



XL Insurance
Reinsurance

Space insurer current view on COTS

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| Space Insurer current view on COTS | Nov 2019

1. Questions on COTS based on current space-designed units statistics
2. Space insurer concern on COTS
3. Conclusion



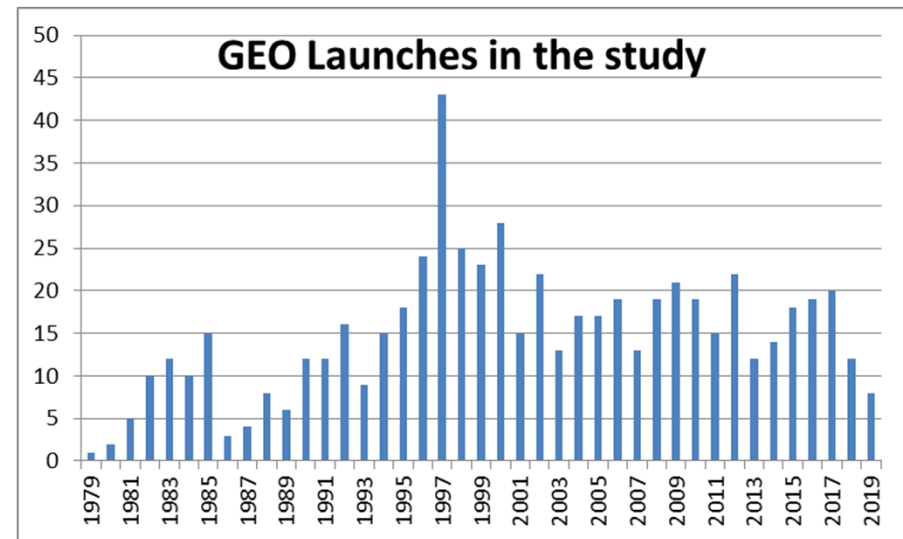
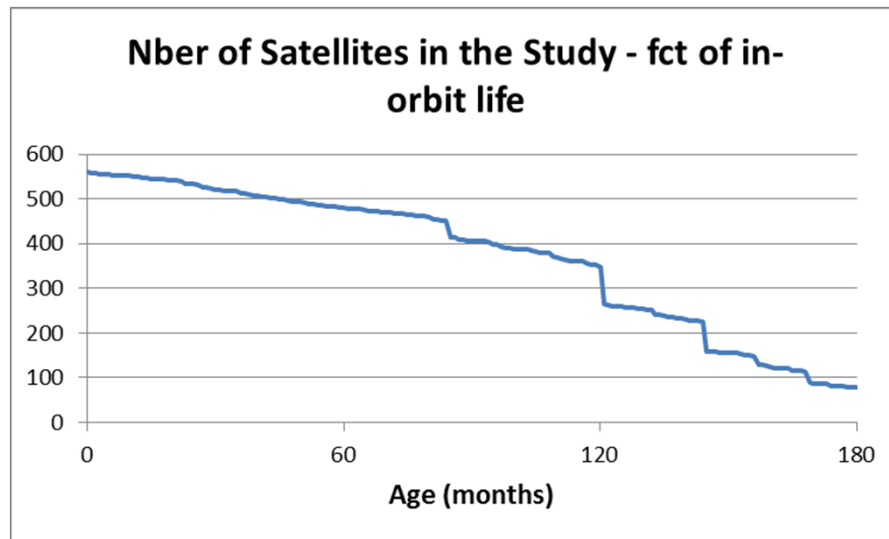
Insurer's Data

Satellite population of the Study

- Type of satellites : Telecom GEO
- Manufacturers : Western (6-majors)
- Launch date : after 1979
- Sufficient visibility from AXAXL

