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Title

LEONEEDS - A space debris removal and recycling project

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Abstract

The threat posed by space debris, at all altitudes, has become a big subject of research for the space industry, especially for young startups. The space sector is always on the lookout for more projects and solutions towards space debris removal. We could mention ESA and ClearSpace SA's efforts to bring together new types of missions and demonstrators, being one of the most advanced space debris removal projects.

LEONEEDS, named after the Leonids meteor shower, is a space station concept aimed directly at the treatment of space debris in Low Earth Orbit (LEO). The main goals of the project are the use of a permanent Low Earth Orbit space station, in collaboration with space tugs startups, to remove or recycle space debris. Its objective is to recycle, in orbit, space debris that could serve a new use, for example in collaboration with the future Lunar Orbital Platform-Gateway (LOPG). A second use would be the deorbitation, under thermal shields, of inactive satellites or satellite parts, which would be flight-proven (Technology Readiness - Level 9) and less expensive to produce for young startups or new space programs. Partnerships on the subject of space tugs could allow the new space economy to evolve towards reusability. This reusability would allow the space sector to develop a circular economy, by bringing back previous space missions, either to refuel and re-launch them, or to gain access -either for students, startups or emerging countries – to older space missions, to gain valuable data on the ageing of such missions and the effects of the harsh space environment. LEONEEDS could also serve as a technology enabler, to allow on-orbit testing while still being able to gather data from the mission as it comes back to Earth. The options for such a space station are almost limitless. Any space actor could benefit from a circular economy.

This station has the potential to reinvent on-orbit services, using on-orbit recycling and potential refueling in the long term. The proposed services could first reduce the numbers of new debris through life extension missions, but also reduce the current amount of debris in the short term, while allowing a circular space economy, by letting space debris to come back to Earth for a second life.

Would you throw your once it runs out of battery? This is more or less what's currently done in space with old satellites – why not change the way we treat debris in space?