quality</li> </ul>



# EOS Space Systems Products & Services (cont'd)



EOS provides products and services for Space Surveillance, Satellite Laser Ranging, Observatories and Telescopes

Product / Service	Description
<p><b>Observatories</b></p> 	<ul style="list-style-type: none"> <li>▪ EOS provides complete observatory design, installation, commissioning and maintenance. EOS observatory designs, manufactured to ISO9001:2008 standards, are optimised for thermal performance and can be provided in kit form (standard design) or installed on site (custom design)</li> <li>▪ EOS uses prefabrication and assembly techniques to reduce site time and cost</li> <li>▪ Standard designs can be modified as necessary for specific sites</li> </ul> <p>Optional inclusions:</p> <ul style="list-style-type: none"> <li>▪ Ring wall extension</li> <li>▪ External stairs</li> <li>▪ Plant rooms</li> <li>▪ Workshops</li> <li>▪ Cooling systems for telescope thermal control</li> <li>▪ Metrology sensors</li> <li>▪ Vacuum systems</li> <li>▪ Light pipers</li> <li>▪ Ventilation systems</li> <li>▪ Mirror handling/coating systems</li> </ul>
<p><b>Telescopes</b></p> 	<ul style="list-style-type: none"> <li>▪ EOS is an established supplier of telescopes and observatory systems to the world market</li> <li>▪ EOS designs and manufactures state of the art alt-az telescopes of the highest quality and technical performance as imagers, beam directors and trackers</li> <li>▪ EOS products are highly accurate, reliable, robust and low maintenance with the designs offering seamless integration of the telescope, telescope enclosure, instruments and software programs which are fitted with remote diagnostic support, and automated operation, and are easily upgraded</li> <li>▪ EOS telescope gimbals are manufactured in either modular (standard) or custom designs</li> </ul> <p>Telescope applications:</p> <ul style="list-style-type: none"> <li>▪ Astronomy and Optical Interferometry</li> <li>▪ Satellite Laser Ranging</li> <li>▪ Optical Communications</li> <li>▪ Space Object Classification</li> <li>▪ Space Debris Mapping</li> <li>▪ Laser Beam Directors</li> </ul>

## Existing Sources of Revenue

### Equipment:

- The EOS space tracking sensor comprises many advanced technology sub-systems operating beyond industry norms. Some are occasionally sold to niche markets. For example four 2.3 metre class telescopes (\$8m each) were sold, principally to government (US) funded programs.
- These activities support a production team as well as improving design, production, installation and support. This process is critical for achieving EOS price-performance metrics for its own network deployment and operation.
- To protect EOS technology, no integrated space tracking sensors are sold commercially despite customer requests.

### Services:

- Space services contracts average \$3m annually over the period 2011-2016. Current services contract backlog is around \$4m.
- Service fees are associated with the provision of space tracking data for the purpose of evaluating data quality by the USA and Australia.
- Company expects to transition to operational data delivery contracts from 2019 from commercial and government customers.

## Future Sources of Revenue

### Equipment:

- Equipment revenue will taper towards zero as production resources are increasingly focused on EOS' own equipment needs.

### Services:

- Australia has budgeted around \$500m in long term funding (through budget processes) from 2021 for the delivery of indigenous Australian space data.
- There are no current competitors for this activity, but there is also no assurance the Company will ultimately receive contract awards.
- Commonwealth requirements represent 25% (management estimate) of the accessible market for space data.
- The data needs of Australia and its allies are generally known. Most of the funds required to deploy infrastructure achieving operational resilience and a critical mass of data have already been spent by EOS.
- Commercial space data requirements are well known but the fee scale for data delivery is less established.
- The Company can fund space infrastructure from new capital or by forgoing a share of future revenue.

# Key Partnership Arrangements – SERC



*SERC was established to build on Australian and international expertise in measurement, monitoring, analysis and management of space debris and to develop technologies to preserve the space environment.*

## Space Environment Research Centre (“SERC”)

- SERC is a charitable research organisation funded by the Australian government (34%), EOS (29%) and five other participants (37%).
- SERC participants have pooled \$200m of infrastructure and \$60m of cash to research technology for space debris mitigation.
- SERC aims to develop means of moving space debris using ground-based infrastructure (typically lasers) and to educate the next generation of space technologists.
- EOS has provided founding technologies and 29% of SERC resources.

