EOS SpaceLink

Investor Webinar

Tuesday 24 November 2020
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Today’s Presenters

Ben Greene
Group Chief Executive Officer

Glen Tindall
CEO, Communications Systems

Neil Carter
Chief Strategy Officer
Overview

EOS is Australia’s largest aerospace entity and the largest defence exporter in the southern hemisphere.

Reaching across 18 countries

450+ Employees around the world

$800m R&D spent on EOS IP over 20 yrs, 75% from customers, most of this IP has not been exploited yet

$165m Annual revenue (FY19)

$570m Order backlog (1)

$3.1bn Sales pipeline (2)

(1) The backlog figure represents the expected revenue EOS will receive from contracts which have been awarded to EOS but for which EOS has not delivered the products, as at 30 June 2020.
(2) The pipeline figure represents the potential revenue from specific customer requirements for which EOS has tendered for, or is registered and qualified to tender for over the following 36 months, as at 30 June 2020.
Synergies and Program Support
- High power laser technology
- Missile and UAS defence
- Laser tracking and discrimination
- Modelling for enhanced performance
- Common Defence and Gov’t customers

Synergies and Program Support
- Optical communications and adaptive optics
- Counterspace operations for asset protection
- Space traffic and constellation management
- Laser tracking and discrimination
- Common Defence and Gov’t customers

Synergies and Program Support
- C4 domain expansion from theatre to global
- Bandwidth for future remote operations
- Timely LEO ISR support for defence operations
- Integrated missile defence systems
- Common Defence and Gov’t customers
Strategic Evolution of EOS Communications Systems

2017
• Completed technology platform for optical satcom with x100 increase in capacity
• Plan to transition EOS customers from microwave (RF) to optical satcom by 2027

2018
• Agreement with US entities on EOS entry into satcom market, initially with RF
• Initiated acquisitions for spectrum and terminal-gateway technology required

2019
• Established cooperation framework with Collinear for hybrid RF-optical satcom
• Acquired EM Solutions, a world leader in satcom on-the-move
• Established EOS Communications Systems as an operating division of EOS Group
• Re-positioned EOS USA with special security arrangements for US government programs

2020
• Acquired the business of Audacy Corporation including FCC/ITU spectrum licenses
• Obtained US government FCC and CFIUS approvals for Audacy acquisition
• Acquired the communication technologies of Collinear, and AOptix Technologies – creating the largest known corporate aggregation of optical and RF-optical hybrid communication technologies
• Unveiled the name and technical description of the EOS SpaceLink satcom constellation and appointed sector CEO
EOS SpaceLink: Highlights

SpaceLink will build, own and operate a Medium-Earth Orbit (MEO) satellite constellation
- First constellation to be launched and operational in 2024 with positive operating cash flow
- Subsequent constellations to include optical technology

This will usher in a new era of satellite communications, avoiding the limitations of GEO and LEO orbits
- High bandwidth / capacity, high security
- Low latency, low cost

SpaceLink addresses the highest value market segments
- Primary market: Five Eyes (FVEY) Defense and Government customers with commitments to underwrite funding
- Secondary market: Commercial and Civil space users

Competitive advantages from spectrum allocation and optical IP
- Comprehensive allocation in K, Ka, Q/V bands represents c. 64% of commercially available spectrum in those bands
- Introduction of hybrid RF-Optical technology to cement first-mover advantage

Project economics are compelling
- EOS management modelling suggests NPV of US$1bn per constellation, project IRRs of 20%
- US$800m-$1bn capex to be externally funded in a Special Purpose Vehicle
Current Limitations of Satellite Communications

Satellite bandwidth demand is growing faster than supply
• Bandwidth supply is limited by availability of radio frequencies (aka RF / microwave spectrum)
• Both GEO and LEO orbits are highly congested with little or no free RF spectrum available
• Hence future bandwidth needs to migrate from RF spectrum to Optical spectrum

It is difficult and expensive to provide continuous connection to LEO satellites
• Vast majority of new satellites are in LEO orbit, very close to the earth, limiting their ability to download data in real-time
• LEO satellites cannot be viewed from a single ground station for more than about 10 minutes every 90 minutes. To provide continuous connectivity requires a huge investment in large networks of ground stations
• Even then it does not solve connectivity problems when above an ocean region and is reliant on insecure terrestrial networks

