

# Space debris problem getting worse, say scientists

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You can't see them but they're up there: Millions of bits of orbital junk are a threat to spacecraft

Scientists sounded the alarm Tuesday over the problems posed to space missions from orbital junk—the accumulating debris from mankind's six-decade exploration of the cosmos.

In less than a quarter of a century, the number of orbiting fragments

large enough to destroy a spacecraft has more than doubled, a conference in Germany heard.

And the estimated tally of tiny objects—which can harm or degrade spacecraft in the event of a collision, and are hard to track—is now around 150 million.

"We are very much concerned," said Rolf Densing, director of operations at the European Space Agency (ESA), pleading for a worldwide effort to tackle the mess.

"This problem can only be solved globally."

Travelling at up to 28,000 kilometres (17,500 miles) per hour, even a minute object impacts with enough energy to damage the surface of a satellite or manned spacecraft.

In 1993, monitoring by ground-based radar showed there to be around 8,000 manmade objects in orbit that were larger than 10 centimetres (4.5 inches) across, a size big enough to inflict catastrophic damage, said Holger Krag, in charge of ESA's space debris office.

"Today, we find in space roughly 5,000 objects with sizes larger than 1 metre (3.25 feet), roughly 20,000 objects with sizes over 10 centimetres... and 750,000 'flying bullets' of around one centimetre (half an inch)," he said.

"For objects larger than one millimetre (0.04 inch), 150 million is our model estimate for that."

Risks of collision are statistically remote, but rise as litter increases and more satellites are deployed.

"The growth in the number of fragments has deviated from the linear trend in the past and has entered into the more feared exponential trend," Krag warned.

The conference in Darmstadt, whose opening was broadcast online, is the biggest-ever gathering dedicated to space debris.

Experts will spend four days discussing debris and measures to mitigate space litter such as by "de-orbiting" satellites after their working lives.

## **Debris fields**

Krag pointed to two events that had badly worsened the problem, creating debris fields that may generate further junk as pieces smash into each other.

The second was in January 2007, when China tested an anti-satellite weapon on an old Fengyun weather satellite.

The other was in February 2009, when an Iridium telecoms satellite and Kosmos-2251, a Russian military satellite, accidentally collided.

With enough warning, satellites can shift position to avoid a collision, but this uses fuel and potentially shortens operational life.

ESA receives a high-risk collision alert every week on average for its 10 satellites in low-Earth orbit, Krag said. Each has to resort to "one or two" avoidance manoeuvres per year.

In a message from the International Space Station, French astronaut Thomas Pesquet said the station was shielded for objects up to 1 cm across.

The ISS often has to make manoeuvres to avoid debris, but needs 24 hours' warning to do this, using onboard thrusters, he said.

If there is less time, "our crew will have to close all the hatches and enter the safe haven which is our Soyuz spacecraft so that we can depart the ISS in the case of a collision," he said. "This has happened four times in the history of the ISS programme."

## **Space junkyards**

Experts pointed to two once-pristine sites that have become worryingly cluttered since the space age dawned in 1957.

One is low Earth orbit—generally defined as less than 2,000 kilometres (1,200 miles) from Earth—which is used by satnav satellites, the ISS, China's manned missions and the Hubble telescope, among others.

The other is in geostationary orbit, a coveted zone 35,000 km (22,000 miles) away used by communications, weather and surveillance satellites that must maintain a fixed position relative to Earth.

The trash ranges from fuel tanks and Soviet-era nuclear-powered satellites, dripping sodium and potassium coolant from decrepit hulls, to nuts, bolts and tools dropped by spacewalking astronauts.

The items ironically include a 1.5-metre (five-foot) debris shield that floated off as it was being installed on the ISS on March 30. Lost in low orbit, the shield will eventually be plucked into Earth's atmosphere and burn up.

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