THE ZERO DEBRIS CHARTER

ESA will open the Zero Debris Charter for signature at the Space Summit. It aims to gather like-minded entities around jointly defined, ambitious, meaningful and measurable targets. Through an open co-development process involving any interested stakeholder, the Zero Debris Charter will:

- Build a community of like-minded organisations in Europe and beyond, committed to further advancing space safety and sustainability.
- Develop a precise and common vision for space sustainability by 2030 on which to build an ambitious European roadmap.

The Zero Debris Charter is just the starting point of ambitious, collective capacity-building activities that will drive European commercial and institutional organisations towards global leadership in space debris mitigation and remediation.

SPACE HAZARDS AND CRITICAL INFRASTRUCTURES

The Carrington event

In 1859, strong aurorae were observed around the world and spontaneous fires were reported at multiple telegraph stations. It is thought to have been the results of a massive coronal mass ejection, the largest in recorded history.

The cost of extreme events

The potential socio-economic impact of a single extreme space weather event, like a coronal mass ejection, is estimated to be approximately €15 billion according to a 2016 ESA study.

The first space debris strike

In 1996, the French satellite Cerise became the first-ever satellite damaged by a debris impact. The catalogued debris originated from an Ariane rocket launched 10 years earlier.

Loss of Earth observation data

The total annual loss of data and revenues due to service outage of Earth observation satellites while performing collision avoidance manoeuvres ranges from 2500 to 5600 hours of data acquisition (413 satellites) and conservatively from €158,000 to €355,000 of revenues (92 commercial satellites).

Shortened satellite lifetime

The total annual cost of satellite lifetime shortening induced by collision avoidance manoeuvres ranges from €22 million to €44 million of lost revenues from 2304 small commercial satellites in low Earth orbit.

Tiny debris, huge impact

A 1-cm piece of debris in low Earth orbit, travelling at around 7 km/s, has the kinetic energy of an exploding hand grenade. ESA estimates that there are around a million of such debris, which cannot be observed with current ground-based instruments. A million unrecorded flying hand grenades.

THE PROTECT ACCELERATOR

VISION

The world is becoming ever more dependent on space-enabled technologies; an estimated 10% of European GDP already relies on satellite services. The Protection of Space Assets accelerator (Protect) aims to keep space-enabled technologies safe from hazards such as space debris and space weather.

The outer space environment is degrading at record speed, fuelled by the miniaturisation of satellite systems and the deployment of large constellations that jeopardise the immediate safety of valuable space assets and the long-term sustainability of space operations. Meanwhile space weather events could severely disrupt or even permanently destroy the operations of crucial infrastructures, both on the ground and in space. Accurate space weather forecasts are also indispensable to ensure the safety of human activities on and around the Moon.

The Protect accelerator will forge communities of organisations that rely on space to address the risk posed by space hazards. It will ensure that space technologies and solutions are readily available, thereby ensuring the availability of vital services.

OUR WORK

Europe is positioned to become the world's first zero-debris space power. The Zero Debris Charter recently launched by ESA aims to inspire and promote the widespread adoption of more effective space debris mitigation and remediation practices across the space community.

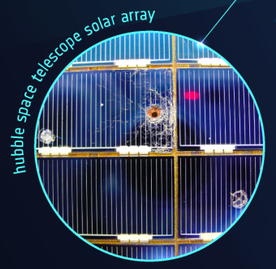
The Protect accelerator supports efforts towards the provision of operational European space weather services, based on the ESA's existing pre-operational Space Weather Service Network. A space weather service demonstrator is now being implemented in the Arctic to gather feedback from a wide range of organisations, capitalising on the current period of intense solar activity, ahead of operations.

By working with national, EU or other European initiatives, the Protect accelerator not only tackles existing challenges but also acts as a catalyst and enabler for transformative solutions. It underscores ESA's commitment to driving innovation and technological advancements, ultimately contributing to safer and more sustainable space activities.

SPACE SUMMIT 2023

SEVILLE

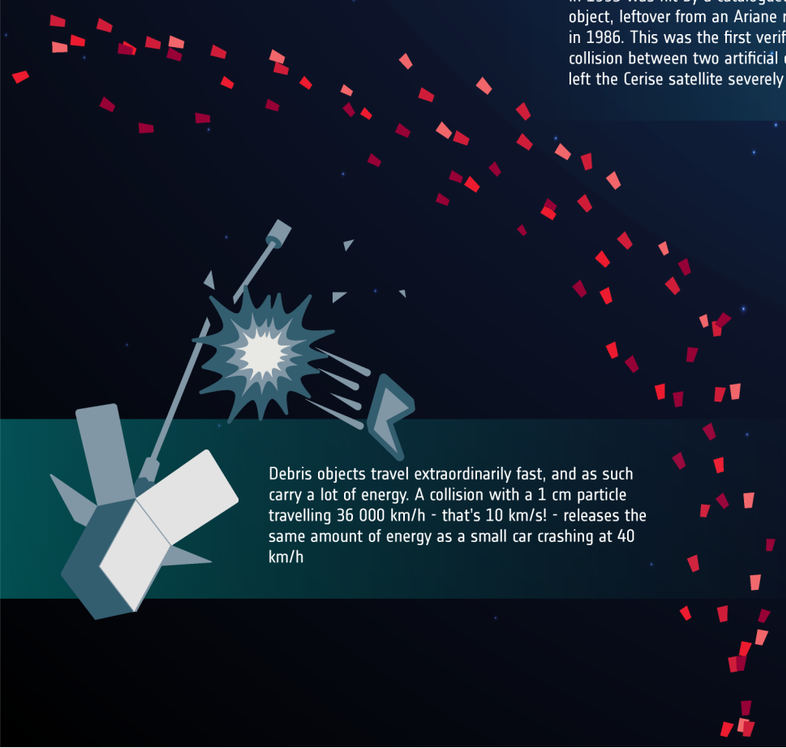
esa AMBITION



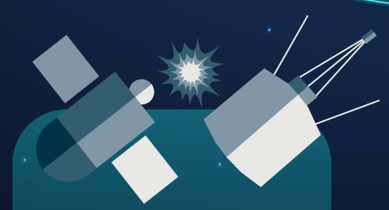
hubble space telescope solar array

Spacecraft bodies can be protected by shields, however their solar panels are constantly hit by small debris fragments, too small to be tracked from Earth. Over time, thousands of small impacts degrade exposed surfaces.

In 1996, the Cerise satellite launched in 1995 was hit by a catalogued debris object, leftover from an Ariane rocket launched in 1986. This was the first verified accidental collision between two artificial objects in space, and it left the Cerise satellite severely damaged.



Debris objects travel extraordinarily fast, and as such carry a lot of energy. A collision with a 1 cm particle travelling 36 000 km/h - that's 10 km/s! - releases the same amount of energy as a small car crashing at 40 km/h



The first collision between two satellites was in 2009. The derelict Kosmos 2251 satellite, launched 1993, and operational Iridium 33 satellite, launched 1997, collided with a relative speed of 11.7 km/s, creating thousands of debris fragments.

coronal mass ejections

solar flare radiation

solar energetic protons

cosmic rays

astronaut radiation

energetic radiation belt particles

single event upset

radiation damage

signal scintillation

enhanced ionospheric currents and disturbance

navigation errors

hf radio wave disturbance

aurora and other atmospheric effects

disturbed reception

decrease directional drilling accuracy

geomagnetically induced currents in power system

induced geoelectric field and current