

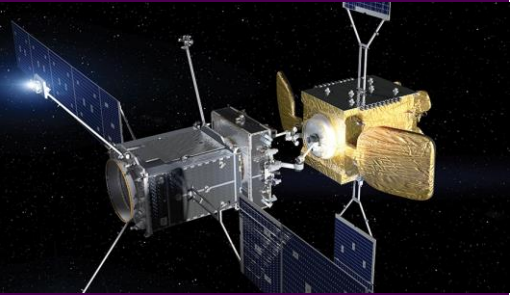
# OOS

# Known and future risks

---

Denis Bensoussan  
Head of Space  
23<sup>rd</sup> February 2023

# Vision



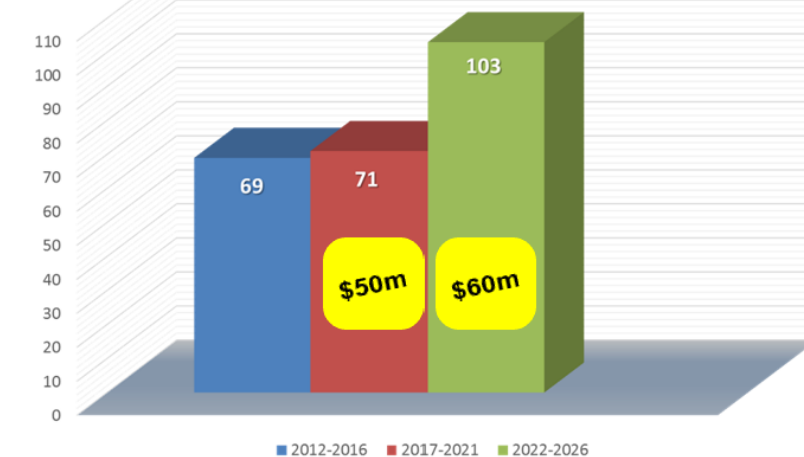
- **Satellites are expensive and sophisticated technologies that retain substantial value** even after critical resources have been expended or key equipments have become obsolete
- Launching a spacecraft to **manage orbital objects can derive additional utility** from what would have become useless or a loss
- **OOS challenge is not only technology and CONOPS, but the “business case”**
- **International law presents a complication** to such activities because of **extensive ownership provisions**
- **Insurance solutions have helped** to address and manage these challenges thus **supporting and enabling the emergence and development of OOS**
- **Important risks management lessons can be learnt** for future OOS evolution and development

# Shared interests

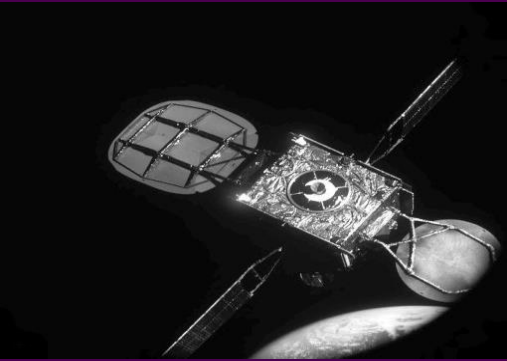


- **Space insurance is a promoter and enabler of space business and innovative space technologies and CONOPS**
- Space insurers have a **strong interest and stakeholders in OOS:**
  - Protecting future **access to space, space operations** and the **health of the space business**
  - OOS creates a **new business paradigm and opportunities:**
    - **New solutions for OOS missions**
    - **Longer, healthier and more valuable satellite mission life**
    - **Recovered, salvaged, repurposed satellites**
  - Contributing to a **safer in-orbit environment**
  - Improve **satellites reliability**
    - Risk mitigation: anomaly prevention, health monitoring
    - Additional propulsion redundancy and fuel margin
    - Additional capability to deal with emergency

Retiring satellites (number / est. av. revenues)



