Space debris a growing problem

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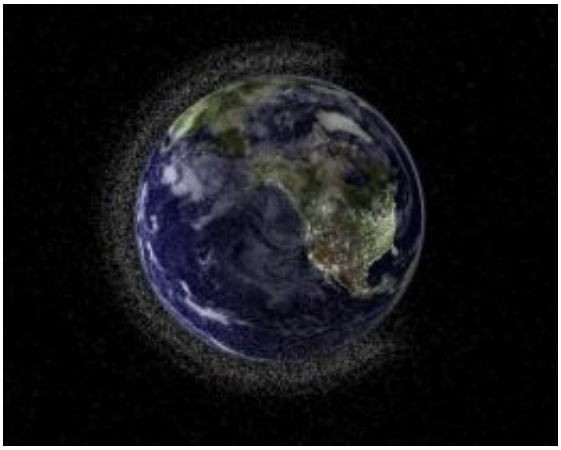

This handout illustration image created by Australia's Electro Optic Systems (EOS) aerospace company shows a view of the Earth from geostationary height depicting swarms of space debris in Low Earth Orbit (LEO). A scare triggered by orbital debris that on Tuesday came within a couple of hundred metres (yards) of the International Space Station (ISS) sheds light on an acutely worsening problem.

A scare triggered by orbital debris that on Tuesday came within a couple of hundred metres (yards) of the International Space Station (ISS) sheds light on an acutely worsening problem.

Millions of chunks of metal, plastic and glass are whirling round Earth, the garbage left from 4,600 launches in 54 years of space exploration.

The collision risk is low, but the junk travels at such high speed that even

a tiny shard can cripple a satellite costing tens of millions of dollars.

Around 16,000 objects bigger than 10 centimetres (four inches) across are tracked by the US Space Surveillance Network, according to NASA's specialist newsletter.

There are around 500,000 pieces between one and 10 cms (half and four inches), while the total of particles smaller than one centimetre (half an inch) "probably exceeds tens of millions," NASA says elsewhere on its website.

The rubbish comes mainly from old satellites and upper stages of rockets whose residual fuel or other fluids explode while they turn in orbit. As the junk bumps and grinds, more debris results.

Another big source, though, is a Chinese weather satellite, Fengyun-1C, which China destroyed in a test of an anti-satellite weapon in 2007.

Debris specialists and satellite operators were incensed. At a stroke, it helped increase the tally of large debris by more than a third.

In May 2009, a 10-cm (four-inch) chunk from Fengyun-1C passed within three kilometres (1.8 miles) of the US space shuttle Atlantis, prompting plans for evasive manoeuvres that proved to be unneeded.

Four known collisions have occurred between tracked objects, France's National Centre for Space Studies (CNES) says.

In 1991, a Russian navigation satellite, Cosmos 1991, collided with debris from a defunct Russian satellite, Cosmos 926, although this event only came to light in 2005.

In 1996, a fragment from an exploded Ariane rocket launched in 1986

damaged a French spy micro-satellite, Cerise.

In 2005, the upper stage of a US Thor launcher hit debris from a Chinese CZ-4 rocket.

And in 2009, a disused Russian military satellite, Cosmos 2251, smacked into a US Iridium communications satellite, generating a debris cloud in its own right.

In low Earth orbit, which is where the ISS is deployed, debris impacts at around 10 kilometres (six miles) per second (36,000 kph / 22,400 mph), says the CNES.

An aluminium pellet just one millimetre (0.04 of an inch) carries roughly the same kinetic energy as a cricket ball or baseball fired at 450 kph (280 mph).

In June 1983, the windscreen of the shuttle Challenger had to be replaced after it was chipped by a paint fleck just 0.3 mm (0.01 of an inch) across that impacted at four kms (2.5 miles) per second.

To cope with such threats, the ISS has some shielding but depends mainly on manoeuvering to get out of the way, an operation it has done several times.

Satellites, too, can take evasive action using onboard thrusters, but this is costly because it reduces the craft's operational life.

The ISS "is the most heavily shielded spacecraft ever flown," NASA says.

"Critical components, e.g. habitable compartments and high pressure tanks, will normally be able to withstand the impact of debris as large as

one centimetre (half an inch) in diameter."

On the plus side, at low Earth orbit, debris is only a relatively short-term problem.

At orbits below 600 kms (375 miles), the material falls to Earth, where it usually burns up to nothing in the atmosphere, within several years.

Beyond 800 kms (500 miles), orbital decay is measured in decades, but beyond 1,000 kms (620 miles), the debris will trundle around the planet for a century or more.

The European Space Agency (ESA), Japan, Russia and the United States have issued guidelines for mitigating the debris problem, such as designing satellites and spacecraft so that they can be deliberately "de-orbited," using a fuel reserve, rather than let them drift in space.

Leading space agencies have also formed a panel to address the problem and the issue is also discussed in the UN's Committee on the Peaceful Uses of Outer Space (COPUOS).