



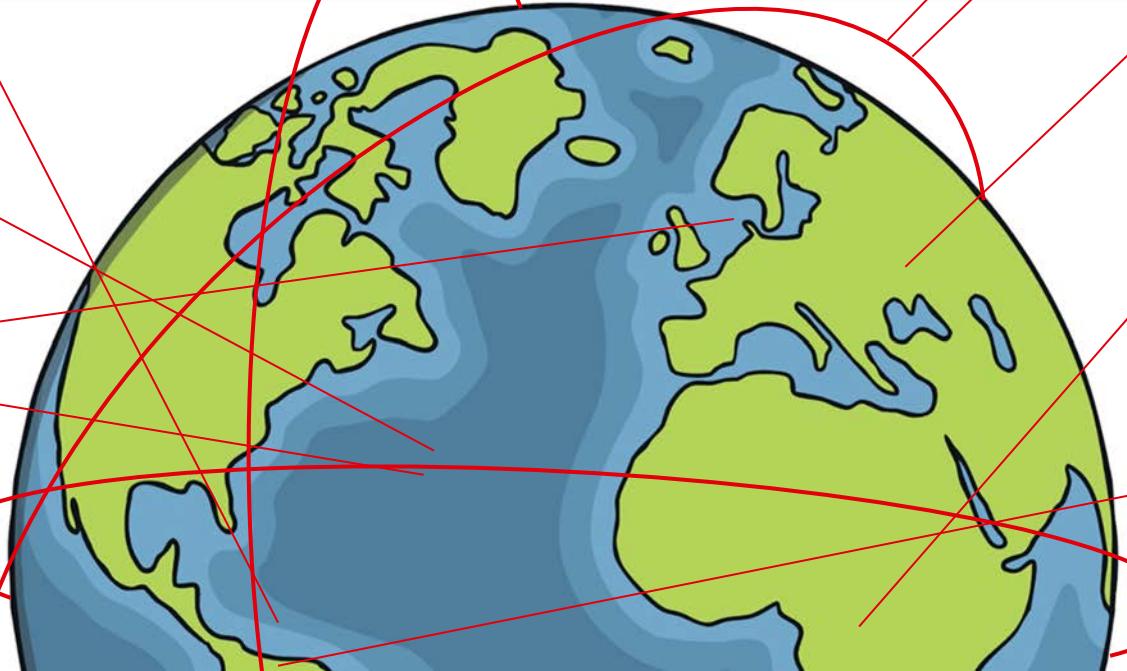
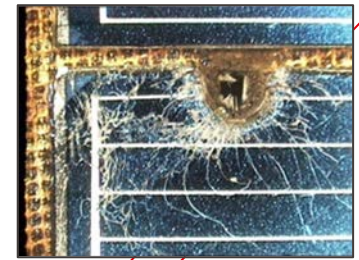
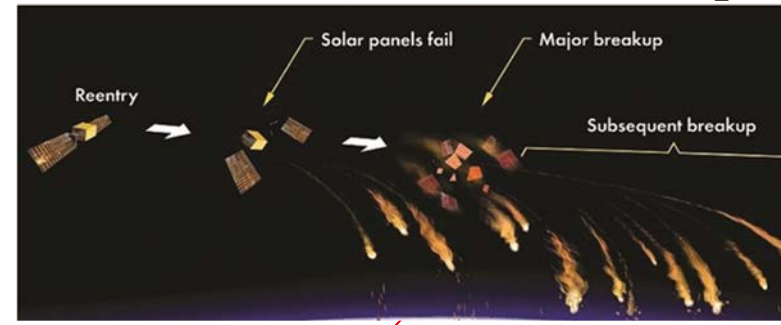
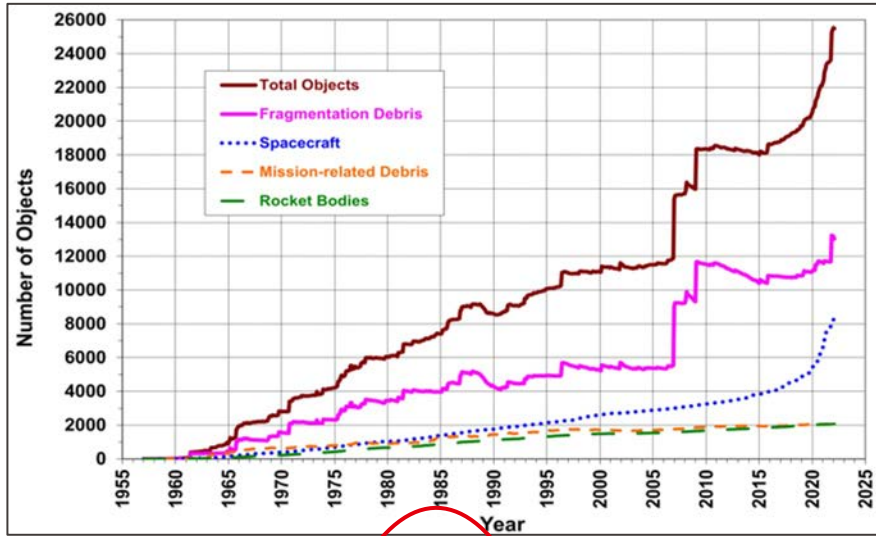
Mapping of space sustainability competences at EPFL

