Council of the
European Union

Brussels, 3 September 2024
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ESPACE 75
INTER-REP 88

COVER NOTE

Subject:	Zero Debris Charter - Powerpoint presentation (Space WP meeting 03.09.2024)

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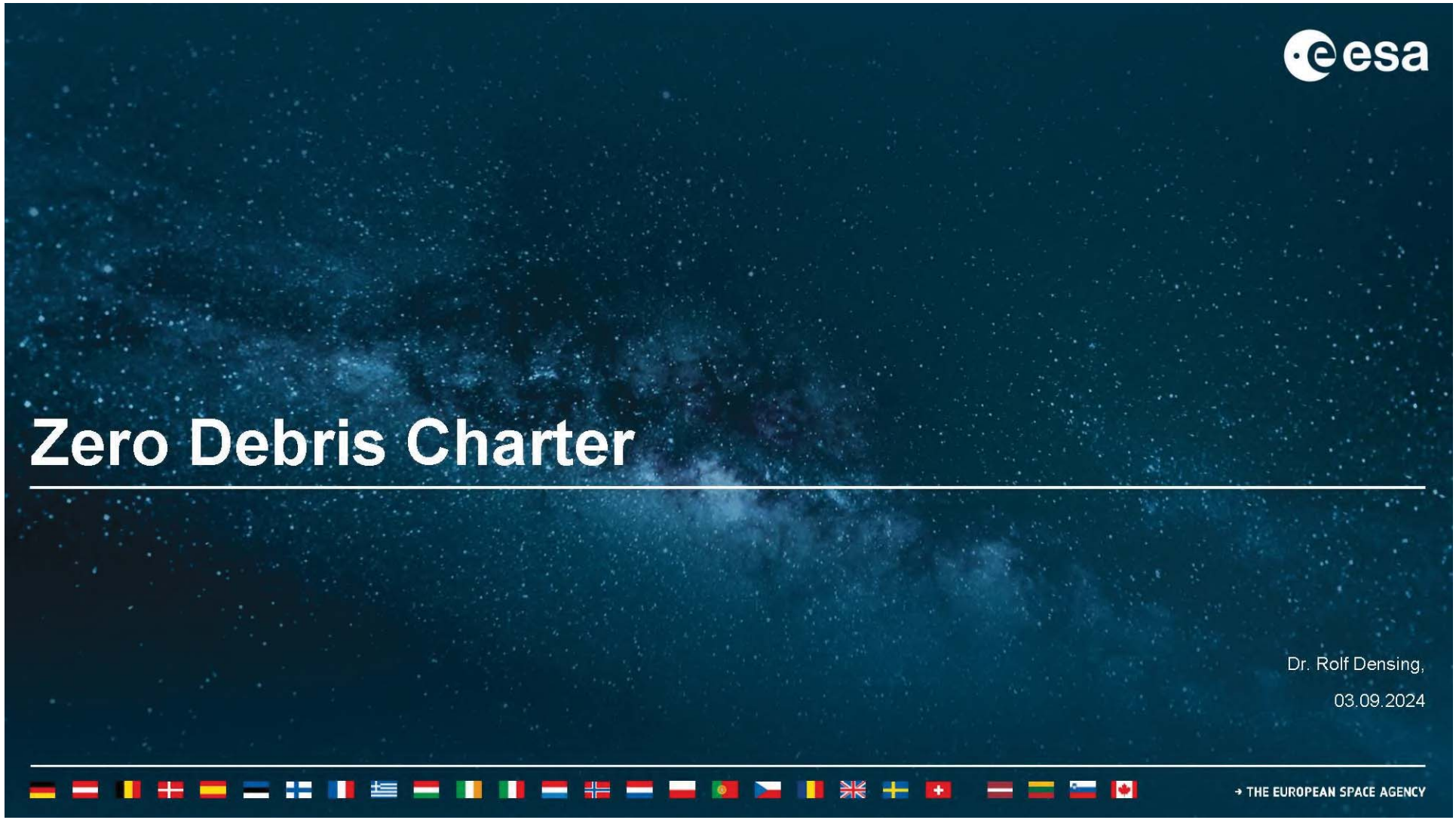
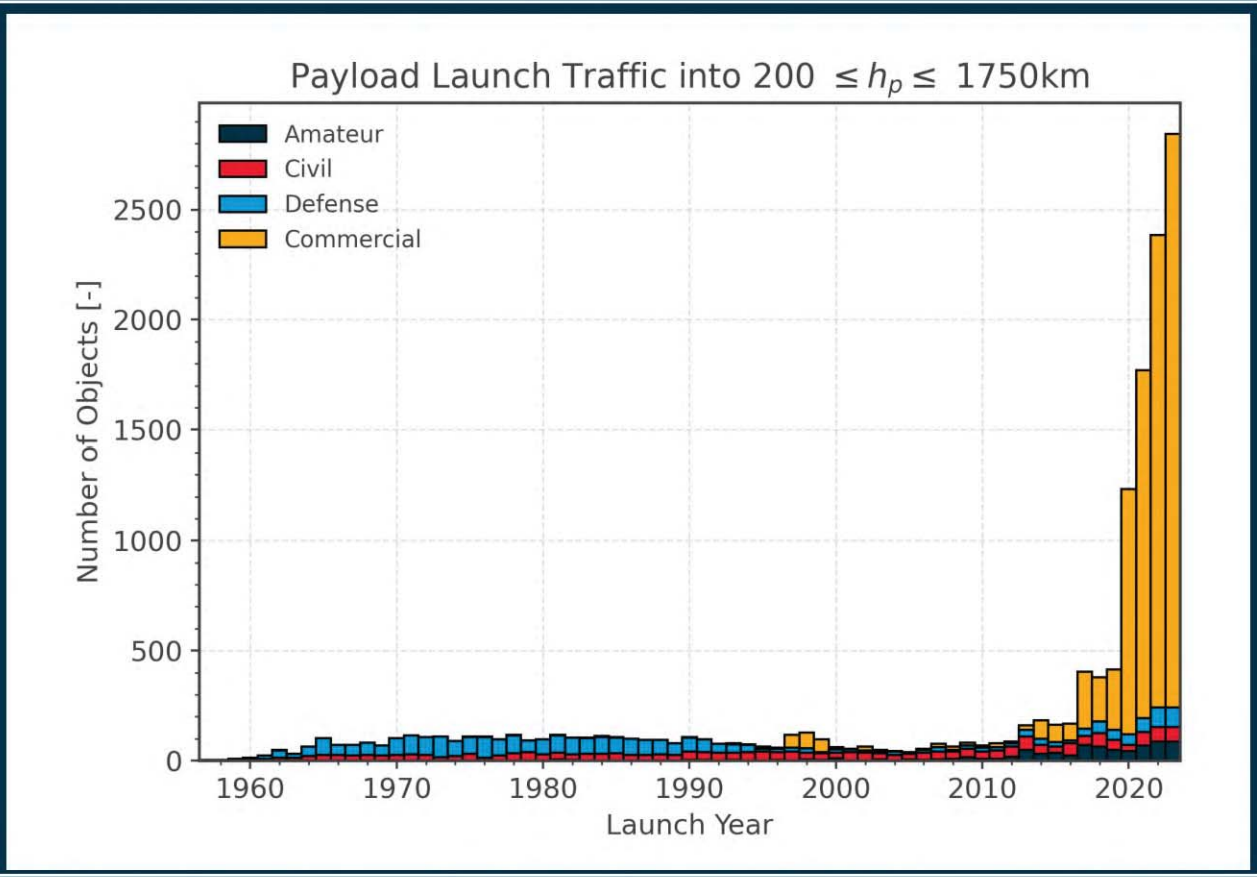
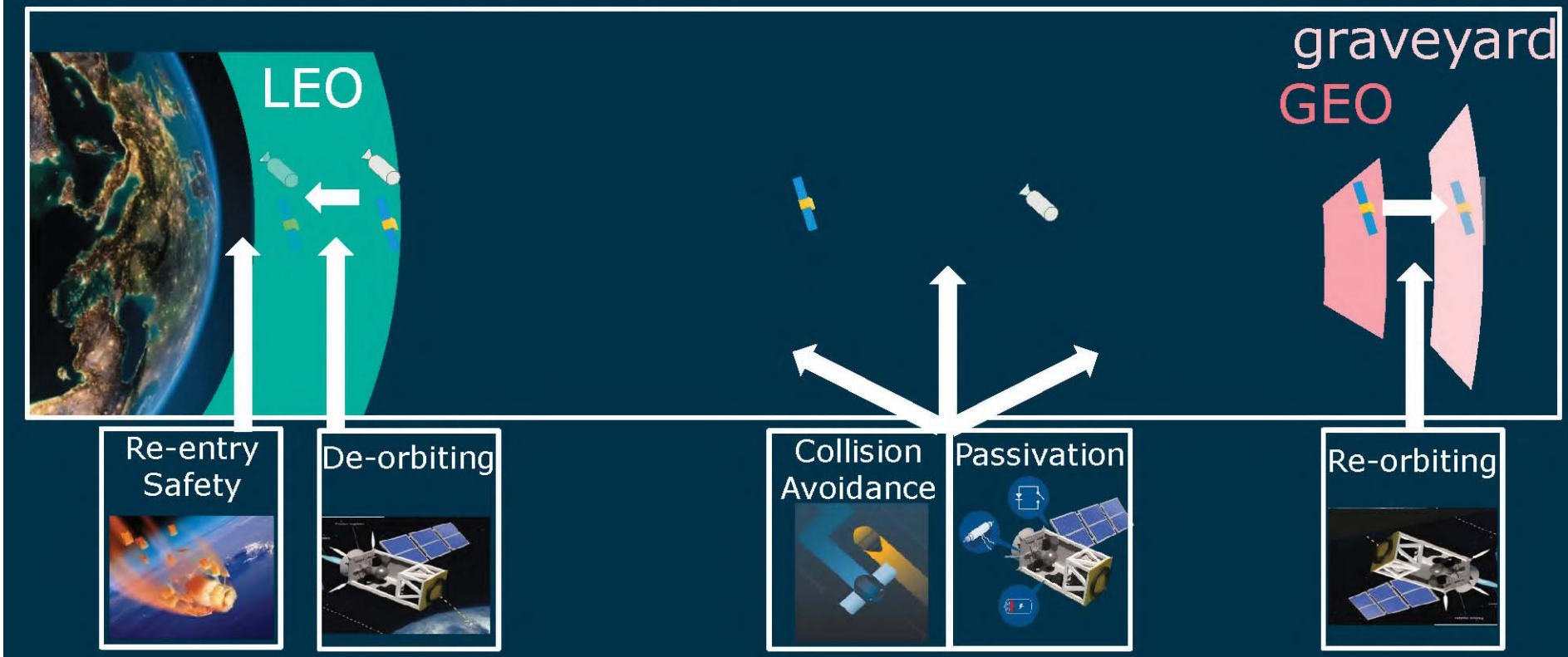


