

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

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ANALYSIS OF CLOSE APPROACHES BETWEEN SMALL SATELLITES AND CATALOGUE  
OBJECTS**Abstract**

Recent advances in technology have made it possible to miniaturize many satellite components, and in turn reduce the size of functional satellite dramatically. Compared to historical satellites that are on the order of 1000 kg, micro-satellites typically weigh between 10 kg and 100 kg, nano-satellites are typically less than 10 kg, and pico-satellites are less than 1 kg. These classes of satellites are becoming increasingly popular for universities and other entities because of their small size, mass and low manufacturing and launch costs. Since small satellites are smaller in size and lower in mass than traditional satellites, they are difficult to track with existing space situational awareness capabilities and may not have deorbit or maneuver capability. In this paper, the close approaches between small satellites and catalogue objects are analyzed with respect to several specific regions. Short- and long-term effects of the present cataloged small satellites (<15kg) on the space environment are estimated based on the observational data from the U.S. Space Surveillance Network (SSN). A conjunction algorithm presented by Wang Ting is applied in the present work. The analysis could help determine whether or not a large increase in the number of small satellites in orbit will present an increased risk of collision and an increase in the growth of the space debris population. The calculation results could also provide technical basis for potential small satellite traffic management solutions, which would reduce the probability of debris causing collisions and thus enable space activity to continue to increase more efficiently for all actors.