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Strategic Risk Management for Successful Space & Defence Programmes (4)

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SPACE SAFETY - ESA'S RISK MITIGATION ACTIVITIES FOR LEO

**Abstract**

ESA has prepared a new programme that aims for Europe to “ensure European autonomy in accessing and using space in a safe and secure environment”. The primary goal of this programme is the protection of our planet, humanity and assets in space and on Earth from hazards originating in Space.

This paper will concentrate on the space debris-related aspects of the programme and provide details on ESA's plans to develop sensor technology for debris monitoring in the area of laser, ground- and space-based optical telescopes and radar. Further, it will detail the chosen approach to enhance space debris on-orbit and re-entry risk models and means for mitigation analysis. This latter part will rely on a space mission carrying a passive optical telescope for the detection of mm-sized debris in sun-synchronous orbits.

Finally, the programme will also engage into the space segment in anticipation of more strict space debris mitigation requirements. Here, it is planned to develop onboard technology to improve European compliance with such requirements in an economically viable way. This includes the technology for design for demise, de-orbiting kits and design-to-be-tracked.

A major element relates to just in time collision avoidance, where the programme has put forward technology studies for the use of laser systems for precise tracking and nudging of space objects using photon pressure. The results of a recently completed feasibility study will be presented in the paper.

One of the flagships of the programme will be an element entitled CREAM (Collision Risk Estimation and Automated Mitigation), which is a series of activities for the development of automated collision avoidance capabilities and alternate fast commanding option for public and private entities coping with enhanced space traffic, including a demonstration of such capabilities by 2023. The most prominent cornerstone will be the first ever active debris removal mission as an enabler of European industrial capability to conduct in-orbit servicing. The goal is to remove an ESA-owned space debris target object  $\geq 100\text{kg}$  before the end of 2025 on orbit in a service approach, building on the industrial interest in gaining access to the rising in-orbit servicing market.