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Electro Optic Systems

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

EOS Space Systems sector specialises in applying EOS-developed optical sensors to detect, track, classify and characterise objects in space. This information has both military and commercial applications, including managing space assets to avoid collisions with space debris, missile defence and space control.
Defence Systems Recent Milestones and Outlook

- EOS has won A$600m in contracted orders in the last 12 months for its advanced RWS for delivery through 2018-2022.

- Through 2017 the Company’s new RWS was selected as the preferred bidder for contract negotiations in every competitive tender in which it has competed.

- Contract negotiations with other customers which have selected EOS as their preferred supplier with a combined order value of up to a further A$400m underway with additional material market opportunities.

- Additional long term revenue of up to 150% of the original contract values is expected to be derived from maintenance and spares support.

- Given material historic R&D investment EOS expects to achieve divisional EBIT margins of around 10% for the delivery of these contracts going forward.

- Ongoing support of the Commonwealth Government to the defence export sector with $3.8bn fund established within EFIC to support export sales. EFIC is already partnering and assisting EOS with contract financing.
Market Environment for EOS’ R400S RWS

- Global RWS market size expected to double from 2016 to be worth US $12.7bn in 2022 (Janes Information Group).
- Market growth underpinned by the looming first generation RWS replacement cycle anticipated to comprise up to 14,000 units over the next 10 years (reflects end of life for top 3 manufacturers 2004-2008 production).
- EOS anticipates significant market share given its technical superiority in key segments of this market. R400S-Mk2 RWS combined with the OATK M230 30mm cannon is dominating its segment due to superior accuracy, range, reliability, weight and advanced software features.
- Contracted hardware sales are normally augmented by ongoing annuity-style revenue streams derived from maintenance and spares parts sales worth up to 150% of the original hardware contract value. These are expected to be spread over a typical 15 year RWS unit useful life, and are typically budgeted by customers at c10% of the contract value per annum.
- Deployment to combat operations will escalate maintenance requirements and bring forward upgrade requirements.
- Development pipeline provides potential new revenue streams: remote turret application for heavy combat vehicles expected to be launched in 2019. Management anticipate market size to be A$1.5bn p.a. when mature from 2022.
Pipeline for contracts under negotiation includes only contracts where EOS has been selected as preferred supplier and contract negotiations have commenced. A$140m of these contracts would fall beyond 2021.

Revenue from maintenance and support programs will escalate to significant levels from 2021. Above table reflects initial hardware sales revenues only.

Total contract receipts include revenue from 500 RWS sales where EOS is prime contractor. These sales includes the cannon sales value.

Based on the economic profile of the executed contracts EOS expects the weapons division to be profitable and generate positive cash flow from CY2018.
COMPANY BACKGROUND
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$210m
- An established defence and aerospace player serving niche markets globally and providing leading industry technology
- Long history of successful 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 period 2011-2016 the Company re-positioned for even stronger growth. Without debt or new capital, the Company has made significant achievements by Q1 2017, including:
  - Development of three new products (replacing one), each addressing a different and major market (>$2b) and with new products launching each 1-2 years 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.
### 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.
- FY17 unaudited segment revenue of $19.9m and loss of $4.6m.

### 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.
- FY17 unaudited segment revenue of $3.4m and loss of $4.5m.
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

<table>
<thead>
<tr>
<th>Defence Systems</th>
<th>Space Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ First-to-market with new technology that addresses evolving customer requirements.</td>
<td>▪ Unique, vertically integrated system of sensors, infrastructure, operations, command and control, and support capabilities.</td>
</tr>
<tr>
<td>▪ Advanced market research allowing a narrow focus on few products with early customer buy-in.</td>
<td>▪ Proprietary technology in low-cost space data sensors.</td>
</tr>
<tr>
<td>▪ Proven supply chain and partnerships with global defence manufacturing leaders.</td>
<td>▪ Exceptional management with decades of experience in industry leading technology.</td>
</tr>
<tr>
<td>▪ Early commitment allowing years of reliability testing prior to production.</td>
<td>▪ Already a major source of space data with customer recognition and market momentum.</td>
</tr>
<tr>
<td>▪ Strong investment in production outsourcing over five years and highly scalable operations.</td>
<td>▪ Australian location extremely important to initial customers.</td>
</tr>
<tr>
<td>▪ Key differentiators of technology, quality and user support making it an industry leader.</td>
<td>▪</td>
</tr>
</tbody>
</table>
EOS Financial Overview

Commentary

- Defence Systems unaudited loss of $4.6M was mainly due to absorbing most of the one-time costs of scaling production up by x10 over 30 months from mid-2017.
- Space Systems unaudited loss of $4.5M was mainly due to transferring most effort in FY2017 to testing of space network performance prior to committing the last phase of infrastructure deployment.

