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LAUNCH ACCESS TO SPACE IN THE PRESENCE OF LARGE LEO CONSTELLATIONS AND THE SPACE FENCE

Abstract

Space is becoming more congested as a result of recent increases in activity. In the near future that problem will become more pronounced as new constellations are launched and the new Space Fence tracking system becomes operational. For example, based on public FCC filings, there are several companies proposing constellations each containing hundreds to thousands of new satellites. A common feature of many of these constellations is their concentration of satellites into tightly controlled altitude regions of Low Earth Orbit (LEO). As a result, constellation owners and other LEO operators should expect an increase in the number of collisions and collision alerts. Previous studies by the authors and others have examined the on-orbit issue of the additional collisions and collision avoidance alerts this New Space activity is expected to generate. This paper examines the launch collision avoidance (LCOLA) issues associated with these expected large LEO constellations (LLCs) and the new Space Fence (SF). The goal of this study is to determine whether and how much a launch window will be closed if LLCs are present and the new SF objects are added to the catalog. To answer the question of whether or not "safe corridors" for launching vehicles exist, two types of missions were examined: transfer orbit (launch through LEO to high altitude regardless of where the final mission ends up) and LEO (launch vehicle stays in low Earth region). It was found that the largest general impact to LCOLA comes from the Space Fence. The reason is that the SF is expected to add more than an order of magnitude more objects to the catalog than the LLCs will. It was also found that missions to LEO will be affected by a much larger amount under current LCOLA processes than missions to higher altitude. For new objects found through the SF, safe corridors do not exist, but for LLCs, "regions to avoid" do; specifically launch trajectories that intersect the LLCs at an altitude and latitude equal to the altitude and inclination of the LLC should be avoided. The large uncertainties associated with launch vehicles dominates over the orbiting object uncertainties, so improved tracking of on-orbit assets will not noticeably improve the LCOLA results.