

ESA re-entry expertise

Every week, on average, a substantial, inert satellite drops into our atmosphere and burns up. Monitoring these re-entries and warning European civil authorities has become routine work for ESA's space debris experts.

Each year, about 100 tonnes of defunct satellites, uncontrolled spacecraft, spent upper stages and discarded items like instrument covers are dragged down by Earth's upper atmosphere, ending their lives in flaming arcs across the sky. This news was reported in a communiqué issued by the European Space Agency on 30 March.

Some of these objects are big and chunky, and pieces of them survive the fiery re-entry to reach the surface. Our planet, however, is a big place, mostly covered by water, and much of what falls down is never seen by anyone, sinking to the bottom of some ocean, or landing far from human habitation.

While still in orbit, these and many other objects are tracked by a US military radar network, which shares the data with ESA, since Europe has no such capability of its own.

It is the task of ESA's Space Debris team to look at these data and issue updates to ESA Member States and partner civil authorities around the globe.

They mix in additional tracking information gleaned from European sources, such as Germany's Fraunhofer research radar near Bonn or telescopes and other detectors run by a mix of institutional and private researchers, to generate re-entry forecasts – a challenging and imprecise art.

In the words of Holger Krag, head of ESA's Space Debris Office: *'With our current knowledge and state-of-the-art technology, we are not able to make very precise predictions. There will always be an uncertainty of a few hours in all predictions – even just days before the re-entry, the uncertainty window can be very large. The high speeds of returning satellites mean they can travel thousands of kilometres during that time window, and that makes it very hard to predict a precise location of re-entry.'*

Most larger descents, about 50 per year, happen unseen by anyone and never make the news. In the history of spaceflight, no casualties from falling space debris have ever been confirmed.

International cooperation

Around once a year, ESA takes part in a joint tracking campaign run by the Inter Agency Space Debris Coordination Committee, which consists of experts from 13 space agencies and organisations such as NASA.

Holger Krag added: *‘Members use these campaigns to pool their predictions of the time window, as well as their respective tracking datasets from radar and other sources. The aim is to cross-verify, cross-analyse and improve the prediction accuracy for all members.’*

ESA is serving as the host of the 2018 campaign that is following the re-entry of China’s Tiangong-1 space station (details available via ESA’s Rocket Science blog)

Since 2009, ESA has been developing software, technologies and precursor systems to test a fully European network that would provide independent data on the risks from spaceflight.

Krag concluded by saying: *‘Today, everyone in Europe relies on the US military for space debris orbit data – we lack the radar network and other detectors needed to perform independent tracking and monitoring of objects in space. This is needed to allow meaningful European participation in the global efforts for space safety.’*