

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

Author: Mr. Mathias Rohrbeck
OHB System AG-Bremen, Germany

Mr. Bastian Burmann
OHB System AG-Bremen, Germany

Mr. Detlev Hueser
OHB System AG-Bremen, Germany

Mr. Gerrit Hausmann
OHB System AG - Munich, Germany

Mr. Zachary Krevor
Sierra Space, United States

Mr. Johannes Weppler
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany

ACTIVE DEBRIS REMOVAL MISSIONS WITH SNC'S DREAM CHASER®

Abstract

The reusable US spacecraft Dream Chaser® is a lifting-body developed by Sierra Nevada Corporation (supported by NASA in the framework of the Commercial Crew Development Program) and its primary mission is transporting crew and cargo to the International Space Station. Co-funded by the Space Administration of the German Aerospace Center (DLR) and with SNC as project partner, OHB System explored further applications for the Dream Chaser® and their European utilization in the framework of a feasibility study. With a market analysis for the low Earth orbit (LEO) regime, active debris removal (ADR) was identified as a promising application regarding the critical situation on certain orbits and increasing interest in space debris reduction. For this application, the Dream Chaser® already offers necessary capabilities such as unmanned operations, berthing and docking as well as orbit manoeuvring. Considering the utilization of an existing system that can be re-used 25 times (with maintenance), ADR using the Dream Chaser® has the potential of reducing development and recurrent costs while enabling high mission performance. Being directly inserted into its target orbit by an Atlas V, performance analysis reveals that the Dream Chaser® is capable of removing multiple debris objects and high mass priority targets from critical orbits (e.g. sun-synchronous orbits). The paper addresses relevant orbits and classes of priority debris targets that are used as reference objects for an ADR mission. Taking the given Dream Chaser® configuration into account, several ADR mission and system concepts (e.g. de-orbits kits, robotic arms, etc.) are identified and traded in cooperation with OHB's group member Kayser-Threde. For promising concepts, the feasibility, operational approach, achievable performance, necessary interfaces and required adaptation to the Dream Chaser® are analysed. In the end, programmatic aspects of an ADR mission with the Dream Chaser® are compared to a conventional non-reusable ADR mission.