Available data

- Satellite design
- In-orbit anomalies
- Losses
- Covered by NDA

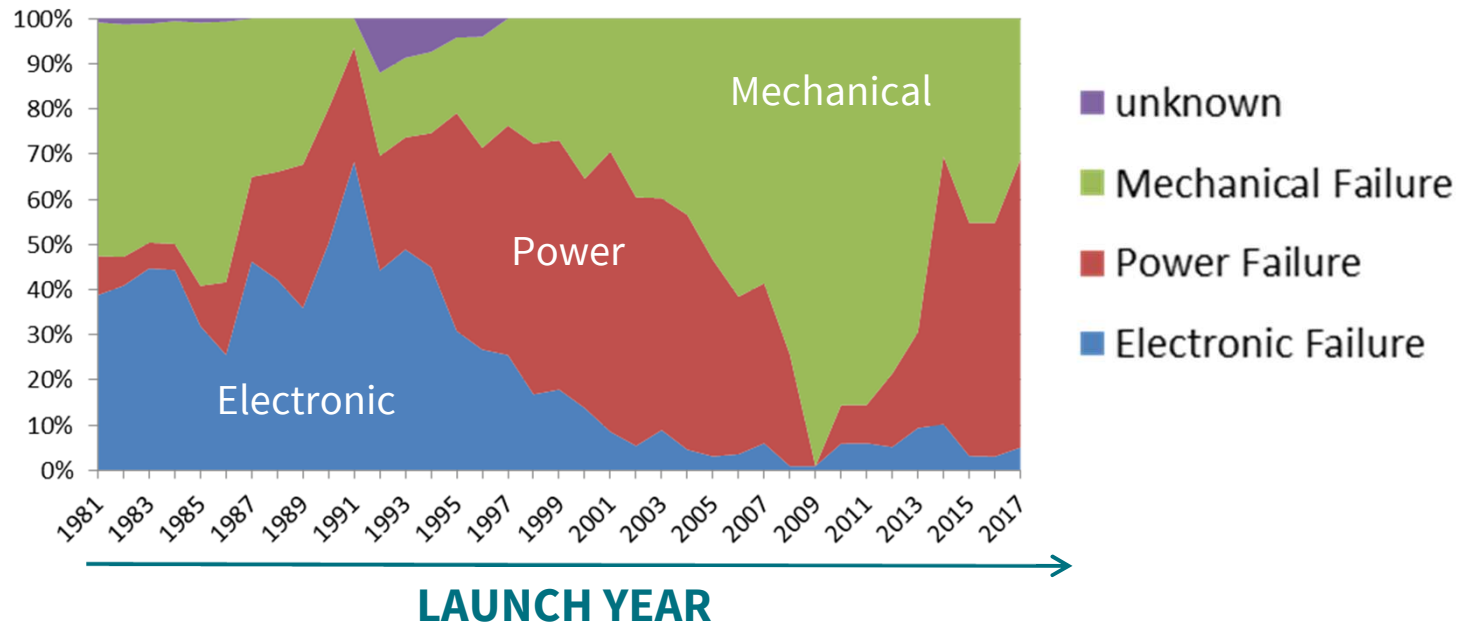


→ Database of 5600 satellite.years and 74 equivalent.satellites failure



Reliability Statistics

Type of failed units



- ➔ Losses of electronic units have decreased
 - ➔ design / protection / testing / screening have improved

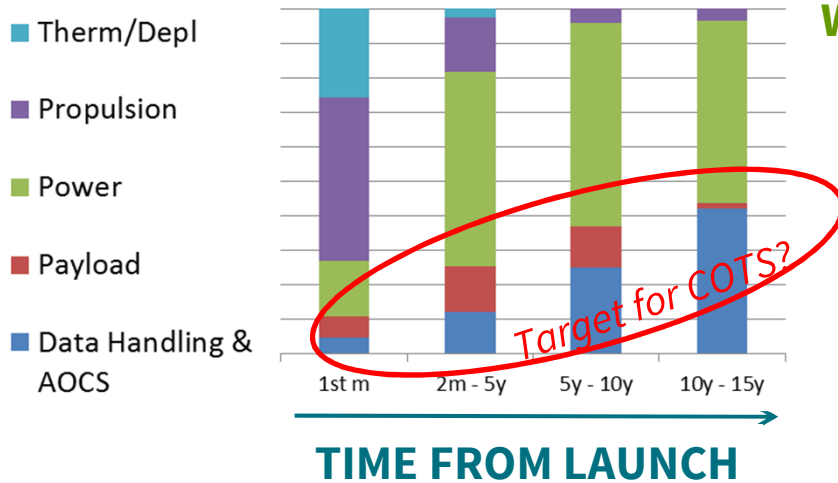
➔ How can COTS integrate lessons learned from “space designed” units ?



