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LESSON LEARNED FROM TRACKING & IDENTIFICATION FOR RIDESHARE LEOP SUPPORT

Abstract

The growing popularity of small satellites and the demand for affordable launch services has led launch providers to rideshare missions as a cost effective solution for getting their customers to orbit. This has created a new challenge for the SSA community. With some launchers deploying over 100 satellites, cataloguing these new objects is difficult and takes time. This can cause problems for operators who need to establish reliable communications with their satellites as soon as possible to ensure mission safety and begin commissioning. Satellites can be lost if operators cannot establish communications soon enough. Even when reliably tracked and catalogued, accurate identification poses a significant problem, with some payloads never making it to the catalogue.

Neuraspace has supported a number of operators on SpaceX Transporter and Bandwagon rideshare launches. In this paper we present an analysis of the number of rideshares and payloads to illustrate the scale of the problem facing SSA systems. We then examine the time to catalogue for these payloads under the current system.

The primary need from operators is the provision of TLEs with sufficient accuracy to establish two-way communication with the satellite. A comparison is made between initial propagations of the state vectors supplied by the launch provider, and the initial TLEs added to the catalogue, in order to analyse the size of the error that can develop over this period. We then discuss the choice of orbit determination method, in this case the Batch Least Squares, and its application to both optical tracking and GNSS data, along with their advantages and limitations.

The next section describes some lessons learned from supporting a number of payloads launched on rideshare missions. We discuss issues with obtaining data and orbit determination, advantages and limitations of optical tracking and techniques to optimise the chances of successfully track a satellite. Optical tracking data was provided by Neuraspace's telescopes an we also address the advantages of multiple sensor locations and geographical considerations.

Next we examine the actions that could be taken by spacecraft manufactures and operators to improve identification and tracking in the days after deployment. Finally we conclude with some takeaways on best practice for rideshare deployments, with a view to maximising the chances of successfully tracking the payload from deployment to its inclusion in the space-track catalogue.