Space debris expert warns of increasing CubeSat collision risk

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The increasing number of small 'CubeSat' satellites being launched combined with a relaxed attitude to debris mitigation could lead to hazards for all space users unless preventative measures are taken, warns a leading space debris expert from the University of Southampton.

Speaking today at the 65th International Astronautical Congress in Toronto, Dr Hugh Lewis said that this combination leads to a growth in space debris, as a result of collisions between CubeSats and other objects in orbit.

CubeSats are small satellites (around 10x10x10cm) that are providing opportunities for companies to break into the space data and communications industries. Despite many CubeSats not having any manoeuvring capability so they cannot avoid collisions during the mission or manoeuvre to a disposal orbit at their mission end, they are still perceived to have a low impact on the space debris environment.

However, despite guidelines requiring the satellites to deorbit within 25 years, some are being launched into high Earth orbits, which means their orbital lifetime could be much greater.

More than a third of all CubeSats launched to-date (around 160 between 2003 and 2013) are predicted to remain on-orbit for more than 25 years. Since 2005, CubeSats have been involved in more than 360,000 close approaches of less than 5 km with other orbiting objects.

Dr Lewis says: "To reduce the risks, some effort is needed to engage with the growing small satellite community. All space users, not just those in the CubeSat community, who are taking the right steps should be encouraged to continue and, ultimately, lead on sustainable practices and debris mitigation activities.

"Those who are not yet engaged with this approach should be encouraged to do so. It's probably a matter of changing their perceptions of the risks and helping them to understand that there is a collective responsibility to ensure that outer space activities are sustainable so that future generations have the same opportunities to use space as we do."

Dr Lewis and his team used their Debris Analysis and Monitoring Architecture to the Geosynchronous Environment (DAMAGE) model to simulate three future CubeSat launch traffic scenarios until the year 2043. By comparing these with close approach data from 2005 to 2013, the team found CubeSats are estimated to be involved in millions of close approaches over the next 30 years, with a handful leading to a collision.

Analysis of the close approaches found that most of the collision risk from CubeSats comes from high-speed encounters with large spacecraft. In addition, many of these encounters were in Sun-synchronous orbits that are popular with remote sensing and Earth science satellites.

Dr Lewis adds: "By far the greatest risk comes from those with long lifetimes at altitudes of about 750 km. If CubeSats continue to be launched into long-lived orbits without any means of disposing of them, then they will contribute to the growing space debris hazard. This is not a responsible or sustainable practice, in my view. However, if efforts are made to limit the lifetimes– as some are already doing – then the risks will be reduced."

Provided by University of Southampton