**Automating Maneuvers: Considerations for Collision Avoidance**

Matthew Hejduk, Lauri Newman

As more space operators implement large constellations of spacecraft, automating orbit maintenance maneuvers becomes a key feature of their operations concept to ensure that the workload is manageable. However the practice of performing a maneuver without sharing the plan with other nearby spacecraft causes a risk that two spacecraft will collide, not only destroying the spacecraft involved, but creating debris that will affect all other spacecraft using that orbit regime.

In order to share the maneuver plan, a predicted ephemeris file containing the maneuver must be sent to a central authority to screen against predicted trajectories of all other on-orbit objects to determine where and when close approaches may occur that need to be mitigated. Currently the screening authority used by US operators is the 19th Space Defense Squadron. However the conjunction screening process in use by the 19th was developed over 30 years ago and was not designed with automation in mind, so screenings are performed once every 8 hours, meaning that spacecraft using automated maneuvering need to allow 16 hours to share their maneuver plan via the screening process.

Many operators assume that automated maneuver planning must be real-time; however this time between planning and execution to allow for screening is possible if planned for during system design.

In an effort to speed up the screening process, NASA has developed a prototype system for performing near-real-time screenings. This prototype system was necessitated to support the NASA Starling mission, a constellation of 4 cubesats that planned to fly at the same altitude as the SpaceX Starlink constellation, both performing automated maneuvering. Without screening of the planned maneuvers, the two constellations risked a collision.

Once converted from a prototype to an operational system, this capability will greatly help smallsats, for example those that are planning to test propulsive capabilities, by allowing fast turnaround feedback to ensure safety form collision with other objects.

This paper describes the existing CA process, the prototype real-time capability, and results from the experiment that tested the prototype.