SpaceOps2011 Workshop

RAL Space

Collision Avoidance

Rationale

The number of tracked and correlated space objects in the USSPACECOM catalogue is on the order of 21,000 today. The size of the catalogue has increased two-fold during the past 20 years, with 50% of the currently tracked population originating from events since 2007, of which the Chinese Fengyun-1C ASAT test in January 2007 and the first collision between two intact objects (Iridium-33 and Cosmos-2251) in February 2009 are the main debris contributors.

The growth of the space debris population has affected spacecraft missions and their operations. Today, in-orbit conjunction event analysis and collision avoidance has become part of routine mission operations for many space agencies and commercial spacecraft operators. Most of these entities rely on orbit information of the catalogued population provided through USSPACECOM, often augmented with their own tracking data and orbit determinations on the risk object, and with precise ephemeris of their operational spacecraft.

Avoidance manoeuvres are most frequent in the densely populated low Earth orbit (LEO) regime between 700 and 1000 km, particularly for high orbital inclinations. By executing an evasive manoeuvre, a spacecraft operator uses the minimum amount of propellant that is required to establish a conjunction stand-off distance and a corresponding collision probability that is compliant with mission requirements and/or with governing national or Agency-specific regulations. Such manoeuvres often interrupt mission operations that require a precise phasing of the space- or ground-track of the satellite, and they consume propellant that in many cases was not planned for in the mission design, and that hence reduces the overall mission lifetime. In spite of the adverse effects on their missions, spacecraft operators have implemented collision avoidance policies for two reasons: (1) to protect their mission, and (2) to contribute to a stabilization of the space debris environment.

Purpose

Under the current theme the full spectrum of operational issues for in-orbit collision avoidance aspects will be addressed, including risk assessment procedures, the acquisition and processing of necessary data, the implementation and execution concepts of evasive manoeuvres, as well as collision avoidance policies, regulations, and guidelines. The focus is on operational issues, assuming that the technologies have been developed elsewhere.

Output

At the end of the workshop, a list of areas which are considered the most important to initiate or to develop further will be produced. Each identified area will be accompanied by, at least, the following information:

- Justification for selecting the area and description of the current state;
- Description of what needs to be done to implement;
- Proposal to implement.