Financials

* FY17 results are unaudited
Highly Mobile Cannon Concept – We Do It Better
EOS Defence Systems Overview

**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.
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.
EOS Defence Systems Products

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

<table>
<thead>
<tr>
<th>Conventional RWS</th>
<th>Advanced RWS</th>
<th>Remote Turrets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Launch date: 2004 (legacy product)</td>
<td>Launch date: Q1 2017</td>
<td>Launch date: 2018</td>
</tr>
<tr>
<td>Market size and share: After almost 20 years only 15-20% market share is retained in $105m market</td>
<td>Market size and share: $5b to 2025, market share 100% to 2018 with $2.6b cumulative sales by 2025 (management estimate)</td>
<td>Market size and share: Size &gt;$11b to 2025, 20% market share (management estimate)</td>
</tr>
<tr>
<td>Competition: Market now saturated with copiers and competitors</td>
<td>Competition: Competition from Q4 2018</td>
<td>Competition: Competition already here</td>
</tr>
<tr>
<td>Outlook: Legacy product being replaced with Advanced RWS</td>
<td>Outlook: $600m awards FY2017 and pipeline exceeds original forecasts</td>
<td>Outlook: Awards from 2020 expected</td>
</tr>
<tr>
<td>Product example - EOS R-600</td>
<td>Product example - EOS R-400S</td>
<td>Product example - EOS R-2000</td>
</tr>
</tbody>
</table>
RWS Market Overview

### 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 $600m in FY2017 (100% captured) and cumulatively reaching $5b by 2025 (management estimate).
- EOS is the first to market and is meeting strong demand. Competing products are >12 months from qualification.
- EOS should capture around $1b of orders by FY2018 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.
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 2019-2025 (management estimate).
- Product launch 2019.
- Competition from several sources from the outset.
- Performance and technology discriminators expected to secure 20% market share or $2.2b.
## EOS Defence Systems Product Sales

<table>
<thead>
<tr>
<th>Product</th>
<th>Product Launch date</th>
<th>Current order book</th>
<th>Total number sold</th>
<th>Total number still operational</th>
<th>Approx. price per product</th>
<th>Approx. production cost per product</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remote Weapon Systems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-400</td>
<td>2004</td>
<td>20</td>
<td>1200</td>
<td>470</td>
<td>$200k</td>
<td>$180k</td>
</tr>
<tr>
<td>R-600 Dual</td>
<td>2010</td>
<td>0</td>
<td>460</td>
<td>460</td>
<td>$225k</td>
<td>$205k</td>
</tr>
<tr>
<td>R-400S-Mk2</td>
<td>2017</td>
<td>1000</td>
<td>1000</td>
<td>na</td>
<td>$250k</td>
<td>$225k</td>
</tr>
<tr>
<td><strong>Remote Turrets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-2000</td>
<td>2018</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>$1.5m</td>
<td>$1.35m</td>
</tr>
</tbody>
</table>

- 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 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
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
Commentary

- The Defence division has been break-even after very significant R&D costs were fully expensed.
- After 5 years of testing and qualification, EOS successfully launched a new defence product in 2017, capturing $600 million of orders in its initial year.
- New orders require annual capacity of $150-200 million compared with $15-20 million historically. This expansion was commenced in FY2017.
- $4.6M unaudited loss is a transition cost to scale up x10 in revenue, with most of these one-time costs falling in FY2017:
  - Dislocation caused by moving production to new plant
  - Inventory obsolescence and increased R&D
  - Relocation, recruitment, training and equipping costs
  - Contract negotiation and closing costs
- Significant ramp up in revenues to $80M in FY18 on track.
- Division expected to be profitable (EBIT) in FY18.

Financials

<table>
<thead>
<tr>
<th>Financials</th>
<th>FY13A</th>
<th>FY14A</th>
<th>FY15A</th>
<th>FY16A</th>
<th>FY17UA*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue ($m)</td>
<td>24.2</td>
<td>20.3</td>
<td>18.8</td>
<td>16.0</td>
<td>19.9</td>
</tr>
<tr>
<td>Segment profit ($m)</td>
<td>0.7</td>
<td>-2.1</td>
<td>1.4</td>
<td>0.4</td>
<td>-4.6</td>
</tr>
</tbody>
</table>
EOS Space Systems Overview

- Objects in space are currently tracked using radar, however, this only provides ~90% coverage and has limited accuracy in tracking small objects. EOS’s laser technology provides a more accurate, low cost solution that can track objects of all sizes.

- EOS is in the final stages of deploying an operational system for tracking the orbiting debris and objects in space. This is achieved through a network of sensor sites across Australia using laser technology.

- EOS currently has two operational sites in Australia in WA and ACT, with a third site in QLD under development and expected to come online in 2019.

