SPACE DEBRIS SYMPOSIUM (A6)
Mitigation and Standards (4)

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DRAMA 2.0 - ESA'S SPACE DEBRIS RISK ASSESSMENT AND MITIGATION ANALYSIS TOOL SUITE

Abstract

The increasing number of space debris objects, especially in the frequently used sun-synchronous orbital regions at about 800 km altitude, has a large impact on satellite missions conducted today. In order to support mission designers, a software called DRAMA (Debris Risk Assessment and Mitigation Analysis) was developed in the past and was now upgraded under ESA contract during the last year by TUBS and DEIMOS, to include additional components, increase the performance of existing tools and incorporate current mitigation standards. The DRAMA tool suite in its upgraded version delivers five individual components, which shall support the verification of the compliance of space missions with mitigation guidelines and recently published standards. The existing tools ARES (Assessment of Risk Event Statistics) and MIDAS (MASTER-based Impact Flux and Damage Assessment Software) have been upgraded, using the MASTER-2009 model now. The covariance data used by ARES was updated and it is now possible to select covariances as per TLE, CSM, scale them or provide external covariance data. The number of orbit groups and the population size division has also been reviewed. MIDAS allows for additional ballistic limit equations to be defined by the user. SARA (incl. SESAM and SERAM) is used for the analysis of satellite re-entry and the related risk on-ground has been maintained by ESA/ESOC, while a new component called CROC has been developed by DEIMOS to calculate the cross-section of complex bodies. The cross section can be generated for a user defined aspect angle, for an aspect angle plus a defined rotation axis and for a randomly tumbling body. OSCAR (Orbital Spacecraft Active Removal) has been completely redesigned. Several new features are now available. Designers planning to de-orbit the spacecraft by drag augmentation devices can now use OSCAR to do the simulations. For the

estimation of orbits with a specified orbital lifetime (e.g. 25-year-rule), different scenarios for future solar and geomagnetic activities can be selected, which are in line with the current ISO and ECSS standards.

This paper will give a short overview over the work done during the ESA project "Upgrade of ESA's Space Debris Mitigation Analysis Tool Suite". The most important upgrades will be explained, focusing on the redesigned OSCAR tool. The key features of OSCAR will be pointed out to show users how OSCAR can support mission planning.