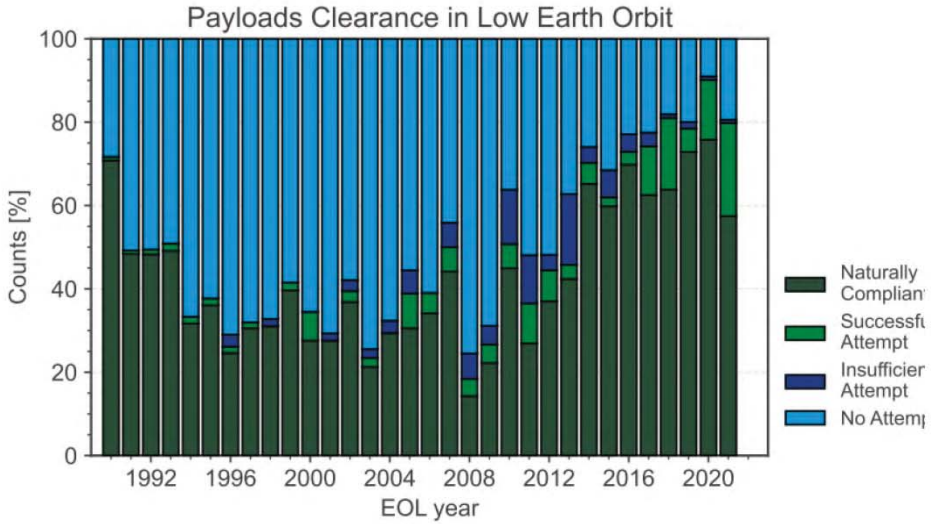
Development of the Launch Traffic



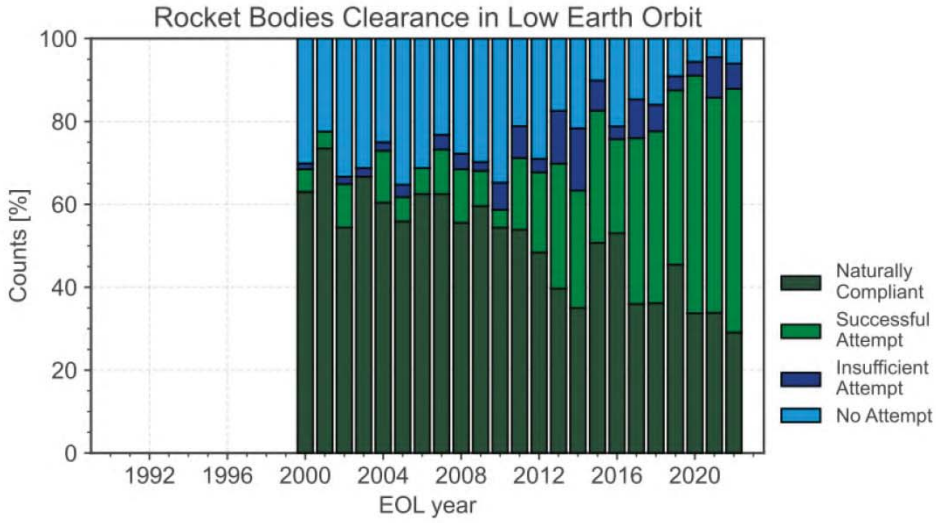
Mitigation of Space Debris



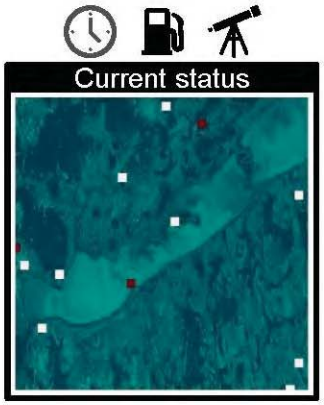
Post Mission Disposal LEO – all objects

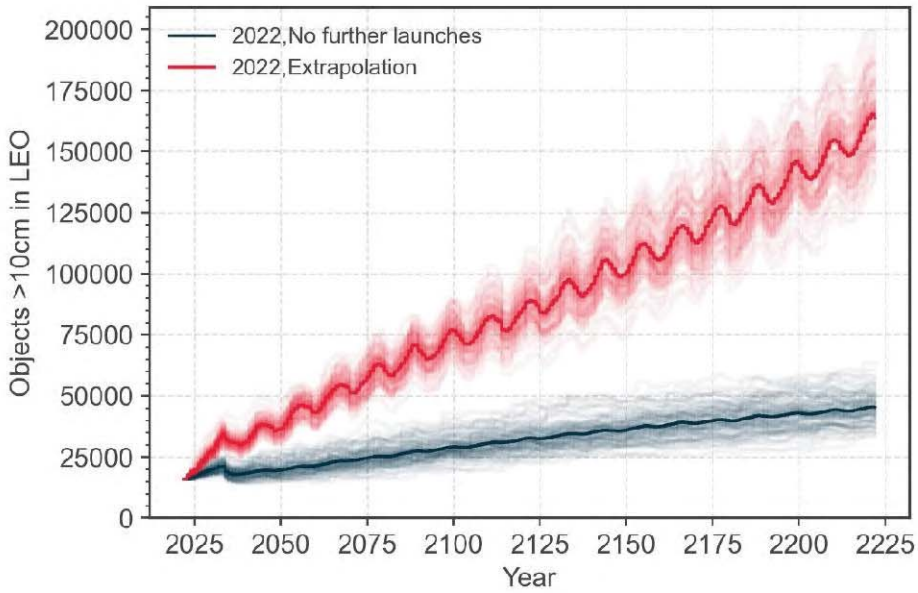


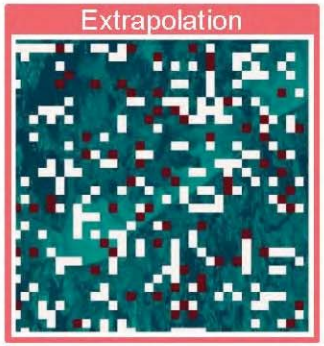
(a) Relative clearance of LEO_{IADC} by payloads.



