Paper ID: 53315
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17th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Post Mission Disposal and Space Debris Removal (1) (5)

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ASSISTED NATURAL REENTRY FOR LEO SATELLITES: IMPACTS ON MISSION AND SATELLITE DESIGN

Abstract

For satellites exceeding the commonly agreed 10-4 casualty risk with the natural uncontrolled re-entry, the only solution today is to perform a controlled re-entry in the South Pacific Ocean. This controlled re-entry requires large modifications at satellite level, with a complex and costly strong chemical re-entry motor. In some cases, the important mass increase can lead to the need of launcher upgrade, with severe costs impacts. Since several years Airbus Defence and Space is working on the development on an alternative strategy called "Assisted natural re-entry". This strategy aims at targeting selected areas on ground (covered mainly by oceans) for the final re-entry, allowing a reduction of the casualty risk in comparison to an uncontrolled re-entry. This strategy can be used for satellite a few times over the 10-4 limit and is feasible with low thrust on board (like with electrical propulsion) and has then the advantage of avoiding strong mass impact. The strategy is to control the satellite descent up to a very low orbit (typically 350x150km) before leaving the S/C for the final uncontrolled phase that lasts about one day. This paper presents the proposed strategy and the impacts on the mission and satellite design: duration of the re-entry (a few weeks to several months), type of operations, propulsion system design, and satellite design impacts due to the extension of the flight domain up to very low altitudes.