

SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Removal Issues (5)

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ROGER A POTENTIAL ORBITAL SPACE DEBRIS REMOVAL SYSTEM

Abstract

Due to the drastically increasing number of debris particularly in the Low Earth Orbits (SSO) the active debris removal is now necessary to counteract to the predicted debris production cascade (Kessler Syndrome), which means the pollution of the total sphere in low earth orbit and not only the SSO area. In most of the debris congresses it was recommended to start removal as soon as possible, e.g. 2020 as NASA recommendation. In the case of large debris objects, the soft capture system should be replaced by a simpler and robust system able to operate from a safe distance to the target and flexible enough to capture and hold different types of targets such as deactivated and/or defective satellites, upper stages and big fragments. A major argument for the commercial applications is a multi-target mission potential. The proposed ROGER system is designed as a spacecraft with rendezvous capabilities including inspection in the vicinity of the target and stabilization and transportation features for the combined configuration. The first proposed capture system is a deployable and closable net. The net is ejected from the mother spacecraft at a safe distance to prevent any collision with the target. After transport to the disposal orbit the net will be cut and the spacecraft will return to the operational orbit of the next target. Another capture system is additionally proposed as a tethered /cabled gripper which is a remote controlled 6 DOF controlled small system linked by a cable to the mother S/C which can be used for power supply and as data link. The capture systems can be used operationally in all orbits, e.g. GEO and LEO, but the return requirements including the specific ground safety aspects for LEO depending on the mass of the target ask for a controlled transport of the target into a re-entry corridor. The philosophy of the multiple use of the mother spacecraft e.g. transfer to a new target orbit will be traded here against other potential transfer solutions e.g. propulsion kits concept. As final result a total mission is derived for a typical set of debris candidates to evaluate the potential of the proposed system concept. Here the orbit parameters of the candidates and the necessary transfer between the orbits are considered to estimate the feasibility for the multi-target mission.

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