Saving our Future







Zero Debris implementation

ESA Zero Debris Approach

A step-by-step approach, leading by example to implement Zero Debris by 2030. This approach is enabled by technical advancements and implemented through a state-of-the-art space debris mitigation technical standard, applicable to ESA missions.

Zero Debris Charter

Engaging like-minded actors of the space sector in a collective effort towards space safety and sustainability

Zero Debris Technical Booklet

List of needs, technical solutions and contributions gathered through the Zero Debris community to achieve the jointly defined sustainability targets by 2030

ESA SDM Standard: What's new? – some examples

Clearance criteria

+ **< 5 years in LEO**
+ **Collision risk** < 1:1000
+ Apogee below 375 km for large constellations
+ If graveyard, no crossing with known constellations

Probability of successful disposal

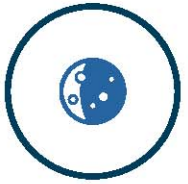
+ ≥ 90% considering both **internal** (reliability) and **external** (impacts) factors
+ ≥ 95% for large constellations
+ Monitoring and reassessment

COLA & STM

+ Encoding of current best practices (e.g. data sharing)
+ Recurrent manoeuvre capability in GEO, in LEO for high and very high-risk objects, and for constellations
+ Collision probability threshold for action ≤ 1:10000 (single conjunction)

Design for removal

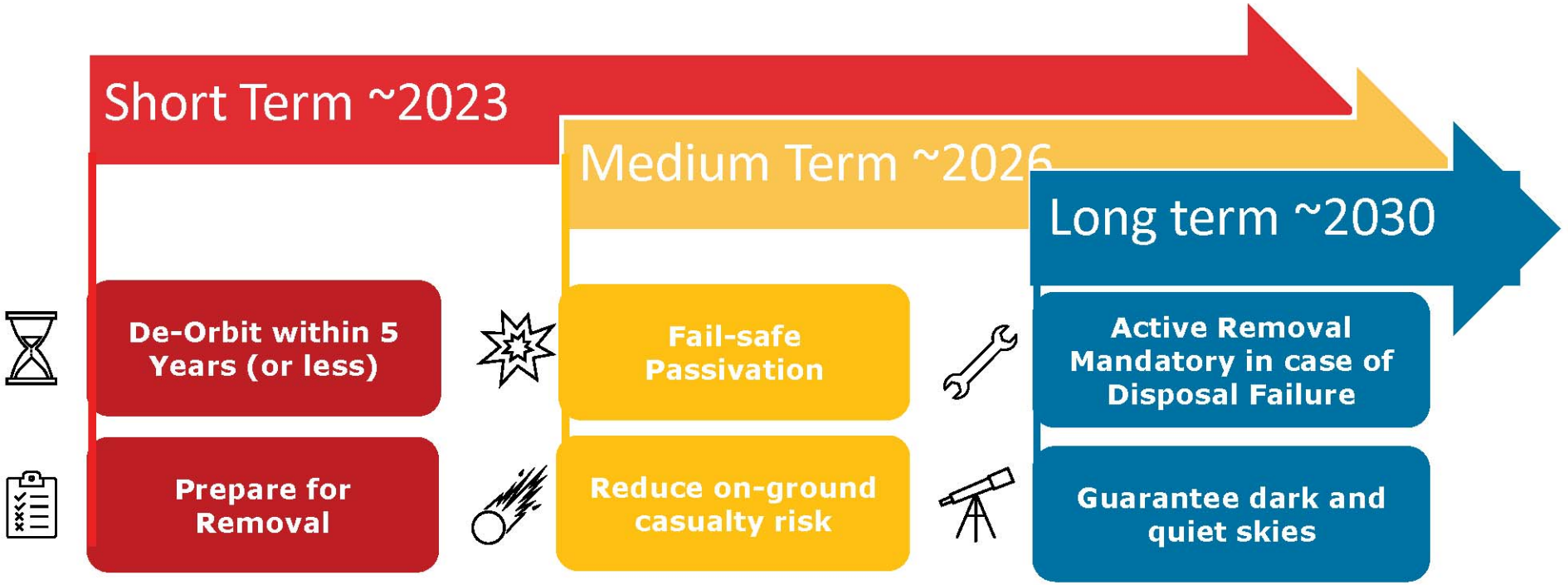
+ **Preparation for removal** for objects in the protected regions, except low-risk ones



Lunar orbits

+ No MROs
+ Break-up prob. < 1:1000
+ Space traffic coordination
+ Analysis of disposal options

ESA's Zero Debris Approach



Zero Debris Charter: Principles and Targets

Release of space debris

No intentional release of space debris and minimise unintentional generation

1

Adverse consequences of Space Debris

Adverse impacts of space debris on the population, infrastructure, earth environment, and dark and quiet skies should be minimised.

2

Common knowledge and understanding of Space Debris

Constant and collaborative efforts to improve our understanding of the space debris population and its impacts

3

Probability of Debris generation by break-ups or collisions

The probability of space debris generation through collisions and break-ups should remain below 1 in 1000 per object during the entire orbital lifetime.

1

Timely and successful clearance

Timely clearance of low Earth orbit and geostationary Earth orbit regions should be achieved with a probability of success of at least 95% after end of mission, including through external means when necessary.

2

Casualty risk on ground

The casualty risk from re-entering objects should remain significantly lower than 1 in 10 000, striving towards zero casualty. A suitable aggregate risk threshold for constellations of satellites in the low Earth orbit region should be identified.

3

Space Traffic Coordination

Routine and transparent information sharing should be facilitated and active participation in strengthening global space traffic coordination mechanisms should be encouraged.

