ESA’s Space Safety Programme

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ABSTRACT

In line with EU and ESA’s “Shared vision and goals for the future of Europe in space”, 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.

The major hazards from space to be tackled by the programme have been identified as the Space Weather originating from our Sun, Planetary Defence from Asteroids and Space Debris. In response to these hazards, the programme has defined a number of ambitious goals:

- A tested and exercised early warning system on Space Weather events providing actionable information to users
- The capability to provide early warnings for asteroids larger than 40m, three weeks in advance
- The ability to deflect asteroids smaller than 1km, if known 2 years in advance
- The demonstrated capability to rendezvous, capture, service and de-orbit defunct space objects in a controlled fashion with a commercial perspective
- To achieve sustainable European space traffic including debris avoidance and disposal in an economically viable way

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.

In addition to this, the programme will develop data processing software in a community approach, that will allow to generate correlated orbit information from surveillance data. 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.

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 >100kg 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.