

SPACE DEBRIS SYMPOSIUM (A6)
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MATURING THROW-NETS FOR SPACE DEBRIS CAPTURE WITH VALIDATED SIMULATORS
AND ZERO-G TESTING.**Abstract**

Space debris is an existing and growing problem for space operations. Studies show that for a continued use of LEO, 5 – 10 large and strategically chosen debris need to be removed every year. The European Space Agency (ESA) is actively pursuing technologies and systems for space debris removal under its Clean Space initiative. One of the most promising of these is the use of throw-nets to capture debris, followed by one or multiple de-orbiting burns during which the debris is pulled with a tether.

Over the past couple of years, the European Space Agency has been studying the Active Debris Removal mission and been running a number of technology activities aimed at maturing different types of capturing technologies. In particular, this paper will detail the development efforts related to capture with throw nets. With our industrial contractors, we have developed and validated high fidelity dynamics simulators, and tested the throw net concept on-board zero-G parabolic flights. We have also been developing a detailed fundamental understanding of tether dynamics

The result is that we can now with confidence demonstrate that the throw-net is an excellent means of capturing defunct spacecraft that does not suffer the risks associated with close proximity operations around a target that may have large rotation rates and poorly known interfaces. Also very importantly, we now have the tools to confidently design and test any shape or size net without having to resort to difficult and expensive tests. We have also developed an understanding of the tether dynamics which shows that there are also no show-stoppers in the post capture scenario.

We have built on previous work to both perform zero-G validation of the net concept, and to develop and validate simulation tools for such a concept, and in the process have taken an important step to maturing throw-nets as a capturing technology for a potential space debris removal mission.