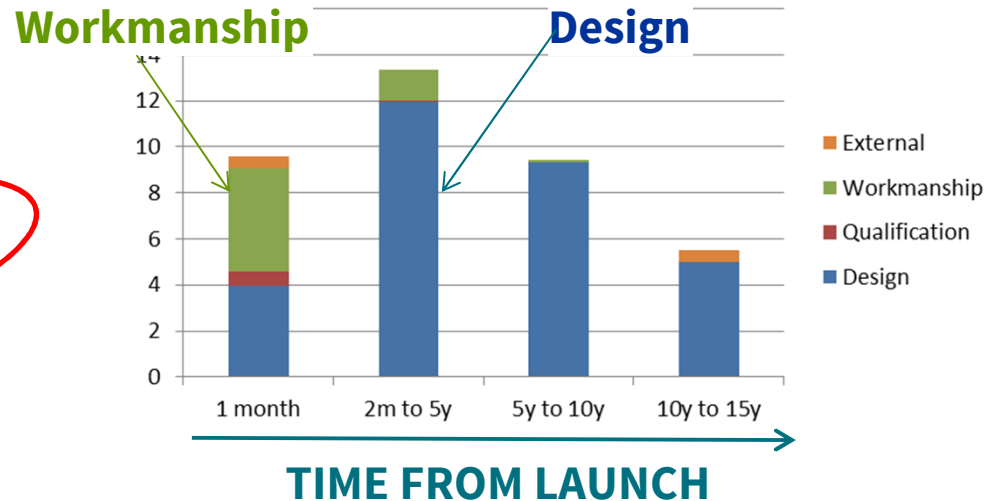
Reliability Statistics

Cause of failure (Launches after 1995)

Subsystem failure as a fct of sat life



Cause of failure as a fct of sat life



- ➔ Most issues are design related
- ➔ Design issues may appear late in life

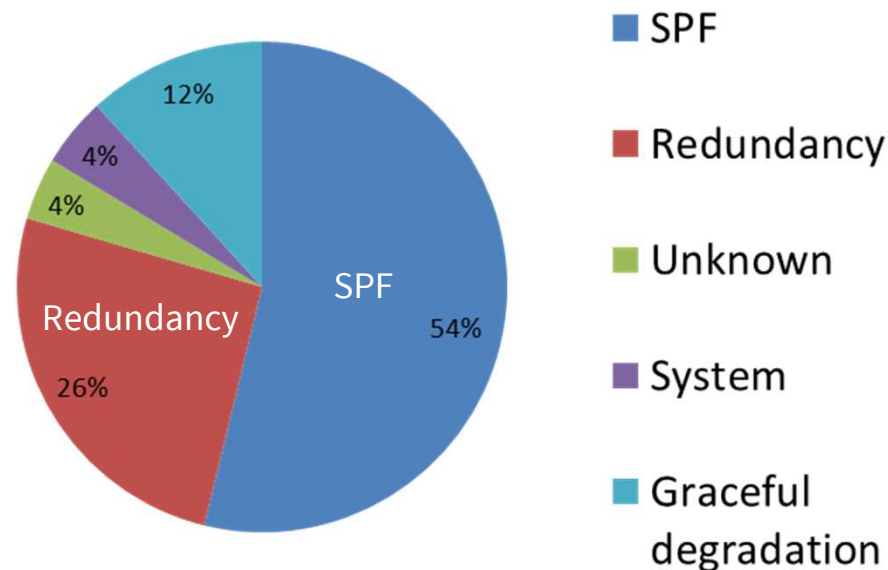
- ➔ Would this be better, worse or different with COTS?
- ➔ REX: large scale on-ground vs small-scale in-orbit?



