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Author: Dr. Vitali Braun
IMS Space Consultancy, Germany

Mr. Benjamin Bastida Virgili
European Space Agency (ESA), Germany
Mr. Stijn Lemmens
European Space Agency (ESA), Germany

EXPECTED COLLISION AVOIDANCE MANOEUVRE RATES IN DRAMA-ARES BASED ON A HISTORY OF CONJUNCTION DATA MESSAGES

Abstract

The Assessment of Risk Event Statistics (ARES) tool is part of the European Space Agency's (ESA) Debris Risk Assessment and Mitigation Analysis (DRAMA) suite, which has been released in an upgraded second version in 2014. In the same year an ESA instruction rendered the standard ISO 24113:2011 on space debris mitigation requirements, adopted via the European Cooperation for Space Standardization (ECSS), applicable to all ESA missions. In order to verify the compliance of a space mission with those requirements, the DRAMA software is used to assess collision avoidance statistics, estimate the remaining orbital lifetime and evaluate the on-ground risk for controlled and uncontrolled re-entries. With ARES, users can obtain an estimate of the expected number of collision avoidance manoeuvres for their mission. This allows to foresee additional fuel margins but also to address operational considerations this might imply for a mission, for example having a dedicated collision avoidance support or not. Since 2014, the Space Debris Office (SDO) has collected Conjunction Data Messages (CDM) for different ESA satellites. The CDMs are the main input to the collision avoidance support the SDO provides to ESA missions. More than a million of these messages have been used in an extensive analysis to derive statistics from and draw conclusions on the uncertainties associated with objects we currently observe in space. These statistics are used by ARES to compute the mean number of avoidance manoeuvres for any mission given the collision probability level the mission is ready to accept. In this paper, the results of that data analysis are presented as well as the comparison to the actual number of performed collision avoidance manoeuvres for different satellites. Moreover, those results are also put into context with the previous version of ARES, which was mainly based on generic information from Two-Line Elements and a few Conjunction Summary Messages (CSM).