

SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Removal Concepts (7)

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ACTIVE DEBRIS REMOVAL : CURRENT STATUS OF ACTIVITIES IN CNES

Abstract

The Kessler syndrome, increase of the number of space debris in Low Earth Orbits due to mutual collisions, is now a fact, triggered mainly by several major break-ups in orbit which occurred since 2007. Time has come to study how to clean in an active way this fundamentally useful orbital region. CNES has studied potential solutions for more than 12 years! The paper aims at reviewing the current status of these activities. The high level requirements are fundamental, and have to be properly justified. The working basis, as confirmed through IADC studies consists in the removal of 5 to 10 integer objects from the overcrowded orbits, spent upper stages or old satellites, as identified by NASA. The logic of CNES activities considers a stepped approach aiming at gaining progressively the required Technological Readiness Level on the features required for Active Debris Removal which have not yet been demonstrated in orbit. The rendezvous with a non-cooperative, un-prepared, tumbling debris is essential. Following maturation gained with Research Technology programs, a set of small orbital demonstrators (Demo-X) will enable a confidence high enough to perform a full end to end demonstration performing the de-orbiting of a large debris (Demo-Y) and paving the way for the development of a first generation operational de-orbiter. The internal CNES studies, led between the Toulouse Space Center and the Launcher Directorate, have started in 2008 led to a detailed System Requirements Document used for the Industrial studies. Three industrial teams did work under CNES contract during 2011, led by Thales Alenia Space, Bertin Technologies and Astrium Space Transportation, with numerous sub-contractors. Their approaches were very rich, complementary, and innovative. The second phase of studies is to begin before mid-2012. Some key questions nevertheless have to be resolved, and correspond generally to current IADC actions: - the casualty risk associated to a "passive" de-orbitation is of paramount importance, major driver between passive and active reentry, - the residual movement of debris is crucial for the interfacing phase, whichever the solution is, - the debris physical state in orbit is a major question, - some solutions increase the collision risk, but for a limited time period; we may not have yet the appropriate tools. The paper gives a status of where we stand, of the cooperation with the international partners, and raises the questions which remain open and have to be dealt with in the coming months.