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SPACE DEBRIS MITIGATION MEASURES AND COST ISSUES

Abstract

The space debris environment is highly dynamical. There are processes that cause an increase in the object population. The most significant is the fragmentation of spacecraft. Other processes lead to a reduction of the object population. The most important influence is the residual drag of the atmosphere on low earth orbits which causes of many objects to descend. It would be preferable if at least a balance between two processes could be achieved so that the number of objects in space may not increase further. Overall, however, a continuous increase in the number of space debris objects is observed. Computer simulations show that the rising trend will continue in the future due to two causes. On the one hand, the number of objects in space continues to increase due to spaceflight activities. Particularly this leads in on sun-synchronous orbits (SSO) to a high accumulation of debris. On the other hand, the probability of catastrophic collisions in SSO increases. Due to the high collision velocities resulting from the particular impact geometry on satellites or rocket bodies in SSO high-energy collisions are expected on these orbits. The resulting debris will lead to a further increase in collision risk. It is therefore advisable not to release any more debris on SSO. However, it is expected that even in the case of a suppression of all future explosions, an increase in orbital debris generation will occur due to accidental collisions. Therefore, the implementation of further mitigation measures is reasonable. The implementation of mitigation measures is costly. But there will be long-term savings in the future due to lower damages to satellites. The discussion of this cost-benefit balance is the subject of this paper.