A CASE STUDY: SDA’S SPACE DATA CENTER ENABLES FAST, ACCURATE RFI GEOLOCATION AND CONJUNCTION ANALYSIS

Solution | Space Situational Awareness

Challenge:
Growing congestion in space poses risks of radio frequency interference (RFI) and on-orbit collisions for communications satellite operators worldwide.

Solution:
The Space Data Center (SDC) is an automated system that uses high-quality, operator-supplied ephemerides and RF data to support quick and efficient geolocation of RFI ground interferers and provide automated collision avoidance monitoring for member organizations. The SDC was built and is operated by AGI using its commercial software.

Results:
An SDC study shows that using SDA operator data can reduce RFI geolocation uncertainty by up to two orders of magnitude compared to using publicly available data from non-cooperative tracking (NCT) sensor systems such as radar and optical sites. In the case of the Galaxy 15 anomaly, an SDC study found that 15% of the publicly available NCT-derived ephemeris data was corrupted by these errors.

In the case of RFI, the SDC will provide members’ queries with a ‘solution set’ of data to support RFI geolocation measurements as well as historical data on other similar or relevant events. The solution set will include the best choice of adjacent satellite, ephemerides and reference data to significantly improve the geolocation measurement. After the geolocation solution sets are generated, they are immediately made available to the affected member. An internal study of SDA-provided data versus data from non-cooperative sources such as radar and optical sites shows that the RFI geolocation uncertainty can be improved by up to two orders of magnitude due to the use of more accurate input data.

Conjunction analysis is likewise improved by drawing upon shared authoritative data and removing errors due to format incompatibility, out-of-date data and manual processes. The SDA’s capabilities were the primary reason why collision was not a major concern during the uncontrolled drift of Galaxy 15. SDC predictions created from such shared data proved considerably more accurate than any other publicly available source. Significantly, the owner-operator data used by the SDC is the only, and can be the only data source which also includes maneuver planning predictions —any other data set based solely on measurement data is inherently lacking in a proper SSA knowledge of the object catalogues.

Since the SDA was formed, both simulations and real-world experience reflect dramatic improvements from using owner-operator data for space situational awareness analysis. This reinforces the SDA’s view that combining the most authoritative data into a common operating picture greatly improves SSA timeliness, validity and accuracy when compared to other alternatives.