

SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Removal Issues (5)

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HOW CAN WE IDENTIFY COLLIDING OBJECTS TO BE REMOVED?

Abstract

This paper discusses how we can identify colliding objects to be removed from the low Earth orbit region for sustainable space development and utilization for humankind. Here we compare two different approaches to identify colliding objects to be removed. One approach keeps a view on the possibility of multiple removal. Thus, this approach specifies orbital regions where objects are crowded, and then compares size and/or mass between the objects in the crowded region to select candidates. Another approach thinks of impact on the current/future space debris environment. Thus, this approach compares the probability of accidental collision and/or the number of fragments added to the environment due to the accidental collisions to select candidates. As examples of the former approach, this paper proposes two orbital regions: 1) altitude range of 900 and 1000 km, and inclination range of 82 and 84 degrees, and 2) altitude range of 700 and 1000 km, and inclination range of 98 and 100 degrees. Top 100 larger objects are selected from the first region, whereas top 100 massive objects are selected from the second region. As examples of the latter approach, however, this paper proposes the cumulative probability of accidental collisions after 25 years, and the expected number of fragments added to the environment due to the accidental collisions in 25 years. Comparison in the effectiveness between the four different approaches in total will be conducted through future projections of the space debris environment in the low Earth orbit region. This paper uses NEODEEM, a space debris evolutionary model for the near Earth orbit region, to conduct this comparison. The initial population includes all 10 cm and larger objects with perigee altitudes below 2000 km on 1 May 2009.