SPACE DEBRIS SYMPOSIUM (A6)
Modelling and Risk Analysis (2)

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COMPARING LONG-TERM PROJECTIONS OF THE SPACE DEBRIS ENVIRONMENT TO REAL WORLD DATA - LOOKING BACK TO 1990

Abstract

Long-term projections of the Space Debris environment are commonly used to assess the trends within different scenarios for the assumed future development of spacefaring. General scenarios investigated include business-as-usual cases in which spaceflight is performed as of today over mitigation scenarios, assuming the implementation of space debris mitigation guidelines at different advances or the effectiveness of more drastic measures, such as active debris removal. One problem that always goes along with the projection of a system's behavior in the future is that affecting parameters, like the launch rate, are unpredictable. In other fields of research, it is common to look backwards and re-model the past. For spaceflight, this is a rather difficult task as spaceflight is still quite young, and furthermore mostly influenced by drastic politic changes, as the break-down of the Soviet Union in the end of the 1980ies. Nevertheless, since the end of the cold war, more than 20 years of a rather stable evolution of spaceflight activities are past. This period of time therefore is used in a comparison between the real evolution of the space debris environment and that one projected using the Institute of Aerospace System's in-house tool for long-term assessment LUCA (Long-Term Utility for Collision Analysis). In this comparison, three different scenarios will be investigated; all of them have the common starting point of using an initial population for May 1990. In the first scenario, spaceflight will be reproduced as publicly known: In here, only exactly those launches and events that actually occured in the time between 1990 and 2015 will be included. The second scenario uses the knowledge of the past 25 years to assess in general needed input parameters such as explosions per year, launch rates etc., but does not explicitly include known events: In here, events such as collisions and explosions will be determined by the included routines and executed randomly based on calculated probabilities. For the third scenario, all knowledge about the last 25 years will be ignored and techniques applied as used today to determine inputs such as launch- and explosions rates to perform long-term simulations. Results from all simulations are then compared to the real evolution of the space debris environment.