Emmanuelle David,
Executive Director

Stephan Hellmich

Mathieu Udriot

Impacts of space activities





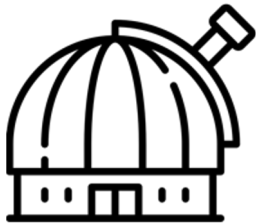
How can we **foster** space activities while **sustaining** the use of outer space
in the long term?

EPFL's competence group for new technologies and services to secure the long-term usability of space



**Sustainable
Space Hub**

1. Measure



Filling the knowledge gaps about space objects

2. Understand

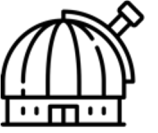


Analyse and quantify environmental risks and impacts of missions

3. Act



Include assessments in space mission design since the early phase



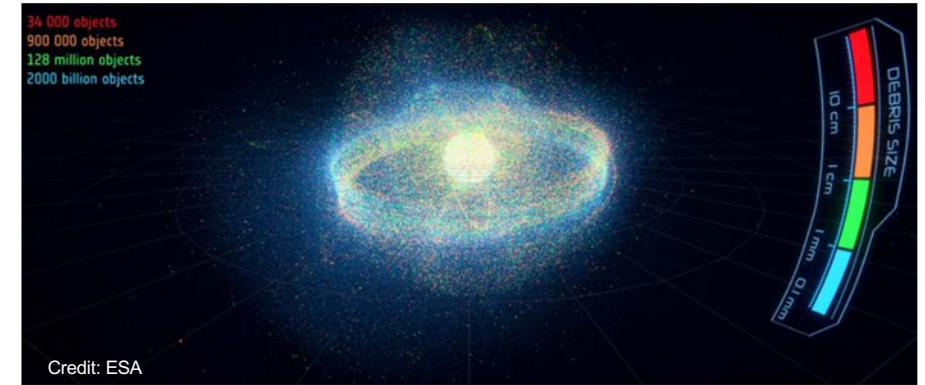
CVLAB | LASTRO | eSpace

- **Total number and orbital distribution**
 - Evaluation of the current situation
 - Risk assessment
 - Define mitigation measures

- **Rotation states and physical properties**
 - Support active space debris removal
 - Detect imminent fragmentation events
 - Study long-term effects of the space environment

SKACH

- **Interference with optical and radio astronomy**
 - Protection of ground-based and orbit-based astronomical observations





eSpace

Space Logistics research

- Scenarios and optimisation (deployment, ADR, refilling)
- Space debris risks

EPFL/UNIL

Satellite conjunction

- Statistics
- Risk thresholds for collision avoidance manoeuvres

LSMS

In-Space fragmentation

- Hypervelocity impacts
- Modelling of fragmentation
- Catastrophic collisions





eSpace

Assessment and Comparison Tool (ACT)

- Trade-off design choices accounting for environmental performance
- Covering the entire life cycle (incl. re-entry)

LPAC

Demisability of composite materials

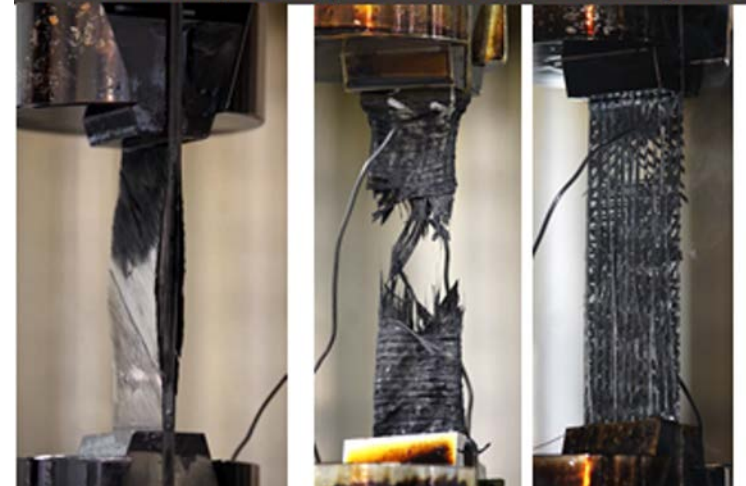
- Models, experiments
- Sandwich panels and joint structure

LSMS

Fragmentation during re-entry

- Initial orbital conditions
- Break-up of structures leading to more demise

Demisable panels | Flax-Carbon fibers hybrid



+ Study the effect on the atmosphere- looking for competences!!!