Reliability Statistics

Type of failed system : with or without redundancy

- Single Point Failure : partial loss or total loss (typ SADM, depl mechanism, LAE)
- Redundancy : lack of redundancy
- System : affecting all units
- Graceful degradation (typ. SA string, battery cell)

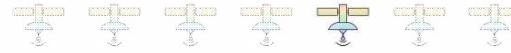


- Given the uncertainty on COTS reliability :
 - Can we avoid COTS usage on SPF?
 - Redundant systems : can we mix COTS and “space designed” units?

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Concern for Insurers to insure COTS

→ **Space environment effect**

- Vacuum (outgassing...), T° cycling, Radiation...
- Validation from Design or Tests

→ **Reproducibility / traceability**

- Is the heritage applicable?
- Confidence on Lot Acceptance Testing?
- Qualification process to be adjusted?

→ **Long Term Behavior**

- Need to wait several years before validating a design
- As for any new technology

→ **Failure propagation**

- New type of packaging
- Hidden SPF

→ **Serial Risk**

- On-board degradation might be different
- Failure on several satellites due to same root cause

→ IMPACT ON RELIABILITY?

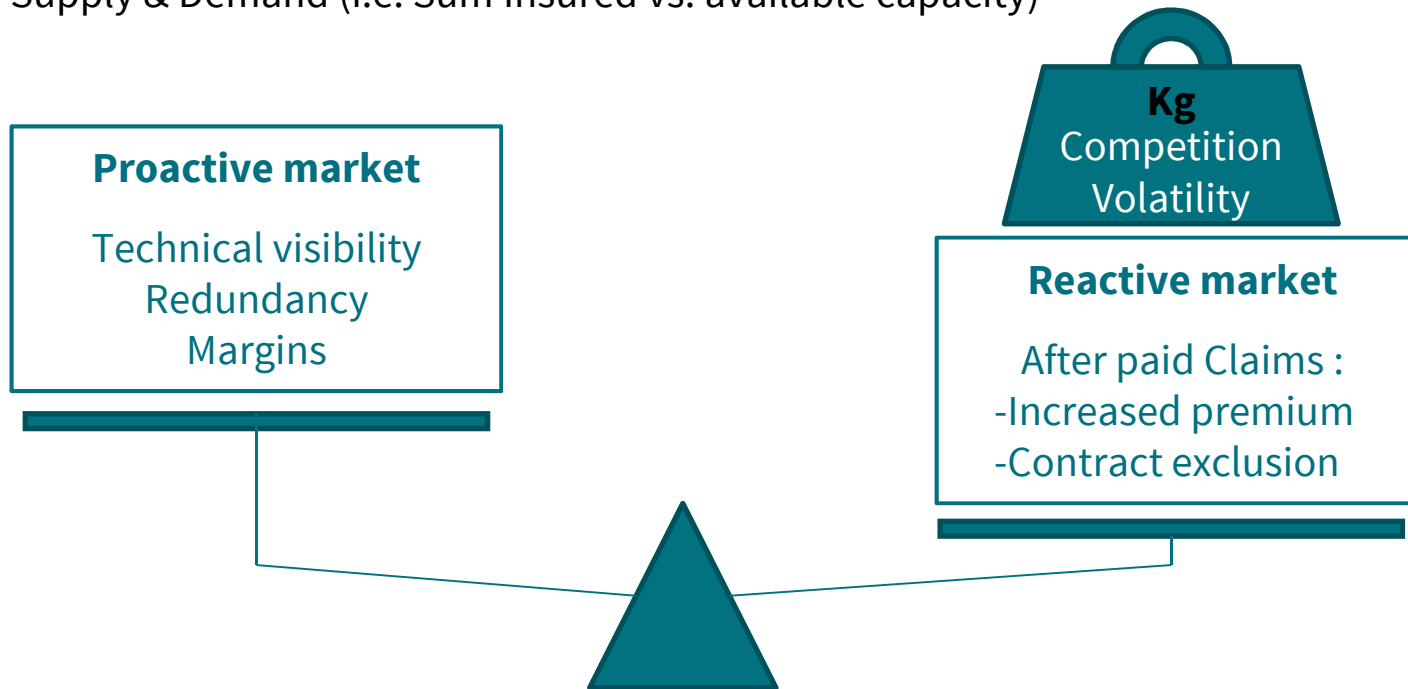
→ MORE UNCERTAINTY?

