European Conference on On-Orbit Satellite Servicing and Active Debris Removal

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Insurer's Perspective and Expectations

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1. Space Insurance Overview

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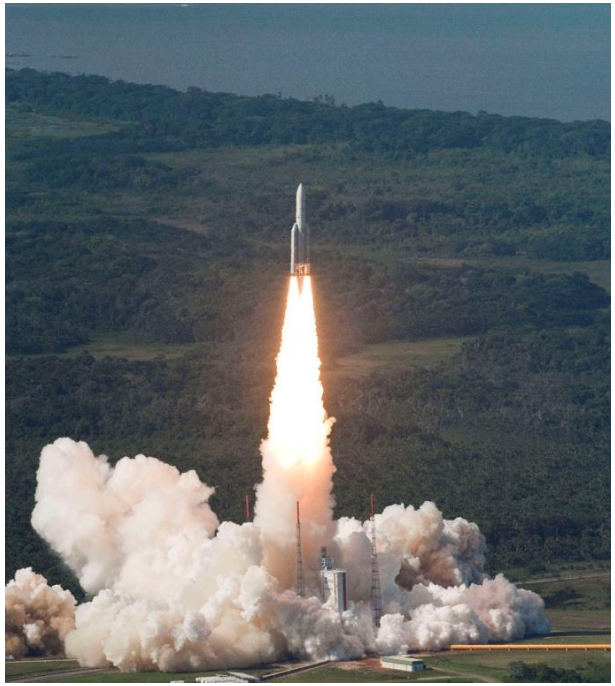
- A highly technical/specialist insurance sector
- Insurance policy conditions and pricing strongly correlated to technical risk profile
- Major risks covered: GEO broadcast platforms (90%) and LEO imagery/navigation/telecom s/c (10%)
- Launch & commissioning = most exposed mission phases, risk is by nature volatile ("*all or nothing*")
- Highly volatile market: Annual market Premium volume ~ Average Ariane 5 Amount of Insurance (~700MUSD in 2012)

⟶ Need for consistent risk assessment and financial sustainability



… at Argo International

Space Insurance Products

- Launch Phase cover
- Commissioning and Early Operational Phase cover
- Incentives & Warranty Pay Back insurance
- Service interruption / loss of revenues
- Third-Party Legal Liability (for launch and in-orbit operations)

Key Financial Ratings

- Lloyd's: A.M. Best "A", S&P "A+"
- Argo Group: A.M. Best "A", S&P "A-"

2. How space debris risks are being handled

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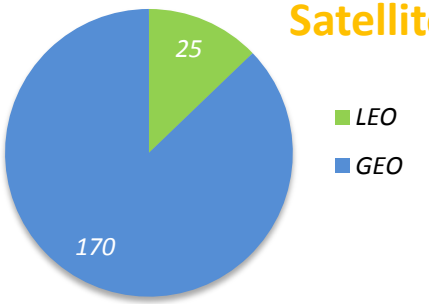
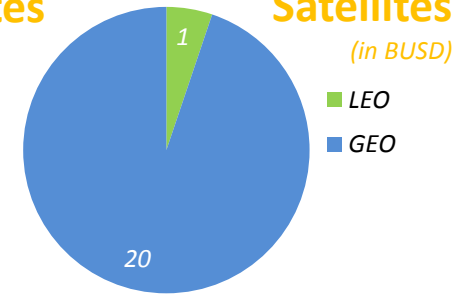
- In GEO (the majority of insured assets), risk is negligible (debris catastrophic risk ~ 10^{-9} annual but steadily growing)
- In LEO: insured constellations see large increase in debris risk (~10^{-5} with inclination & altitude discrepancies)

Number of Insured Satellites



Value of Insured Satellites *(in BUSD)*



Currently…

- « all risks », 1-year insurance covers, w/ specific exclusions
- No debris-specific clause:
- No subrogation rights within industry (in space procurement contracts) but often insurers' subrogation rights (in case of claims)
- Weak legal framework (unclear concept of "fault")
- In-orbit losses and failures to be demonstrated

