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DESIGN OF COST EFFECTIVE LEO SATELLITE CONSTELLATION FOR AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B)

Abstract

Primary technique being used for Air Traffic surveillance is RADAR, but now-a-days its capacity surveillance is gradually replaced by newly used Automatic Dependent Surveillance–Broadcast (ADS-B) because of higher accuracy, low power consumption and long range providing more safety to aircraft till to date. Both ground based RADAR and ADS-B coverage is only available in 10 % areas of the whole globe, leaving 90 % air space uncovered from real time surveillance. On the other hand, Air Traffic is growing rapidly, making available air routes more and more congested. The purpose of this research is to propose Space-Based ADS-B system of 20 LEO satellites to provide global Air Traffic surveillance especially over busy Air Traffic routes and oceanic regions to make better use of available air space. The efficiency of designed constellation is evaluated by using simulations on Satellite Tool Kit (STK). Four trans-oceanic flight regions are selected and different constraints like total number of accesses and average access time, total gaps, percentage regional and global coverage are applied to validate the mission design. Link budget for ADS-B signal is theoretically calculated as well as verified on STK, satisfying predefined link requirements. The results thus obtained have shown that constellation is providing 87 % coverage in all selected regions and is only feasible and cost effective alternative for ground based Air Traffic surveillance.