COPUOS

Topic B: Retrieval and mitigation of Man-Made Space Debris

Background Information

Since the Committee on the Peaceful Uses of Outer Space (COPUOS) published its Technical Report on Space Debris in 1999, it has been a common understanding that the space debris environment leads to a risk for spacecrafts in Earth orbit.[1]

Space debris is designated as all man-made objects that are non-functional, in Earth orbit or re-entering the atmosphere. Historically, the primary sources of space debris in Earth orbits have been accidental and intentional break-ups, producing long-lasting debris and debris released intentionally during the operation of launch vehicle orbital stages and spacecraft. More than 27,000 pieces of orbital debris are tracked by the Space Surveillance Network (SSN) sensors.[2] Both the debris and spacecraft are traveling at high speeds of approximately 15,700 mph in low Earth orbit, an impact of even a tiny piece of orbital debris with a spacecraft could create big and severe problems.

The rising population of space debris increases the probability of collisions and fragmentations that could lead to potential damage to all space vehicles, including to the International Space Station and other spacecraft with humans aboard, as also the risk of damage on the ground, if debris re-entry the Earth's Atmosphere. Before 2007, the principal source of debris was the explosion of old launch vehicle upper stages, used to give satellites the final kick into the desired orbit. In the past, these

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[1] *Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space*. (2010)

[2] *Space Debris and Human Spacecraft*

rocket stages were often left at high altitude with small remnants of fuel and stored energy which unchained in some cases explosions. The first recorded fragmentation is dated back in 1961, when the US Ablestar upper stage exploded in an orbit of 800 km by 1000 km releasing nearly 300 large fragments and increasing the total orbital debris population by 400%. In 2011, 50 years after the event, 60% of this debris was still in Earth orbit due to the high altitude of the event. We have reached a point where the majority of space debris has been produced by the accidental or intentional collision between large spacecraft. According to NASA, the intentional destruction of the Fengyun-1C weather satellite by China in 2007 and the accidental collision in 2009 between two communications satellites, the operational American Iridium-33 and the Russian Cosmos 2251, greatly increased the number of large debris in orbit and now represent one-third of all orbital debris. Generally, the higher the altitude, the longer the space debris will remain in orbit.[3] Typically, orbital debris left in orbits below 600 km normally return back to Earth within several years. However, at altitudes of 800 km, the orbital decay lasts decades and above 1,000 km, debris is not expected to fall back to Earth before a century or more.

While space debris is unlikely to affect space travel, it will lead to significant problems for spaceflight around Earth. The risk would be highest for objects orbiting at an altitude of around 1,000 km, which is used for communications and Earth observation.

This committee has as an objective to create a solution to reduce the production of this man-made debris of intentional or unintentional causes, as well as the retreat of these debris to clean the space environment, in order to prevent catastrophic events

[3] *Space Debris Mitigation –*. (n.d.)

and potential damages to all the tools located in space for our better development on Earth and space.

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