

Latest Space Collision: Wake-up Call for Active Debris Removal

On January 29th, 2020, we saw a near miss between two large derelict objects in space. The Infrared Astronomical Satellite (IRAS) and the Gravity Gradient Stabilization Experiment (GGSE) 4 satellite passed very close to each other, with approximately a 1 in 20 chance of collision. This chance was increased from a 1 in 1000 chance in the few days. Since both of these objects are no longer operational (derelict), we could not do anything but watch.

Since these are relatively large objects and since they are moving in opposite directions, this would have been a massive collision. They would have hit with the effective speed of about 14.9 Km per second. GGSE-4 is about 75 Kg, and it would hit IRAS with about 9.4 gigajoules. This is about the same energy as 2 ¼ tons of TNT, or about 2 Tomahawk cruise missiles.

It's really the high speeds of objects in space that gives even small object tremendous energy at impact. And keep in mind that GGSE-4 was launched in 1967! Holy crap, that was a long time ago. Today, there are about 22,000 tracked objects in space accumulated since 1957, and companies like SpaceX and Blue Origin are going to triple that number of tracked objects in the next couple years.

In addition to the 22,000 trackable objects over 10 cm, there are an estimated 900,000 objects 1 cm to 10 cm, and an estimated 128 million objects over 1 mm. When you understand the speeds and high energy of these smaller objects, the large number of objects buzzing around, and the high numbers of launches over the next few years, you start to understand the alarm.

Small debris can hit new satellites and disable them, creating larger numbers of derelict objects and increasing the likelihood of larger objects colliding and creating giant debris fields. All of this is accelerating our march toward an unusable low Earth orbit (LEO) in what has been named Kessler syndrome. Kessler syndrome basically says we will be unable to effectively launch satellites or other space vehicles because we have so much debris circling the Earth creating an artificial asteroid belt.

Three things need to be done:

1. Adopt and ratify comprehensive guidelines of good behavior in space collectively known as remediation guidelines
2. Fund ADR for large objects. There are a few projects underway at ESA, but the US, China, and Russia have yet to start.
3. Fund ADR for smaller objects. This technology is being advanced by OrbitGuardians and helps decrease the risk of creating additional larger derelict objects.

NOTE: At time of publication, the fate of IRAS and GGSE-4 was barely known. Visionaries like Moriba Jah have plans to increase visibility and tracking of space debris. Fascinatingly, the probability of collision went up and down over the last 5 days with predictions of the mean miss



distance of 12 meters to 100 meters and chance of collision ranging from 1 in 1000, to 1 in 20. The prediction became more difficult when LeoLabs realized that an 18 meter boom was deployed. Assume out of control objects a spinning and you realize how close this puts the two objects.

<https://www.forbes.com/sites/ericmack/2020/01/29/the-possible-collision-of-iras-and-another-satellite-over-pittsburgh-didnt-happen/#55850f465724>