## SERC Technology Exploitation

- SERC’s key objectives are the near-term mitigation of space debris threats to satellites and the expansion of the population of space technologists with post-graduate qualifications.
- SERC expects to develop technology to manoeuvre objects in space using lasers on the ground, as an extension of EOS’ laser tracking technology, with the ultimate goal of removing space debris from orbit.
- Although applicable to only 20% of space debris, the process would be a valuable contribution to a global problem.
- SERC activities are arranged as individual “Research Programs” and each participant determines to which Research Program its contributions will flow.
- SERC technology is commercialised by licensing on the open market, however any participant bidding successfully for a license will receive a discount equal to the percentage of resources they have contributed to the research.
- All license fees and royalties, after applicable discounts, are retained by SERC to fund further research.

## SERC Participants



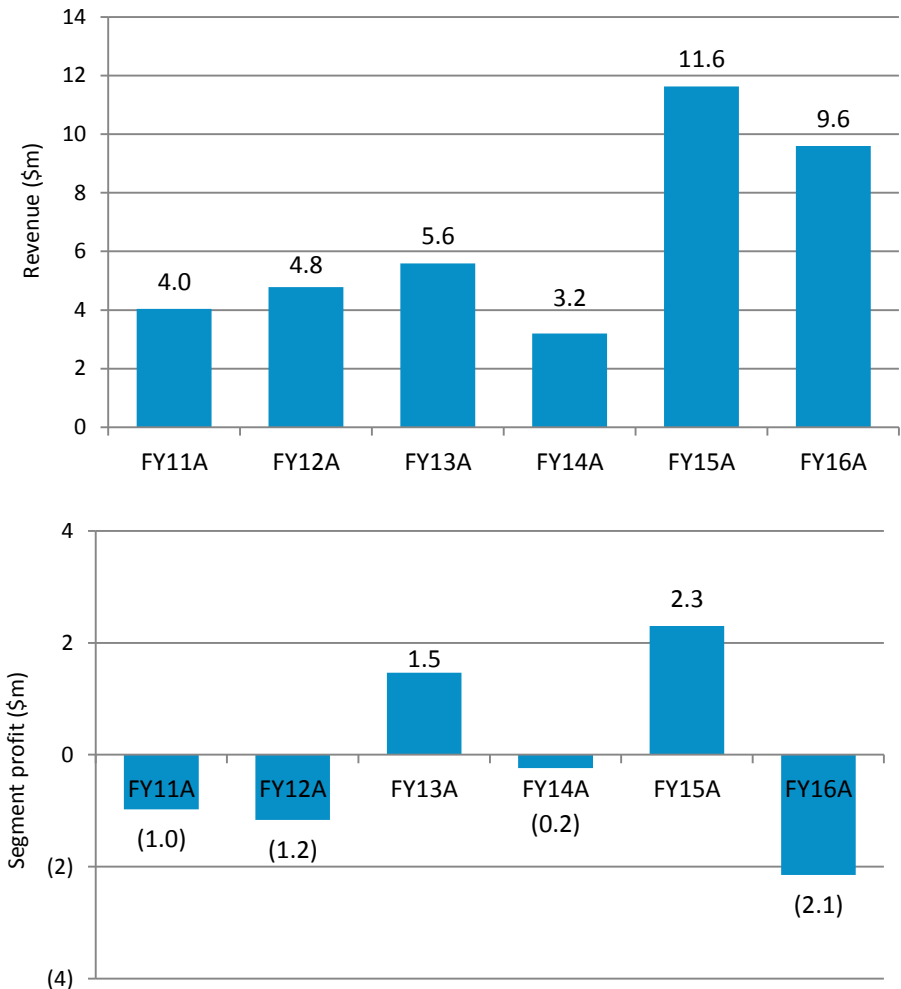
# EOS Space Systems Financial Overview



## Commentary

- In 2004 the EOS Space division successfully demonstrated, under a US defence contract, a new type of sensor for ground-based detection, tracking and characterisation of space objects.
- The market for this data exceeds \$2b if it can be cost-effectively obtained from a global network of sites, but with an emphasis on data acquired from Australia.
- EOS space strategy has been to reduce cost and risk by co-funding with US and Australia the full qualification of this sensor system.
- Each sensor includes many sub-systems which are sold for other space applications to generate revenue and market test EOS costs.
- Each customer will need a small amount of data from many sensors, so the business model requires the private deployment of a network of sensors to generate a critical mass of data.
- Capital for expansion of the sensor network is segregated from the Defence Systems division and is drawn from Space Systems own partnering and capital arrangements.
- Space already has sufficient resources to achieve a critical mass of space sensors for initial customers by late 2018.
- After critical mass, incremental expansion of an EOS network will be funded as demand increases for higher data volumes.

