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Author: Mrs. Claire FREMEAUX
Centre National d'Etudes Spatiales (CNES), France, claire.fremeaux@cnes.fr

COLLISION AVOIDANCE : FROM GENERAL GUIDELINES TO INDIVIDUAL REALITIES

Abstract

Among other Space Debris mitigation measures, collision avoidance has become a necessity to keep Space useful for future missions and generations : Space Agencies and Operators have dramatically measured the consequences of a single collision since the Iridium – Cosmos event, and growing international efforts are being made at all levels.

Some individual operators – generally operating a large fleet - as well as dedicated "middle man" organizations - such as CARA team in the United States or CAESAR team in France - have been dealing with collision avoidance for years and have set up tools and rules to follow from the detection of a "high interest event" to the effective resolution of a collision risk.

But even in cases that look similar, it appears that each satellite and mission has its specificities. They can orbit at lower or higher altitude, in a more or less crowdy region, they can occupy alone their nominal orbit or have to share it with other missions, this sharing may be coordinated with other partners or not coordinated at all, they may have to deal with periodic or constant proximity with other operated satellites. Each satellite itself has different capabilities, constraints, station-keeping and manoeuvres strategies, operation modes, which can also be affected by its health or redundancy availability. Each mission has its owns specificities regarding constraints, criticity and coordination. Last, on–ground means, staffing and general operational organization can also be very different

As a consequence, and even if general principles to follow are well defined, mission impacts, general avoidance strategy and operational management of collision avoidance activities may be strongly different from one mission to another, or from one situation to another. This diversity will be illustrated through several examples from CNES recent operational experience among the 12 LEO missions (23 satellites) controlled over the last few years, and lessons learned will be highlighted.