Current commercial systems are unsuitable for Defence & Government (D&G) customers’ special needs
• Commercial satellite systems optimised for consumer and business applications are often unsuitable for D&G customers
• D&G customers require high bandwidth and low latency with specific security specifications (ideally dedicated systems)

EOS SpaceLink will provide a solution to these limitations on behalf of high value D&G customers
EOS has a strong position in MEO with compelling competitive advantages in technology and regulatory approvals.
The SpaceLink Solution

SpaceLink addresses the market need
• Network optimised for high value customer requirements
• Supports users in space (LEO), on the ground, and at sea
• Delivers first 10x and later 100x increases in bandwidth

Constellations of three satellites
• Comprehensive coverage from MEO at 14,000km above earth
• First constellation (2024) using existing RF technology
• Second constellation (2027) using hybrid RF-Optical technology
• Leverages EOS’ proprietary optical IP

Targeting high value customers who seek
• Continuous connectivity
• High bandwidth
• High resilience
• High security
• Low latency
SpaceLink Target Markets

Defense and Government (D&G) customers plus some Commercial

**Example D&G growth in data demand**

- **Situational awareness/UAVs**
  - High bandwidth applications
  - Need for real-time data
  - The military UAV market is expected to grow ~12.4% p.a. from 2018 to 2026

- **Imagery and video**
  - Defense modernization adding devices and data capture
  - Centralized battle management system requires large volumes of secure data transfer

- **Data exchange / synchronization**
  - D&G agencies fast growing demand for email, voice and video data
  - D&G data is highly sensitive, requiring secure communication that can only be provided by satellite
  - Data synchronization across global locations moving to satellite networks

**Example commercial growth in data demand**

- **Human space flight**
  - Human space flight by private and government agencies is data intensive
  - Additional rigor and detail for monitoring passengers required

- **Earth observation**
  - Earth observation is increasing the amount of high resolution imagery
  - Increasing environmental monitoring also requires major increases in data
  - Continuous connectivity unlocks and enables new applications
**SpaceLink Target Market: Five Eyes D&G Customers**

**Five Eyes D&G satcom budget growth**  
(FY2020E-24F)  
Billions of USD

- U.S. D&G budgets are forecast to grow ~7.8% p.a. through 2024F
- Similar D&G budget growth can be expected in other Five Eyes countries
- Overall addressable market US$4.6B expected to increase to US$6.3B by 2024
- EOS has strong, long-standing relationships with key Five Eyes D&G customers
- EOS SpaceLink is ideally positioned to participate in this market development

Source: Industry sources, market research, EOS estimates
Industry Landscape: Potential Competitors by Adjacency

- Established commercial providers cannot match SpaceLink’s combination of orbital radius, spectrum, future technology compatibility and speed to market.
- Newspace LEO providers are looking at data relay for Five Eyes countries and have some spectrum capacity.
  However, they have not optimized their networks for the security and resilience sought by D&G customers.
- Whilst some start-ups intend to operate in MEO, they may struggle to secure funding and lack SpaceLink’s speed to market.
- Major defense contractors to date have focused on manufacturing and supply of satellites rather than service operations.
- Big Tech providers focused primarily on consumer and IoT applications.

Source: Northern Satellite Research, EOS
## SpaceLink Advantages

<table>
<thead>
<tr>
<th>Security, Resilience, Latency, Connectivity, Cost, Bandwidth, Scalability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Security and resilience</strong></td>
</tr>
<tr>
<td>• The MEO orbit is a superior space environment due to low density of spacecraft, adversarial threats and orbital debris</td>
</tr>
<tr>
<td>• Inclusion of MEO adds to resilience as LEO and GEO networks are likely to be compromised in a conflict</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>High-speed real-time connectivity</strong></th>
<th><strong>Available capacity</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• The MEO orbit requires only 3 satellites to enable ‘always-on’ transmission and global coverage</td>
<td>• LEO and GEO orbits are congested with satellites and space debris, and nearing maximum capacity</td>
</tr>
<tr>
<td>• LEO can only downlink in the narrow timeframe where contact is made with the satellite</td>
<td>• The MEO constellation can be continuously scaled to increase bandwidth</td>
</tr>
<tr>
<td>• MEO latency support real-time interactivity</td>
<td></td>
</tr>
</tbody>
</table>

*With very few MEO constellations in orbit, SpaceLink has a first mover advantage and the opportunity to capture customers who seek a next-generation MEO constellation with state of the art technology*
Competitive Advantage 1: Comprehensive Spectrum Allocation

SpaceLink has a comprehensive spectrum allocation

- EOS’ spectrum allocation provides first-priority rights to ~22GHz of spectrum in the K/Ka and Q/V bands, which is ~64% of the total commercially-available satellite spectrum in these bands.
- This provides a sustainable competitive advantage for space to ground communications.
- As EOS introduces optical technology, EOS’ RF spectrum allocation will remain important for resilience and security.