- EOS intends to monetise this investment by selling access to the data generated.
  - Military Applications – EOS has extremely strong relationships with the US and Australian Governments which are natural customers for EOS’s space tracking data. Notwithstanding very significant US outlays on infrastructure upgrades there remain unmet requirements for space data which are growing with time.
  - Commercial Space Data Requirements – There are ~US$900bn of satellites in orbit currently, most of which is vulnerable to loss from collision with space debris. This presents a significant commercial opportunity to EOS once its data network is operational.
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 (>US$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.
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
- 2019: 3rd Australian site comes online to provide sustainable and resilient network operations
- 2020: 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 Space Systems Products & Services

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

<table>
<thead>
<tr>
<th>Product / Service</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Space Surveillance** | - EOS employs sophisticated satellite laser ranging technologies to carry out surveillance of space assets  
- 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)  
- 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 |
| **Satellite Laser Ranging** | - 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  
- System features:  
  - Eye safe operation even with high power lasers  
  - Automated or remote controlled  
  - Ranging to high and low satellites with millimetre resolution  
  - Picosecond timing systems  
  - High temporal resolution (kHz) tracking  
- Other technologies available from EOS include:  
  - CAN based servo control systems  
  - Servo control systems of any accuracy and precision  
  - LAN based control environments for observatory management  
  - Observatory Control System software for standardised modular automation of observatories (see AMOS 2013)  
  - Low cost remote control of COTS electro optics, such as Canon lenses  
- Laser delay generators for control of multi stage pulse laser systems  
- Digital Pound-Driven-Hall controls for advanced laser management  
- Custom laser design for research or other activity sanctioned by Australian export controls  
- Passive tracking of LEO objects without sunlight imaging (contact us)  
- Observatory design support, especially automated systems |
| **Other technologies available from EOS include:** | - Network synchronized tracking and simultaneous tracking of multiple satellites  
- Standard systems of 1m aperture with other sizes by negotiation  
- Weatherproof in operation  
- ISO9001:2008 quality |

EOS provides products and services for Space Surveillance, Satellite Laser Ranging, Observatories and Telescopes
### EOS Space Systems Products & Services (cont’d)

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

<table>
<thead>
<tr>
<th>Product / Service</th>
<th>Description</th>
<th>Optional inclusions</th>
<th>Telescope applications</th>
<th>Metrology sensors</th>
<th>Vacuum systems</th>
<th>Light pipers</th>
<th>Ventilation systems</th>
<th>Mirror handling/coating systems</th>
</tr>
</thead>
</table>
| **Observatories** | ▪ 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)  
▪ EOS uses prefabrication and assembly techniques to reduce site time and cost  
▪ Standard designs can be modified as necessary for specific sites  | ▪ Ring wall extension  
▪ External stairs  
▪ Plant rooms  
▪ Workshops  
▪ Cooling systems for telescope thermal control  | ▪ Astronomy and Optical Interferometry  
▪ Satellite Laser Ranging  
▪ Optical Communications  |                  |                |              |                          |                  |
| **Telescopes**    | ▪ EOS is an established supplier of telescopes and observatory systems to the world market  
▪ EOS designs and manufactures state of the art alt-az telescopes of the highest quality and technical performance as imagers, beam directors and trackers  
▪ 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  
▪ EOS telescope gimbals are manufactured in either modular (standard) or custom designs  |                                                                                                                                              | ▪ Space Object Classification  
▪ Space Debris Mapping  
▪ Laser Beam Directors  |                                |                |              |                          |                  |
## Space Systems Outlook

### 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

**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 all SERC resources.

**SERC Participants**

**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.
Space Systems division revenue will come from data delivery which requires sensors deployed on 3 sites to generate reliable data. EOS currently has sensors deployed at 2 sites.

EOS plans to build out to 3 sites by 2019 using capital drawn from Space Systems own partnering and capital arrangements, without impacting the Defence Systems division.

Revenue from the sale of space hardware fell sharply in FY17 as the company focused resources on operational testing of its current sensor network under customer contract. This testing will run into H2 FY2018.

All testing of space data is proceeding to specification and budget.

The segment loss for 2018 will fall in FY2018 and again in FY2019.

The company has expensed substantial funds to underwrite the future profitability of this segment.
Corporate Structure & Locations

Corporate Structure

- Electro Optic Systems Holdings Limited
- Electro Optic Systems Pty Ltd
  - EOS Defence Systems Pty Ltd
  - EOS Space Systems Pty Ltd
  - FCS Technology Holdings Pty Ltd
- EOS USA, Inc.
- EOS Technologies, Inc.
- EOS Optronics GmbH
- EOS Defence Systems Pte Ltd

EOS Office and Manufacturing Locations

- Office
- Production

Locations:
- Australia
- Germany
- Singapore
- USA
EOS Senior Management

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.

Peter Short - Group Chief Operating Officer
- 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.
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.

Grant Sanderson – Chief Executive Officer, Defence Systems
- Grant Sanderson joined EOS in January 2018 although he has worked on major EOS development activities as a consultant during 2016 and 2017. Grant Sanderson is a military veteran of 25 years who prior to joining EOS was the Vice President Strategy and Business Development in Australia for the Israeli defence technology company Elbit Systems. Here he oversaw the start up of the local Elbit Systems entity. Prior to joining Elbit Grant was the General Manager 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. Grant has been a long and active figure in the drive for innovation and growth in the Australia defence industry exports.
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.

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.