Ballistic coefficient and life estimation for LEO satellites

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Abstract

In this paper, a semi-analytical orbit propagator is developed to study trajectories of satellites orbiting between 200 and 2000 km of altitude considering the atmospheric drag coefficient, the oblateness of the Earth and the effects of the Sun and the Moon in the orbit. The main goal of the propagator is to predict the decay process of the orbit and the re-entry of the satellite into the atmosphere. In this sense the ballistic coefficient is one of the most important characteristics of the satellite to be considered. This coefficient depends on several factors as the shape of the satellite, its attitude and the temperature and composition of the atmosphere. The implemented algorithm takes into account these factors and their variability in order to solve the nonlinear equations of the spacecraft motion obtaining an optimal balance between precision and computational cost. It works in two stages, the first one consists of a verification study of the tool checking with known data of the satellite; and the second one predicts and estimates the position of the satellite in the future.

References

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