EOS’ first-priority spectrum allocation in the K, Ka, and Q/V bands

**Competitive Advantage 2: Technology**

**Future Constellations Leveraging Optical IP**

- **SpaceLink plans to transition to optical over multiple constellations, each higher speed and lower cost than the one before**

  - **Phase 1**
    - Radio Frequency (RF) transmission
    - Satellites will operate on the allocated RF spectrum
    - *Expected capacity:* 100 Gbps

  - **Phase 2**
    - Introduction of optical transmission
    - EOS will introduce its proprietary optical technology to increase system capacity
    - *Expected capacity:* >400 Gbps

  - **Phase 3+**
    - Full hybrid RF-optical network
    - Customers will migrate to optical transmission with massive bandwidth + RF to boost resilience
    - *Expected capacity:* Tb/s range

**SpaceLink plans to deploy new technologies and constellations in line with market appetite**

- SpaceLink’s planned innovation pipeline will allow margins to be retained in each phase without cannibalizing its own market
- SpaceLink will deploy its new technologies in line with customer demand for increased bandwidth
  - Optical transmission has the potential for 100x increase in bandwidth and a ~4x reduction in cost compared to RF
- EOS has first mover advantage for incumbent relationships with major D&G customers ahead of their transition to optical communications

**Source:** EOS
## SpaceLink Specifications

<table>
<thead>
<tr>
<th>Space Link constellation key specifications</th>
<th>Base case assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Orbit</strong></td>
<td>Medium Earth Orbit (MEO) @ 14,000km</td>
</tr>
<tr>
<td><strong>Satellites</strong></td>
<td>4 satellites (3 operational + 1 on-orbit spare incl launch costs)</td>
</tr>
<tr>
<td><strong>Ground Stations (Teleports)</strong></td>
<td>6 (planned locations: Australia, U.S., Europe, Middle East)</td>
</tr>
<tr>
<td><strong>Control Segment</strong></td>
<td>2 x Satellite Operation Centre / Network Operation Centre</td>
</tr>
<tr>
<td><strong>Total available capacity</strong></td>
<td>100Gbps</td>
</tr>
<tr>
<td><strong>Saleable capacity</strong></td>
<td>50-75Gbps</td>
</tr>
<tr>
<td><strong>Spectrum allocation</strong></td>
<td>22GHz in highly desirable K/Ka &amp; Q/V bands</td>
</tr>
<tr>
<td><strong>Potential for Optical transmission</strong></td>
<td>Yes, in later constellations</td>
</tr>
<tr>
<td><strong>Expected global data relay time</strong></td>
<td>~300 milliseconds (required for ‘real-time’ responsiveness)</td>
</tr>
<tr>
<td><strong>Pricing expectations</strong></td>
<td>Data transfer rate model (in Mbps / Gbps) declines 5-10% pa</td>
</tr>
<tr>
<td><strong>Operating expenses</strong></td>
<td>$30-35m pa</td>
</tr>
<tr>
<td><strong>Asset lifetime</strong></td>
<td>12 years</td>
</tr>
<tr>
<td><strong>Primary market focus</strong></td>
<td>Defense &amp; Government communications</td>
</tr>
<tr>
<td><strong>Secondary market focus</strong></td>
<td>Data relay for LEO satellite operators</td>
</tr>
</tbody>
</table>

- Strong interest >$150m pa > all costs
Project Economics: Base Case IRR = 20%

Capex requirement = US$800m - $1bn
- Roughly equal tranches of US$200-250m over four years in build phase (2021-24)
- Constellation to be launched and operational in 2024 with positive operating cash flow

Mix of Debt and Equity funding = 70/30
- 70% debt / project finance from vendor finance / export credit agencies
- 30% equity from external sources into a Special Purpose Vehicle
- EOS contributes assets, staff and IP (no cash) and retains majority economic interest and control

Project funding to be underwritten by customer commitments
- Operating expense of US$35m pa + Depreciation of c US$80-100m pa => total costs of US$115-135m pa
- Will secure firm customer commitments for US$150m+ to underwrite project funding