## Financials





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## APPENDIX

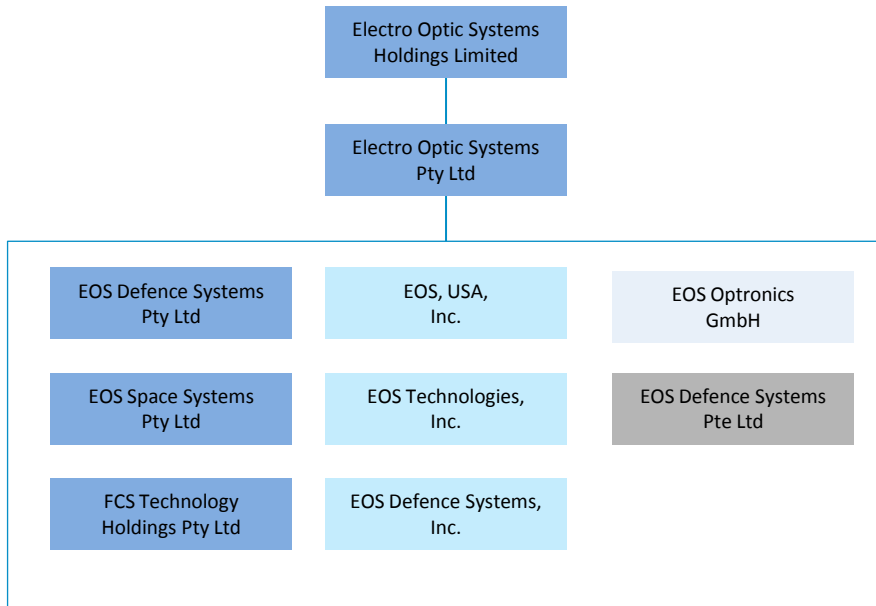


# Corporate Structure & Locations



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## Corporate Structure



## EOS Office and Manufacturing Locations



- Office
- ▲ Production

*EOS has a strong leadership team comprised of individuals with strong technical, management and operational experience*

## **Ben Greene – Chief Executive Officer of EOS Group**

- Dr Greene established laser space tracking in Australia in 1974 and the US Army remote weapon programs in 1993, and is the founding CEO of EOS. He is widely published in weapon system design, laser tracking, space geodesy, quantum physics, satellite design, laser remote sensing, and the metrology of time. He has authored numerous patents, and his work is recognised by NASA and USAF awards. Ben is a past member of Australia’s Prime Ministers Science, Engineering and Innovation Council (PMSEIC), CEO of the CRC for Space Environment Management and Deputy Chair of the Western Pacific Laser Tracking Network (WPLTN).

## **Scott Lamond – Group Chief Financial Officer**

- Scott Lamond joined the EOS team in 2006 and was appointed CFO in 2012. Scott brought to the team a wide range of experience in SME manufacturing, particularly agricultural machinery. As a CPA, Scott has been able to support the group with the management of ERP systems used by the military business. Scott is well grounded in the commercial aspects of doing business after initially starting his career in insolvency and reconstruction. Prior to joining EOS, Scott has been Financial Controller for privately owned companies for 14 years.

## **Warwick Holloway – Chief Executive Officer Defence Systems**

- Dr Holloway joined EOS in 2011 and was appointed as the 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. Warwick is listed as an inventor on six patents spanning across consumer electronic and telecommunications products and is named as an author on 12 academic papers. He holds a Bachelor of Science and a Bachelor of Electrical & Electronic Engineering from Monash University. He also holds a PhD in Electrical and Electronic Engineering from the University of Melbourne.

# EOS Senior Management (cont'd)



*EOS has a strong leadership team comprised of individuals with strong technical, management and operational experience*

## **Craig Smith – Chief Executive Officer Space Systems**

- Dr Smith joined EOS in 1998 and was appointed CEO of Space Systems in 2003. Previously Dr Smith also held the positions of CEO of EOS Technologies and Head of Research and Development. Prior to joining EOS he was a Senior Research Fellow at the Australian Defence Force Academy where he developed novel techniques for imaging-polarimetry and spectro-polarimetry at thermal IR wavelengths. Dr Smith has lectured in Physics, Electronics and Military Ballistics. He obtained Bachelors and PhD degrees from the University of Melbourne.