Next…

- Space Debris Risk considered low but increasing, potentially catastrophic and difficult to assess (large uncertainties in terms of identification of objects in GEO, debris position and velocity, projections following collision/fragmentation and actual impact of critical collisions at system level)
- Worst-case scenarios being updated on a regular basis (e.g. Lloyd's guidelines on Realistic Disaster Scenarios include space debris provisions)
- Highly reactive market, meaning that tailored policies or exclusions could rapidly be put together to respond to new risk profiles and changing environments.

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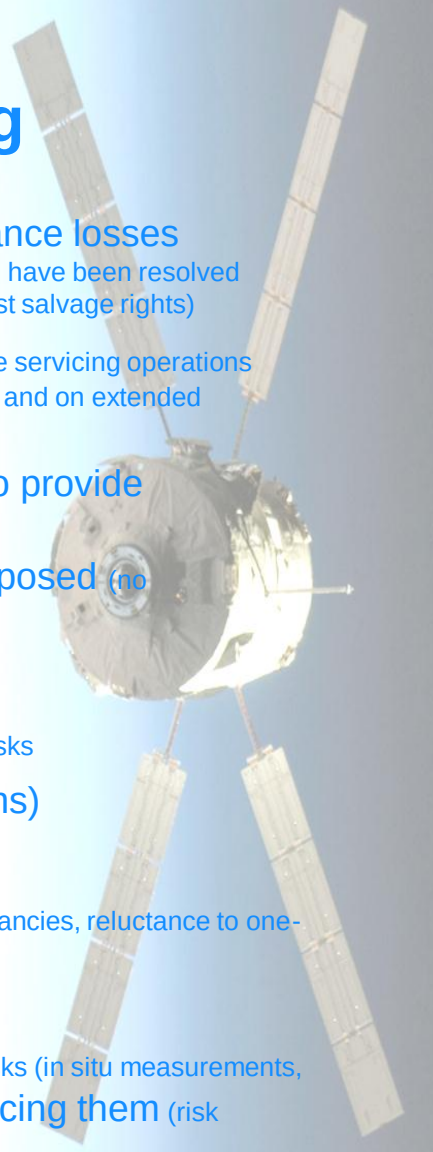
3. Active Debris Removal & On-Orbit Servicing

- Necessary operations, from a sustainable use of space standpoint, and could be critically needed in case of large debris clouds generation
- Third-Party Legal Liability is challenging (impacts on neighbouring satellites hard to assess, and to demonstrate in case of damage) and requires active collaboration with Customers/Insurers alike
- Raises awareness on space debris reality and opens new ways of innovation
- Paves way to new innovative concepts

- Could bring key resolution to insurance losses (some major losses over past couple of years could have been resolved with refuelling/reboost solutions, to be traded against salvage rights)
- Introduces new risk profiles (due to the servicing operations themselves, but also on modified hardware in-orbit, and on extended hardware past their design life)
- First-Party Property cover difficult to provide (unproven technologies, first-flight items)
- Third-Party Legal Liability highly exposed (no precedent)



→ **Need for Insurer's insights early in design phase:**

- Overall Trade-off necessary: Potential Benefits (economics, safety, sustainability) vs New risks
- Cross first-party/third-party risk assessment (end-to-end coverage solutions)
- Insurance already involved in Maximum Probable Loss definitions
- Requires in-depth technical visibility (e.g. testing, qualification, heritage, margins, redundancies, reluctance to one-off missions)
- Insurers represent multiple parties at stake (in the interest of overall risk reduction)
- Opportunity to jointly promote such initiatives aimed at better understanding space risks (in situ measurements, radar tracking and debris catalogue, collaborative databases, improved conjunction analyses), and reducing them (risk monitoring/mitigation measures, optimized avoidance manoeuvers)

Thank You

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