→ NEW FAILURE TYPE?



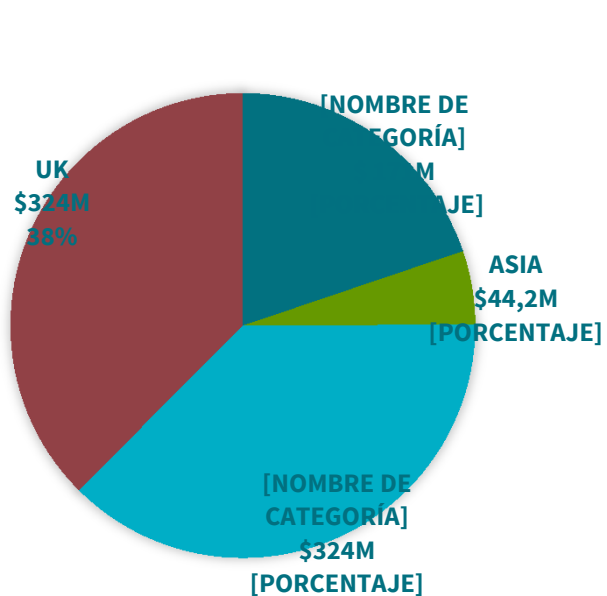
Space Insurance Market

- Insurance Premium rate is based on
 - Technical merit (design, heritage)
 - Supply & Demand (i.e. Sum Insured vs. available capacity)

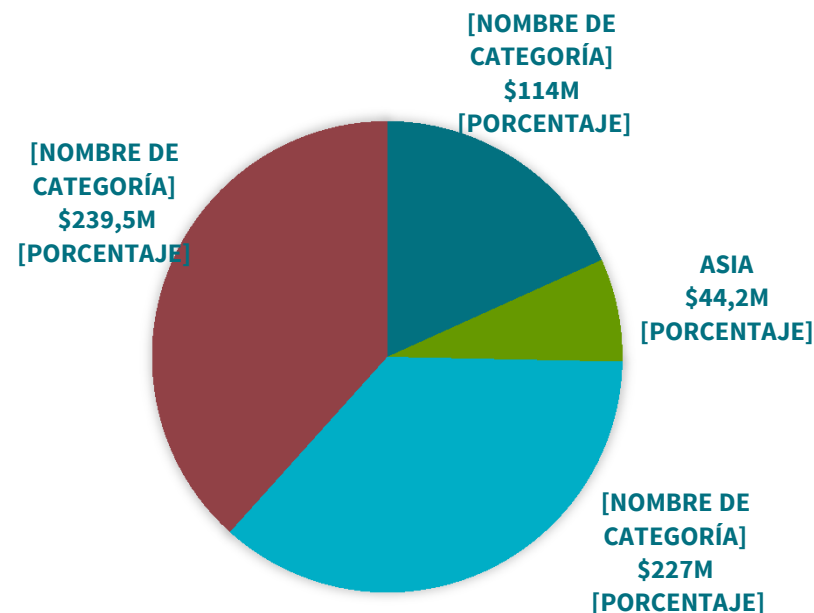


- Usage of COTS might have an impact on the premium today
- Large impact in case of (serial) failure due to COTS