# Proven Solutions

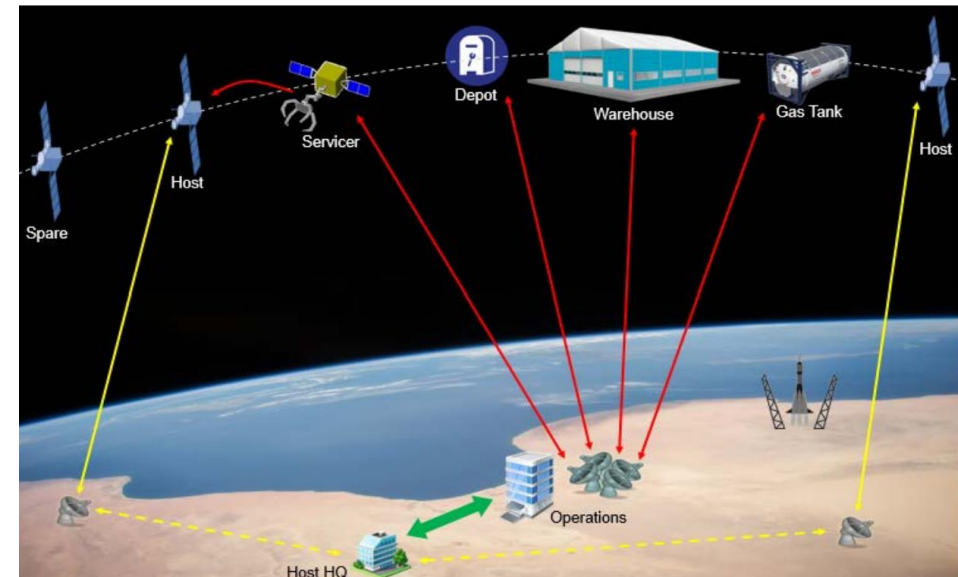
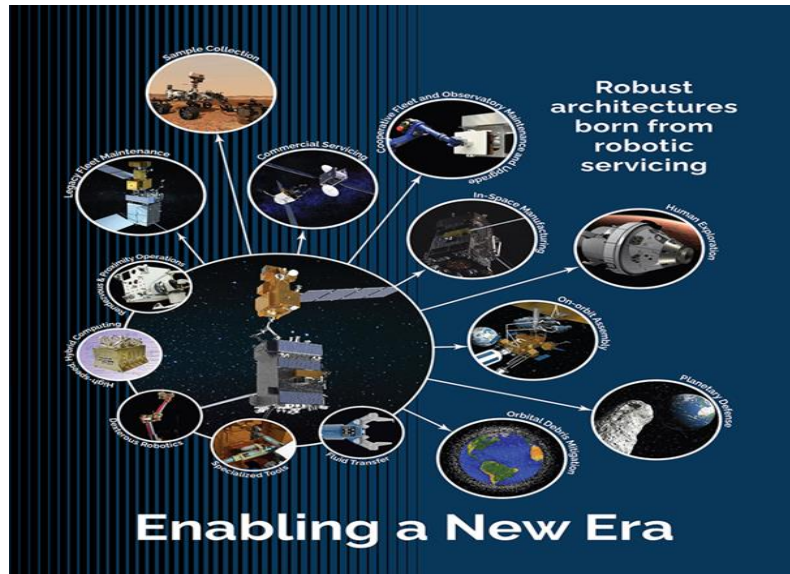


- **Considerable risks management experience gained since genesis of OOS**
- Insurance solutions available for all aspects of OSS operations:
  - Pre-launch
  - Launch
  - Orbital manoeuvring, autonomous rendezvous, docking, robotic manipulation
  - Commissioning & acceptance, In-Orbit R&D and commercial operations:
    - Servicing/Life extension/Repair
    - Inspection
    - Object capture & release
- **Tested coverages and wordings** – all causes covered
- **All risk exposures:** Space third party liability, asset replacement costs, loss of revenue, business interruption, first party/contractual liability

# Future OSS



- New and improved technologies and experience make **extended OOS activities a reality** in the near future: OSAM, AI-led OOS & OSAM
- **Private / commercial ventures** leading the way
- **Satellites design changes:** standardized plug-n-play design to enable the servicer to swap components
- **Space sustainability, Space domain awareness and traffic management** are growing concerns and emerging imperatives
- **Legal/Liability regime** still uncertain