Compelling economics
- Based on EOS’ business plan with 8% WACC, Discounted Cash Flow valuation = US$1 billion per constellation
- This produces Project IRR = 20% and Equity IRR considerably stronger

Source: EOS
## Project Risks and Mitigations

<table>
<thead>
<tr>
<th>Risk to SpaceLink</th>
<th>Risk mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bandwidth demand does not reach expected levels</strong></td>
<td>• U.S. D&amp;G customers often price contracts in a manner ensuring vendors recoup investments; as necessary, SpaceLink could also take steps to broaden its scope beyond the Five Eyes</td>
</tr>
<tr>
<td><strong>Data relay services pricing deteriorates more quickly than expected</strong></td>
<td>• Lower prices may introduce new use-cases and customer segments, driving increases in demand and offsetting overall revenue impact associated with price point deterioration</td>
</tr>
<tr>
<td><strong>Competitors are able to neutralize SpaceLink’s key competitive advantages</strong></td>
<td>• SpaceLink’s technical capabilities are difficult for competitors to replicate given its large spectrum allocation, existing optical IP, and strong reputation with U.S. D&amp;G customers</td>
</tr>
<tr>
<td><strong>U.S. government decides to build in-house system</strong></td>
<td>• Public announcements and market feedback suggest this risk is very low as U.S. D&amp;G customers face increasing pressure to reduce costs and drive service efficiency</td>
</tr>
<tr>
<td>• Breakeven timing would be affected if customers purchase less bandwidth or if demand does not grow over time as expected</td>
<td>• Additional competitive threat would reduce SpaceLink’s first-mover advantage and ability to secure key D&amp;G customers</td>
</tr>
<tr>
<td>• A more significant than expected deterioration in price point would require additional capacity utilization to meet the same break even timing</td>
<td>• Should the U.S. government abandon its stated intent to pursue commercial satellite communications partnerships, the data relay market would become less attractive for all potential vendors</td>
</tr>
</tbody>
</table>

Source: EOS
### SpaceLink: Timetable

<table>
<thead>
<tr>
<th>Critical path items</th>
<th>Status</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Business Model review</td>
<td>Complete</td>
<td>Q3 2020</td>
</tr>
<tr>
<td>Technical due diligence report</td>
<td>Complete</td>
<td>Q4 2020</td>
</tr>
<tr>
<td>Satellite manufacturer negotiations</td>
<td>Current</td>
<td>Q1 2021</td>
</tr>
<tr>
<td>Firm customer commitments</td>
<td>Current</td>
<td>Q1 2021</td>
</tr>
<tr>
<td>Debt / project finance commitments</td>
<td>Started</td>
<td>Q1/Q2 2021</td>
</tr>
<tr>
<td>Equity commitments</td>
<td>Started</td>
<td>Q2 2021</td>
</tr>
<tr>
<td>Satellite orders placed</td>
<td>Pending</td>
<td>Q2 2021</td>
</tr>
<tr>
<td>Satellite construction</td>
<td>Pending</td>
<td>2021-23</td>
</tr>
<tr>
<td>Ground stations (teleports)</td>
<td>Pending</td>
<td>2023</td>
</tr>
<tr>
<td>Control segment (SOC / NOC)</td>
<td>Pending</td>
<td>2023</td>
</tr>
<tr>
<td>Satellite launch and commissioning</td>
<td>Pending</td>
<td>2024</td>
</tr>
</tbody>
</table>
Summary

SpaceLink will build, own and operate a MEO satellite constellation
• First constellation to be launched and operational in 2024 with positive operating cash flow
• Subsequent constellations to include optical technology

This will usher in a new era of satellite communications, avoiding the limitations of GEO and LEO orbits
• High bandwidth / capacity, high security
• Low latency, low cost

SpaceLink addresses the highest value market segments
• Five Eyes Defense and Government customer commitments to underwrite funding (plus sales of space capacity to commercial players)

Competitive advantage from spectrum allocation and optical IP
• Comprehensive allocation in K/Ka, Q/V bands represents c. 64% of commercially available spectrum in those bands
• Introduction of hybrid RF-Optical technology to cement first-mover advantage

Project economics are compelling
• NPV of US$1bn per constellation, project IRRs of 20%
• US$800m-$1bn capex to be externally funded in a Special Purpose Vehicle
Questions and Answers