



**Deutsche Gesellschaft  
für Luft- und Raumfahrt  
Lilienthal-Oberth e.V.**

Wissenschaftlich-technische  
Vereinigung

# Space Debris

Feb. 8<sup>th</sup>, 2021, 19:00 CET  
ZOOM online-seminar

## Speakers

Dr. Carsten Wiedemann, TU Braunschweig  
Marius Eickmans, Director Operations (civ.), German Space Situation Awareness Center

## Host

DGLR Braunschweig Branch

In a 400km orbit an unpowered object will vanish into atmosphere after roughly one year but objects in orbits higher than 1000km will never vanish into atmosphere at all. Consequently, Space Debris that stays in orbit could cause serious damage to satellites or the space station.

Specialists that work on the matter say that they know about 22.000 items that are of the size of a baseball or lager. Furthermore it is assumed that there are more than 900.000 items of the size of roughly 1cm in the low earth orbits.

But how does Space Debris influence space operations? What implications could collisions have on our daily life and what do research and technology contribute to carry out safe space operations?

Our two speakers, Dr. Carsten Wiedemann and Marius Eickmans, are experts on the subject. They will give insight into the theoretical modeling of Space Debris and show how space operations deal with it.

## Lecture 1: Modeling the Space Debris Environment

Dr.-Ing. Carsten Wiedemann

At low earth orbits (LEO), particularly high collision velocities can occur. The potential risk of space debris is associated with the high kinetic energy that can occur during a collision. The collision velocities on LEO are in the order of ten kilometers per second. A risk for active spacecraft exists from a particle diameter of about one millimeter. Above this size, a satellite structure can be seriously damaged. Objects larger than about one centimeter pose a particular risk. Such objects can cause the loss of a satellite mission. They penetrate any satellite structure, even if it is protected by multiple walls. Satellites cannot be protected against the impact of objects larger than about one centimeter. Currently there are about 900,000 artificial objects larger than one centimeter on all Earth orbits. The number of objects larger than one millimeter is estimated at about 130 million. The number of objects in the submillimeter range is several trillion. Objects with a particular risk are those between one and ten centimeters in diameter. They are too small for being tracked and too large for protective measures.

## Lecture 2: Keeping an Eye on Space Debris - The German Space Situational Awareness Centre

Marius Eickmans, Director Operations (civ.), German Space Situation Awareness Centre

The number of space debris objects in orbit caused by launches, break-ups, collisions and anti-satellite tests is increasing rapidly. The rising number of uncontrolled space debris objects orbiting Earth expose space-based infrastructure to a growing risk of collisions causing damage to satellites up to mission loss. Re-entering space objects may also harm ground-based infrastructure and pose a potential threat to human life.

In coordination with its national, European and international partners, the German Space Situational Awareness Centre (GSSAC) observes and catalogues objects orbiting Earth, such as space debris, to identify harmful threats to satellites and to warn satellite operators. Furthermore, GSSAC provides information about space-related threats to the German territory to national civil protection authorities. The presentation shows insights into GSSAC, its routine operations of space surveillance and tracking, risk estimation as well as warning provisions.