4

Space Surveillance and Tracking

Access to timely and accurate data on space objects down to a size of 5 cm or smaller in low Earth orbit and 20 cm or smaller in geostationary Earth orbit should be improved to enhance decision making capabilities for collision avoidance.

5

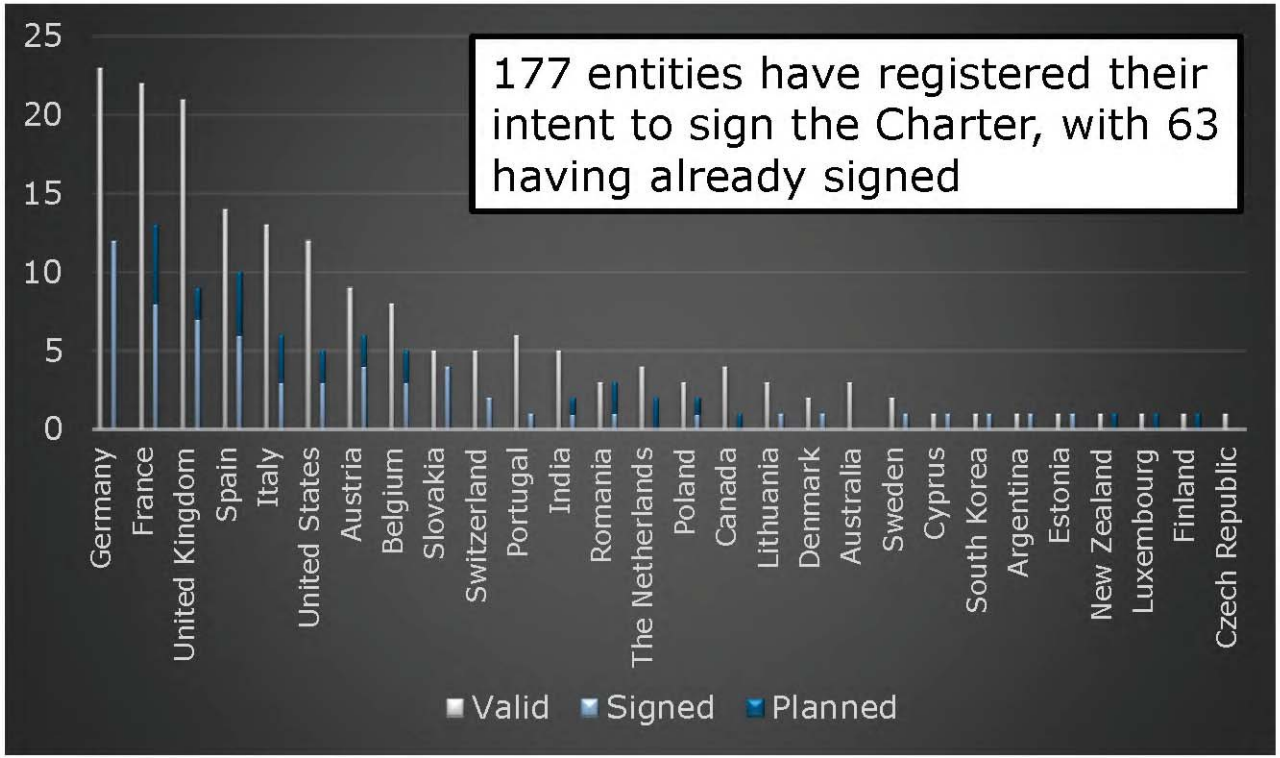
Link to the Charter

Zero Debris Charter

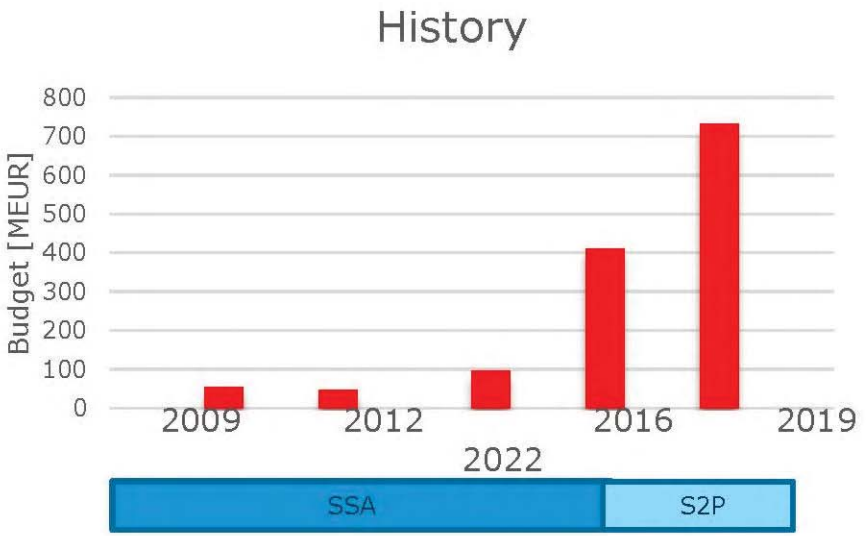
Zero Debris Charter: 12 States
signed at the Brussels Space Council

Zero Debris Charter: 40 companies and universities signed at ILA 2024

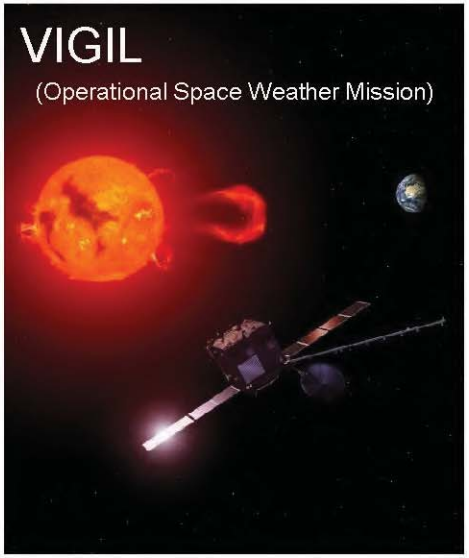
Charter: Status of Registrations/Signature

