

SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Removal Concepts (6)

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AVIOSPACE'S DEVELOPMENTS ON ACTIVE DEBRIS REMOVAL TECHNOLOGIES AND
CONCEPTS

Abstract

This paper aims to illustrate the activities performed by Aviospace in the frame of different projects, both on RD side, such as CADET (CAPture and DE-orbiting Technologies) project, and on ESA Clean Space initiative (where Aviospace took participation in the E.Deorbit program). The scope of this paper is the overview of these projects and their major findings. For all of these projects, the goal is the design, preliminary development and functional verification of enabling technologies required for Active Debris Removal from LEO orbits. A particular focus is held on the selection of preferred in-space capture concepts for large, heavy space debris in LEO orbits, such as upper stages of elderly launch vehicles or decommissioned satellites. Such enabling technologies include: • techniques for recognition of the piece of debris in orbit (target), based on images obtained in-situ by the chaser spacecraft via optical sensors, both in visible and infra-red fields, by which thermo-optical, kinematics, mechanical and inertial properties of the non-cooperative target can be estimated. • Technologies of autonomous guidance, attitude determination and control for phases of close rendez-vous, final approach and capture. In this field, over the development of dedicated control algorithms, the activities focused on development and validation of novel star-tracking and inertial sensors based on COTS. • Technologies, strategies and concepts for target capture and consolidation of target-chaser link: this project branch drove the definition a novel concept of capture mechanism, based on semi-rigid link with the target established via belts; Aviospace performed on this concept the preliminary design and a detailed analysis campaign with FE simulations. Over this concept, within E.deorbit program Aviospace performed a similar task on a more traditional concept (initially conceived by ESA in the frame of the ROGER study) based on a thrown-net to wrap-around the target and then pulled by the chaser via tether. For all such technologies the major outcome of CADET will be for most of them the reach of TRL 4. This will be achieved through the development of two test setups (one for the “non-cooperative rendez-vous”, which implements the functionalities in the field of advanced vision and AOCS, one for the “capture by belts”) and environments to be adopted for functional evaluation and validation tests. CADET project, which will be over by September 2015, is co-funded by Regione Piemonte within program: POR FESR 2007/2013 – linea di attività I.1.1. “Piattaforme innovative” – AEROSPAZIO FASE II.