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EMERGENCY COMMAND PATH FOR SPACE TRAFFIC MANAGEMENT

Abstract

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For Space Traffic Management, the availability of command time slots is a key factor in determining manoeuvre execution. However, nominal command paths are typically provided via existing ground infrastructure and set at pre-determined times with limited ability to react quickly. Manoeuvre commands may need to be sent many hours before expected conjunctions. This greatly increases the decision uncertainty leading to higher overall risk in the space environment. With significantly more satellites expected in the next few years the strain on ground infrastructure will only grow. In particular, deployment of mega-constellations will radically increase conjunctions involving at least one active object as well as conjunctions involving two active objects. Fortunately, Europe has infrastructure already in place that may provide an alternate or emergency command path on a global scale.

The Galileo Navigation System has embedded in the Galileo Signal in Space (SiS) a secure data channel that is near real time, very reliable, and highly available anywhere in earth orbit. Satellites equipped with a Galileo capable GNSS receiver therefore are not only provided with accurate positioning data but also a means to continuously receive commands, even in the event that nominal TTC ability is impaired or lost. This channel would be limited to emergency commands (e.g. manoeuvres or loss of contact situations) and would not be intended for nominal commanding. The use of the Galileo SiS will allow operators to significantly extend the time taken to make manoeuvre decisions wherever the satellite is located. As such, it would act as a back-stop command path thereby significantly enhancing global orbit protection. This paper will provide details on current and planned collision avoidance programs, then detail this SiS data channel, its possible implementation on-board the user spacecraft, potential ground interfaces, the effect on operations, and its safety impact in the space environment along with a request for industry feedback on its possible adoption.