SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Architectures (4)

Author: Mrs. Susanne Peters
Universität der Bundeswehr München, Germany

Dr. Hauke Fiedler
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany
Prof.Dr. Roger Förstner
Universität der Bundeswehr München, Germany

MISSION CONCEPT AND AUTONOMY CONSIDERATIONS FOR ACTIVE DEBRIS REMOVAL

Abstract

Over the last 50 years, Space Debris has become one of the main issues for the safe operation of satellites in space. Fragments and extant man-made objects in space cross the orbits of active satellites permanently, with its increasing amount, the probability of a catastrophic encounter grows constantly. A cascade effect, resulting from the actual collision of two or more objects, is already initiated. Post-mission disposal, operation-safety and collision avoidance maneuver, based on an improved trajectory prediction, are implemented nowadays, however, they are not sufficient enough to stop the escalating amount of space debris. Active debris removal (ADR) as additional method is therefore highly recommended. This paper concentrates on a mission concept for active debris removal, involving autonomy for critical phases. Especially in close vicinity of uncooperative targets, as such space debris is referred, high safety performance is required. Smallest failures can lead to catastrophic results. The normal procedure of dropping into safe mode has to be avoided during the close proximity. Therefore, on-board autonomy is required, especially since the communication link to the ground station cannot be ensures at all times. Prospectively, ADR will require a higher level of autonomy than implemented in today's spacecraft. The collision risk during such maneuvers is very critical, autonomy and its potential for situation based reactions can alleviate this challenge. Within this paper, requirements for autonomy concepts are discussed, and preliminary approaches to solve a specific solutions are given. At a later stage of the project, the studies will be extended to adjusted algorithms already existing and their simulation.