Act- open the dialog and share knowledge

eSpace

Support knowledge transfer

- Lunar sustainability guidelines (May 2024)
- Handbook for eco design (Summer 2024)



eSpace

Sustainable Space Advocacy

- Support the Space Sustainability Rating
- Collaboration with Swiss industries, NGO, IGO
- Participation in different working group



Ext School/STI-SEL

Space Sustainability Education

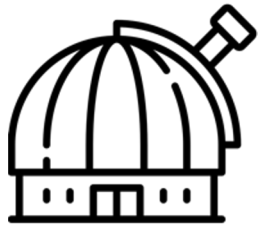
- First Space Sustainability course for prof 2024
- Course on Space Sustainability in Spring 2025



Geneva
Science-Policy
Interface



Conclusion





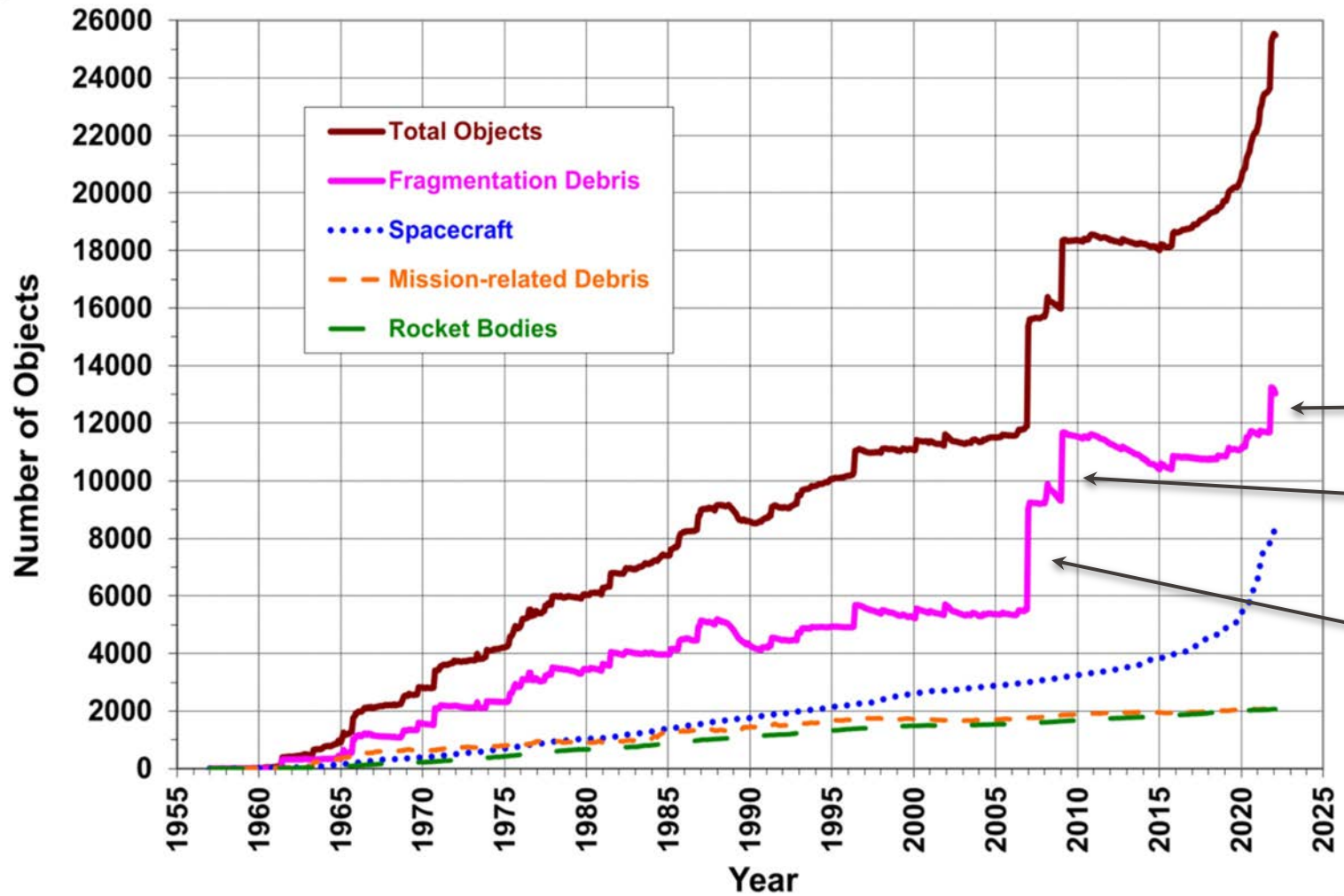
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The debris situation



- Russian anti-satellite missile test
November 15, 2021
- Collision of Iridium 33 and
Cosmos 2251
February 10, 2009
- Chinese anti-satellite missile test
January 11, 2007

Monthly number of objects in Earth orbit officially cataloged by the U.S. Space Surveillance Network.
NASA: ODPO