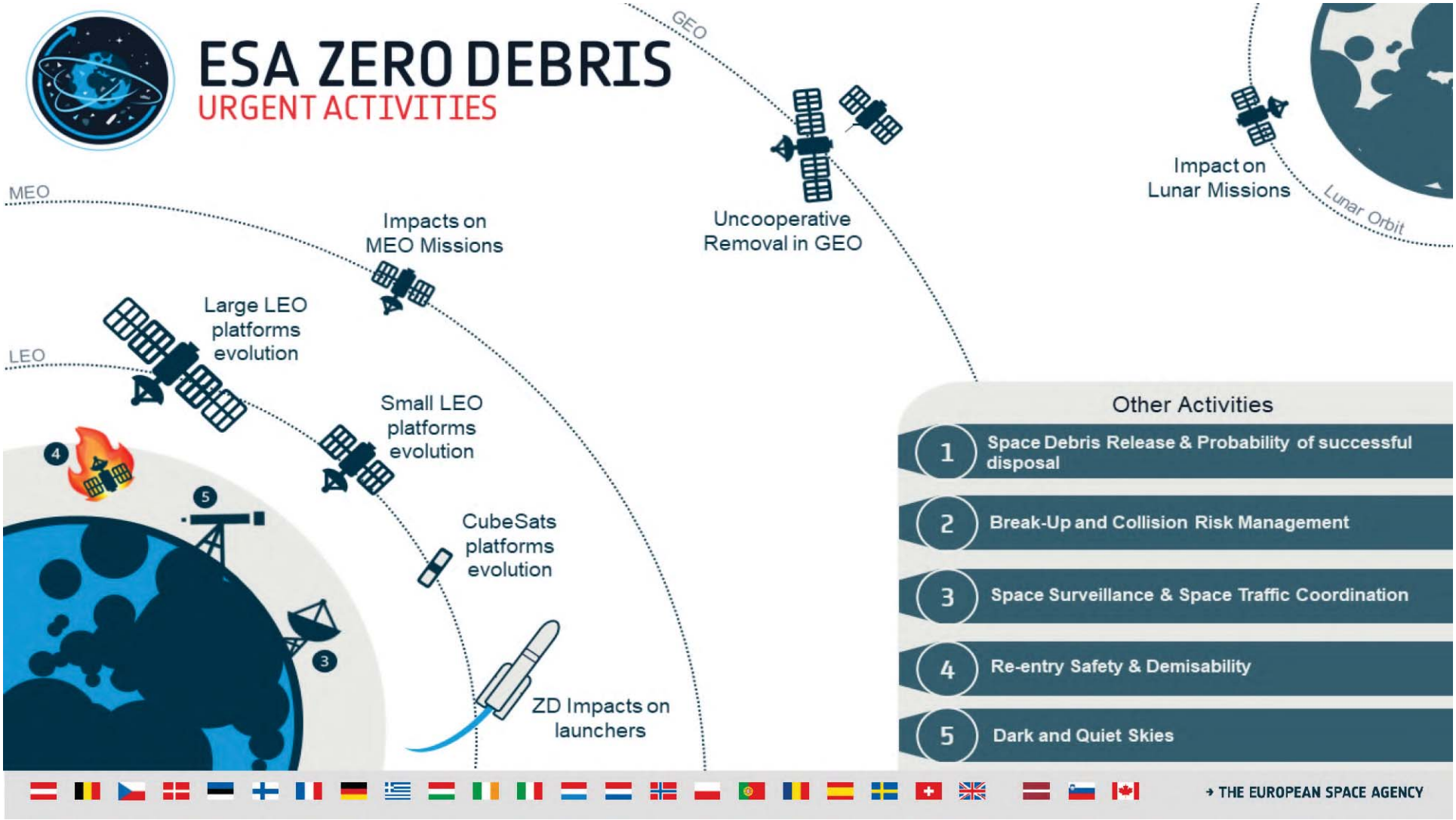


From SSA to Space Safety

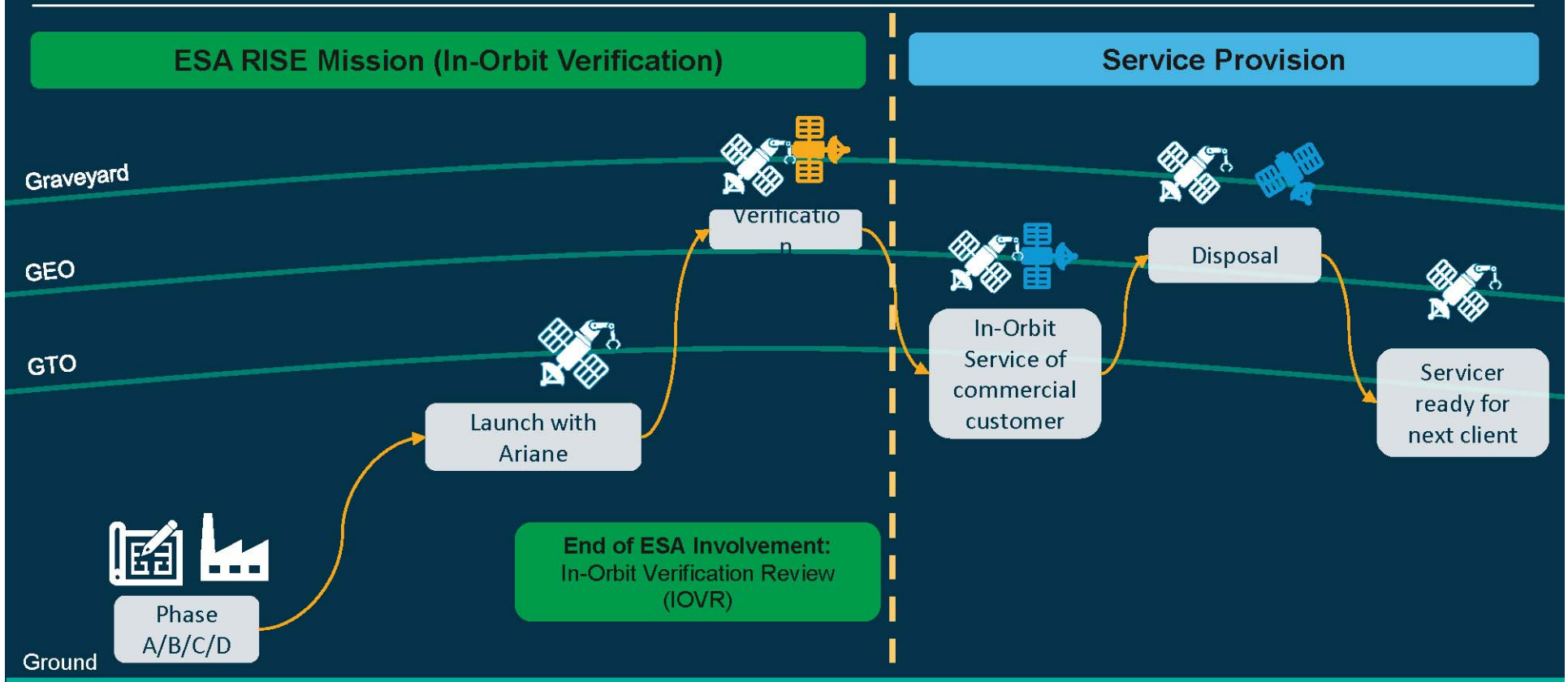


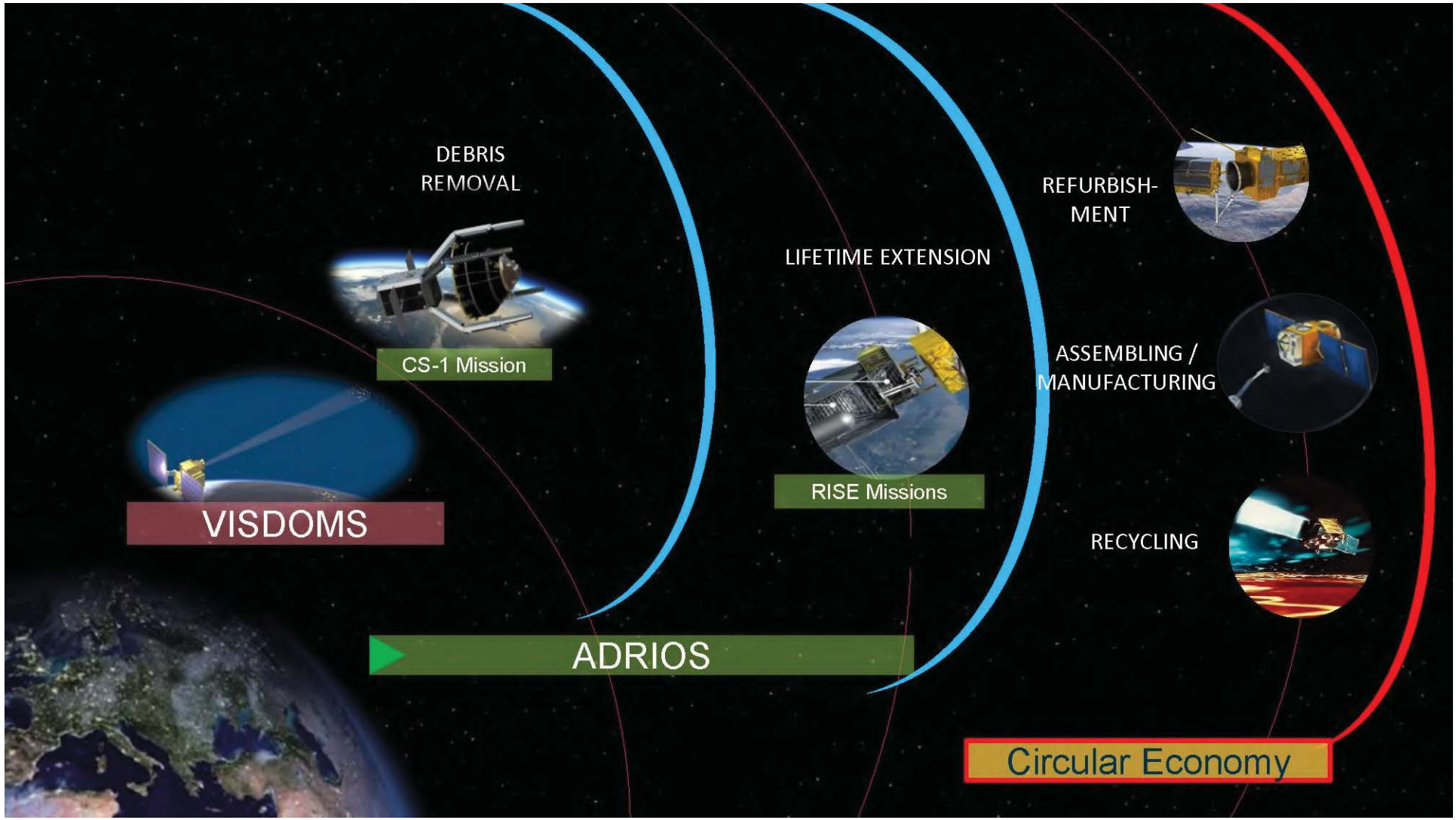
Space Safety Programme Content





In-Orbit Servicing





Goal of the ZD Technical Booklet

The proposed booklet initiative aims to answer to the call to define collaboratively **how to reach Zero Debris by 2030**:

