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CONJUNCTION ASSESSMENT OF LEO SATELLITE FOR FUTURE SPACE TRAFFIC
MANAGEMENT

Abstract

With the rapid increase in space activities in recent years, the topic of space environment and its protection, which are necessary for safe, stable, and sustainable use of space, has been attracting attention. As mega-constellations of satellites as well as cubesat are concentrated in low-Earth orbit, the close approach between space objects are occurring quite frequently. Space is becoming increasingly congested, contested, and competitive, which results in an increased potential for collisions between space objects, including satellites, rocket bodies, and space debris. In this paper, the conjunction assessment of CAS500-1 (the first Compact Advanced Satellite with mass of 500kg, developed and operated by the Korea Aerospace Research Institute, KARI) operating in a sun-synchronous orbit with an altitude of 500 km was analyzed with precise in-house ephemeris and conjunction data messages from CSPOC (Combined Space Operation Center) and LeoLabs. And, the secondary objects were thoroughly investigated for future collaboration and coordination with other space agencies, institute, industries, and academia. The large number and diversity of actors operating at this low altitude are directly linked to numerous conjunction events with payload as a secondary objective, which is not common at higher altitudes. From the statistical analysis, the CAS500-1 had many conjunctions with small payloads such as CubeSats; this was 811 events (51.5%) out of a total of 1,574 events in 2022. This is promising that sharing data and information can enable us to take action for risk mitigation in a safe and efficient manner, making it possible to minimize false alarms, provide more reliable conjunction assessments, and generate operationally applicable procedures for future space traffic management.