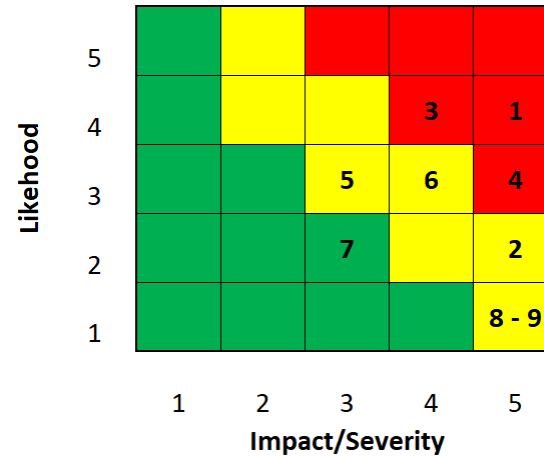


# New Risks



- **Risks Matrix**

1. Technical/Operations risk
2. Debris risk
3. Servicer reliability risk
4. Legal/Liability risk
5. Political risk
6. Cyber risk
7. Business/Commercial risk
8. Unknown risks
9. Ethics



→ The overall risk for OOS is high: average severity above level 4 and average likelihood at level 2.5

- **New Loss scenarios**

- **Space insurance experience with OOS is the foundation for better/future risk management solutions**

# Lessons learnt (1)



- **Technology and the CONOPS are not yet mature.** The OOS market is in its infancy, unproven and experience is lacking, leading to mishaps and near mishaps creating learning opportunities
- **Conservative design and technical choices improve the reliability profile** of an OSS project from a risk management / insurance perspective
  - **Platform/payload design choices should be conservative and testing representative** to provide sufficient level of comfort (representativity / relevance and probability of success)
  - **Prior payload operations in-orbit demonstration and testing** in realistic (life-test) conditions  
→ *“Run-and-gun” / “Fly/Retry” model has its limits*
  - **Platform with relevant flight heritage, adequate technical margins and budgets, redundancy and trouble-shooting capabilities**
  - **Tested and reliable interfaces**
  - **Mature launch vehicle** with excellent reliability record
  - **Mature separation system** with excellent reliability record
  - Identification of all possible **failure scenarios** and development of **contingency plans**



# Lessons learnt (2)



- **Developing a comprehensive risk management strategy is a critical step for OOS: all solutions to be analysed and combined: risk avoidance, risk reduction, risk retention, risk transfer and insurability**
- **Integration of risk management and insurance at very early stage of the project is key: full transparency and involvement of space insurance professionals at design stages and throughout the project development**
- **Risk transfer/insurability depends of space insurance market experience with the OOS project risk and reliability philosophy**
- **Insurance coverage and loss formula definition should be carefully and collaboratively designed in order to balance OSS providers risk retention, pain points, mission objectives, ultimate financial prejudice with a realistic assessment of the risk of mission failure: **coverage to grow with experience****
- **Demonstration to be made that OOS can improve reliability, remove uncertainty and provide additional value to satellite.** When demonstrated, those capabilities will make the project more insurable
- **Space TPL insurance is the primary entry point to space insurance:** it's a good way to present a project and team, to interact with the space insurance market, define its risks management strategy and be viewed as a responsible OSS provider





# Thank you

## Denis Bensoussan

Head of Space

denis.bensoussan@beazley.com

Denis Bensoussan (<https://uk.linkedin.com/in/denis-bensoussan-0b72924>) started Beazley Space business in 2014.

Prior to Beazley, Denis managed Hiscox Space business and worked in aerospace departments at Marsh, at international law firm Simmons & Simmons and at the European Space Agency, the United Nations and the European Commission. With more than 20 years' experience in the space industry, Denis possesses extensive knowledge of the risks and challenges the space industry confronts.

Denis obtained space systems engineering trainings from Southampton University and Supaero Paris and holds a Degree in Air & Space Law from McGill University.

Denis is the Chairman of the London Market Association Satellite Risk Committee.

Denis is an advisor and mentor for space start up, founders, incubators and VC funds.