## **Craig Burmann – Chief Technology Officer, Defence Systems**

- Craig Burmann joined EOS Defence Systems in 1998 as the Senior Electronics Design Engineer. Since that time, Craig has held positions of Electronics Group Manager, Research and Development Group Manager, and he currently serves as EOS's Chief Technology Officer. Craig has been involved in all aspects of the design of EOS Defence Systems Remote Control Weapon Stations hardware and software, and was the Chief Architect for MK1 STK 30mm MK44 RCWS fire control systems. Craig has over ten years experience in system integration of ATK weapons to achieve optimum weapon dispersion, and is involved as Chief Project Engineer for all EOS Defence Systems programs.

## **Peter Short – Vice President, Strategy and Business Development**

- Pete Short joined EOS in January 2016 as VP, Strategy and Business Development. Pete served in the Australian Army from 1984 to 2015 as an Infantry Officer. He served in Somalia, East Timor, Iraq and Afghanistan (twice) and was awarded the Distinguished Service Cross for action in Iraq. His last appointments in the Army were as Director General, Land Development and Director General, Base & Customer Support Services. He has a Master of Arts (Strategic Studies), Bachelor of Social Sciences (Human Resources Management) and is a Thai linguist.

## **Fred Bart – Chairman**

- Fred Bart (age 62) has been Chairman and Director of numerous public and private companies since 1980, specialising in manufacturing, property, technology and marketable securities. Mr Bart is Chairman of Immunovative Therapies Limited, an Israeli company involved in the manufacture of cancer vaccines for the treatment of most forms of cancer. He is a member of the Australian Institute of Company Directors and is a member of the Remuneration Committee. Appointed to the Board on 8 May 2000.

## **Ben Greene – Chief Executive Officer**

- Dr Greene (age 66) established laser space tracking in Australia and the US Army remote weapon programs, and is the founding CEO of EOS. He is widely published in science and technology, has authored numerous patents, and his work has been recognised by NASA and USAF awards. Ben is a past member of Australia's Prime Ministers Science, Engineering and Innovation Council (PMSEIC), CEO of the CRC for Space Environment Management and Deputy Chair of the Western Pacific Laser Tracking Network (WPLTN). Appointed to the Board on 11 April 2002.

## **Ian Dennis – Executive Director**

- Ian Dennis BA, C.A. (age 59) is a Chartered Accountant with experience as director and secretary in various public listed companies and unlisted technology companies in Australia and overseas. He has been involved in the investment banking industry and stockbroking industry for the past twenty five years. Prior to that, he was with KPMG, Chartered Accountants in Sydney. He is a member of the Australian Institute of Company Directors and is a member of the Audit Committee and Remuneration Committee. He is also Company Secretary of Electro Optic Systems Holdings Limited. Appointed to the Board on 8 May 2000.

### **Lt Gen (retired) Peter Leahy AC – Non-Executive Director**

- Peter Leahy AC (age 64) retired from the Australian Army in July 2008 as a Lieutenant General in the position of Chief of Army. He holds a BA (Military Studies), a Master of Military Arts and Science and is a member of the Australian Institute of Company Directors. He is a Professor and the foundation Director of the National Security Institute at the University of Canberra. He is a Director of Codan Limited, Citadel Group Limited, a member of the Defence South Australia Advisory Board, Chairman of the Red Shield Appeal in the ACT and the charity Soldier On, and a Trustee of the Prince's Charities Australia. Appointed to the Board on 4 May 2009.

### **Kevin Scully – Non-Executive Director**

- Kevin Scully (age 60) has over 30 years experience in equities research and analysis, corporate advisory and related matters. He has worked in various positions such as the Head of Research and Director of Schrodgers, HSBC and the Netresearch Group (which he founded). Kevin is an advisor to two regulatory authorities of the Singaporean Government (Commercial Affairs Department and the Monetary Authority of Singapore) since 1999. In March 2014 he was appointed Adjunct Professor in the School of Human Development and Social Services at SIM University. Appointed to the Board on 19 September 2011.

### **Air Marshall (retired) Geoff Brown AC – Non-Executive Director**

- Geoff Brown (age 58) retired from the Royal Australian Air Force in May 2015 as Air Marshall in the position of Chief of Air Force. Among his qualifications he holds a BEng (Mech), a Master of Arts (Strategic Studies), Fellow of the Institute of Engineering Australia and is a Fellow of the Royal Aeronautical Society. Geoff is a Director of Lockheed Martin (Australia) Pty Limited, Chairman of the Sir Richard Williams Foundation and Chairman of the Advisory Board of CAE Asia Pacific. Appointed to the Board on 21 April 2016.