ESA Space Debris
Fact Sheet
May 2019

About space debris

Space debris is defined as non-functional, human-made objects orbiting Earth, such as defunct satellites, explosion and collision fragments or discarded rocket bodies.

In almost 60 years of space activities, more than 5450 launches have resulted in some 44 000 tracked objects in orbit, of which about 23 000 remain in space with a total mass of more than 8400 tonnes – the same as the metal structure of the Eiffel tower.

These objects are regularly tracked, and include pieces larger than about 5–10 cm in low-Earth orbit (LEO) and 30 cm to 1 m at geostationary (GEO) altitudes. Only a small fraction – about 2000 – are intact, operational satellites.

Tiny fragments have the potential to damage working satellites, while collisions with large pieces can destroy them altogether.

Our future space environment

Constellations of satellites are groups of artificial satellites working together with a common cause, frequently used for navigation and communications purposes. Constellations consisting of hundreds to thousands of spacecraft are becoming a popular solution for global telecommunications coverage, for example bringing internet broadband services to everyone on the globe.

The number of active satellites in space is expected to increase from the thousands of today to tens of thousands in the next 10 years, increasing the likelihood of collisions and the amount of space debris.

“Satellites bring us important scientific data and provide extremely useful services to millions of people across the globe,” says Stijn Lemmens, Senior Space Debris Analyst.

“While upcoming constellations of thousands of satellites will bring even more benefits, they have the potential to do immense damage if not designed, launched, and operated with extreme care.”

“Vitally, satellites launched into space must be reliably deorbited and passivated at the end of their lives, and this needs to be considered during their design, development and lifetime in space”.

Space debris by the numbers

The latest figures related to space debris, provided by ESA’s Space Debris Office at ESOC, Darmstadt, Germany. Information correct as of January 2019.

Number of rocket launches since the start of the space age in 1957:

**About 5450 (excluding failures)**

Number of satellites these rocket launches have placed into Earth orbit:
About 8950
Number of these still in space:
About 5000
Number of these still functioning:
About 1950

Number of debris objects regularly tracked by Space Surveillance Networks and maintained in their catalogue:
About 22 300

Estimated number of break-ups, explosions, collisions, or anomalous events resulting in fragmentation:
More than 500

Total mass of all space objects in Earth orbit:
More than 8400 tonnes

Number of debris objects estimated by statistical models to be in orbit:
34 000 objects >10 cm
900 000 objects from 1 cm to 10 cm
128 million objects from 1 mm to 1 cm

ESA will present a plan for action on space debris at the Agency’s next Ministerial Council, called ‘Space19+’, which will be held in November 2019. The plan includes:

**ESA’s vision**

- By 2030, we want Europe’s space infrastructure to efficiently mitigate the generation of space debris and their hazards
- To enable the safe operation of individual satellites and large constellations by developing and demonstrating an Automated Collision Avoidance System
- To develop a European industrial capacity to conduct in-orbit servicing by flying a first-of-its-kind debris-removal mission

**How will we do this?**

- Develop and demonstrate an automated Collision Avoidance System to reduce current costs and increase safety in the looming era of large constellations
- All ESA missions including launcher upper stages are to achieve 100% compliance with debris mitigation regulations without loss in competitiveness
- Develop the necessary optical and laser technologies to enable effective space traffic management
- Demonstrate the technology needed to perform active debris removal as a precursor to a new European industrial capability to perform in-orbit servicing
Media Contact for information

Details available via http://www.esa.int/esa_newsroom

Links

Space Safety at ESA: www.esa.int/Space_Safety

ESA Space Debris Office: www.esa.int/Space_Debris


ESA’s In-Orbit Servicing Vehicle: http://www.esa.int/Our_Activities/Space_Safety/ESA_s_e.Deorbit_debris_removal_mission_reborn_as_servicing_vehicle

Space debris images

ESA Space Debris Facility: http://www.esa.int/spaceinimages/Images/2017/04/ESA_Space_Debris_Facility

International Space Station impact chip: http://www.esa.int/spaceinimages/Images/2016/05/Impact_chip

Sentinel-1 impact: http://www.esa.int/spaceinimages/Images/2016/08/Sentinel-1_impact

ATV shielding after impact test: http://www.esa.int/spaceinimages/Images/2014/06/ATV_shielding_after_impact_test

Hypervelocity Impact: http://www.esa.int/spaceinimages/Images/2013/04/Hypervelocity_Impact

The Optical Ground Station – Eye on Debris: http://www.esa.int/spaceinimages/Images/2017/04/Eye_on_debris

Space debris videos

Space debris video playlist: http://www.esa.int/spaceinvideos/Sets/Space_debris_playlist

Space debris – A Journey to Earth: https://www.youtube.com/watch?v=zT7typHkpVg

ESA’s detection expertise: http://www.esa.int/spaceinvideos/Videos/2019/01/ESA_s_detection_expertise

ESA’s Space Debris Office – news highlights

Space debris training course prepares university students for future challenges: http://www.esa.int/Education/ESA_Academy/Space_Debris_Training_Course_2019 Prepares University Students for Future Challenges
ESA and the United Nations team up for space debris:
http://www.esa.int/Our_Activities/Space_Safety/ESA_and_the_United_Nations_team_up_for_space_debris

Recognising sustainable behaviour:
http://www.esa.int/Our_Activities/Space_Safety/Space_Debris/Recognising_sustainable_behaviour

Mission control saves science:
http://www.esa.int/Our_Activities/Operations/Hundreds_of_impacts_crater_ESA_s_Columbus_science_laboratory

Rocket break-up provides rare chance to test debris formation:
http://www.esa.int/Our_Activities/Space_Safety/Rocket_break-upProvides_rare_chance_to_test_debris_formation

Hundreds of impacts crater ESA’s Columbus science laboratory:
http://www.esa.int/Our_Activities/Operations/Hundreds_of_impacts_crater_ESA_s_Columbus_science_laboratory