1. Involve all stakeholders in identifying the **technical needs** and **possible solutions**
2. This booklet is for the **benefit of everyone** involved in the Zero Debris effort and could be the support different stakeholders' contributions in the future
3. ESA acts as a **facilitator for the booklet**, is one of the contributors and will be one of the beneficiaries.
4. Inputs include **Zero Debris Charter** but also **national and international guidelines and regulatory frameworks.**
5. **Participation is voluntary** and the outcome is for **information**

Participants of the Technical Booklet Working Group are invited to reflect on how the Booklet can serve their organisation's internal strategy

Space Weather Hazards

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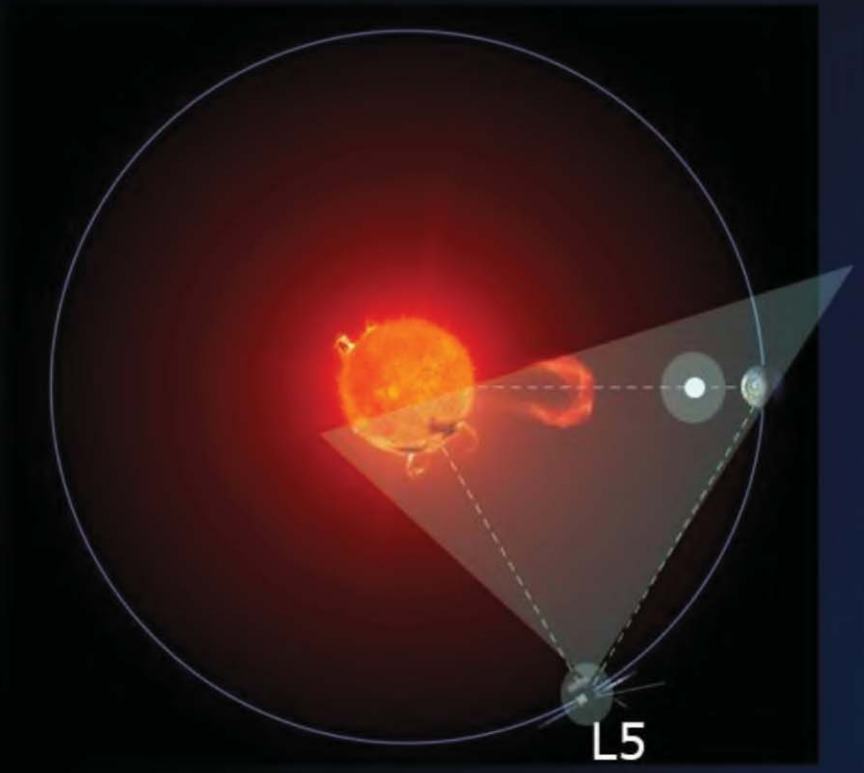
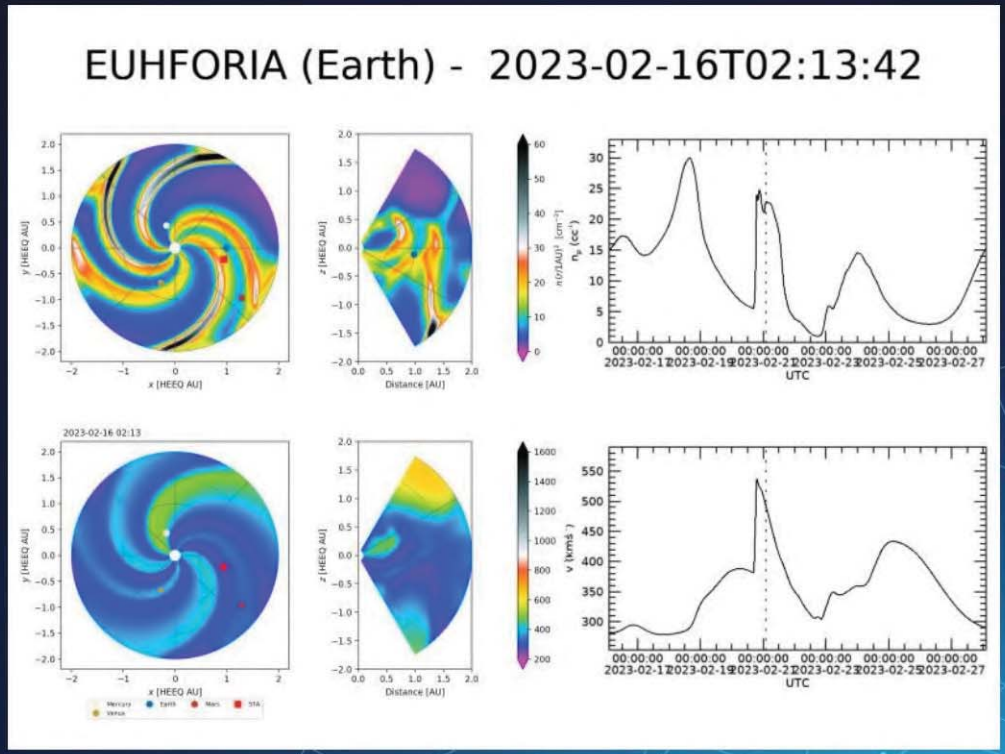
Major Events in 2022/2024

2022

2024

VIGIL Mission – Space Weather Network





ESA / EC collaboration on Space Weather