Insurance Market Capacity in 2019



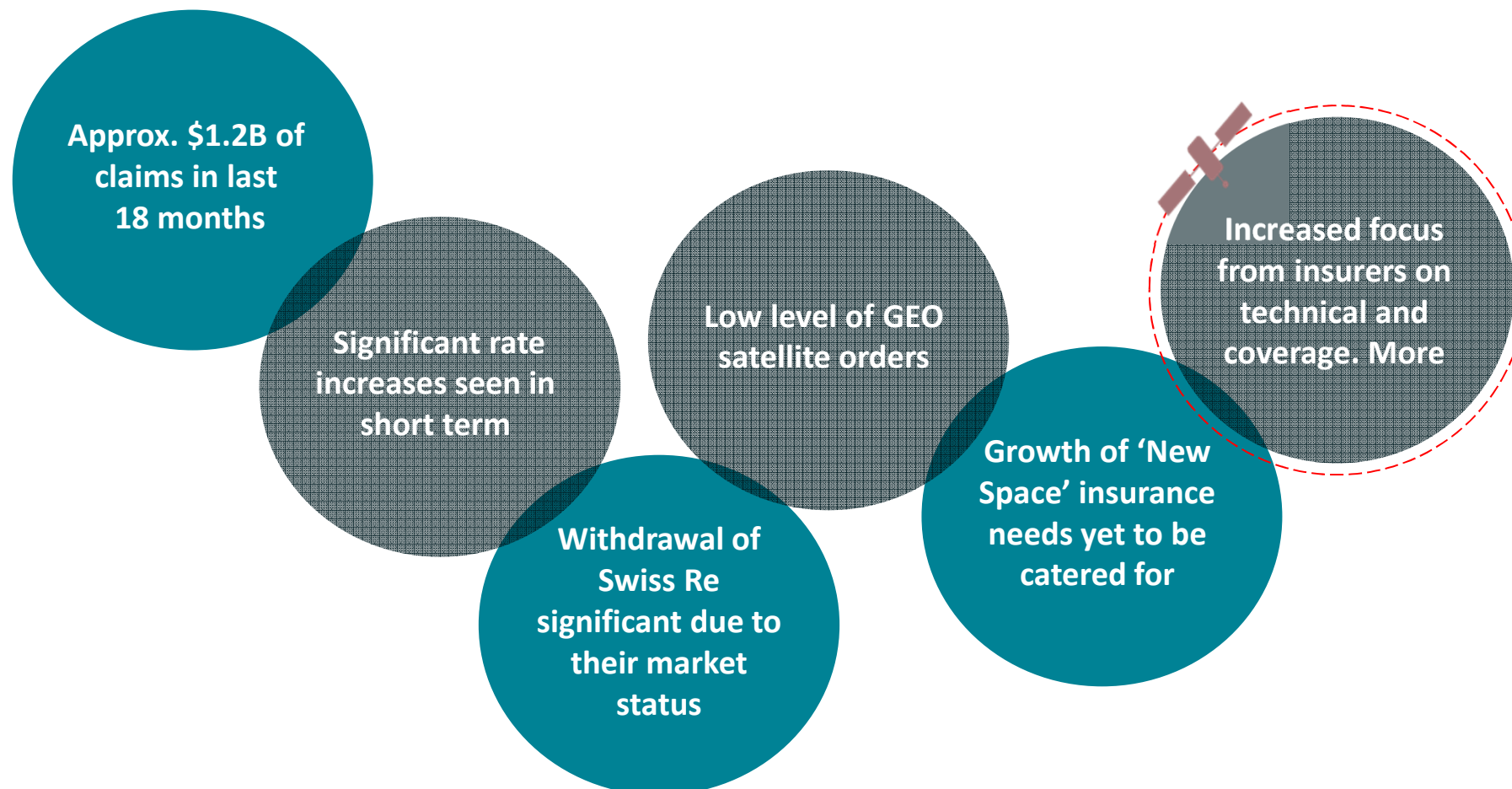
Launch Capacity
\$ 817.2M



In orbit Capacity
\$ 624.7M

Space Insurance Market

Market Summary





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Conclusion

→ Designing space product remains a **challenge**

- How COTS units can have the same reliability?
- More margin? More testing? More screening?

→ **System design with COTS shall be at least as reliable as standard design**

- Trade-off between COTS and redundancy / No SPF with COTS
- COTS impact shall be clearly analyzed, understood and mitigated

→ **COTS usage is expected by insurers to increase**

- With care and higher premium at start
- Insurance market might react sharply in case of serial issues with COTS
- Development of COTS shall be spread enough over time



Thank you