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EMERGENCY END OF LIFE OPERATIONS FOR CNES REMOTE SENSING SATELLITES – MANAGEMENT AND OPERATIONAL PROCESS

Abstract

The French Space Agency (CNES) is currently exploiting more than thirteen satellites among which five remote sensing satellites. This fleet is composed of two civilian (SPOT) and three military (HELIOS) satellites and is going to be completed by the first Pleiades satellite which is devoted to both civil and military purposes.

The CNES operation board decided to appoint a Working Group (WG) in order to anticipate and tackle issues related to the emergency End Of Life (EOL) operations due to unexpected on-board events affecting the satellite. This is of particular interest in the context of the French Law on Space Operations (LSO), entered in force on Dec. 2010, which states that any satellite operator must demonstrate its capability to control the space vehicle whatever the mission phase from the launch up to the EOL.

Indeed, after several years in orbit the satellites may be affected by on-board anomalies which could damage the implementation of EOL operations, i.e. orbital manoeuvres or platform disposal. Even if automatic recovery actions ensure autonomous reconfigurations on redundant equipments, i.e. setting for instance the satellite into a safe mode, it is crucial to anticipate the consequences of failures of every equipments and functions necessary for the EOL operations. For this purpose, the WG has focused on each potential anomaly by analysing: its emergency level, as well as the eventual EOL operations inhibited by the failure and the needs of on-board software workarounds...

The main contribution of the WG consisted in identifying a particular satellite configuration called "critical satellite". This description corresponds to an operational state which involves a redundancy necessary for the EOL operations. Therefore as soon as a satellite reaches this state, a dedicated steering committee is activated and decides of the future of the satellite with respect to three options: a/. the satellite is considered safe and can continue its mission using the redundancy, b/. the EOL operations must be planned within a mid-term period, or c/. the EOL operations must be implemented as soon as possible by the operational teams.

The paper describes this management and operational process illustrated with examples of failures on SPOT 4 satellite corresponding to various emergency cases.