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SPACE DEBRIS SYMPOSIUM (A6)
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COMPLIANCE OF THE ITALIAN SATELLITES IN LOW EARTH ORBIT WITH THE END-OF-LIFE DISPOSAL GUIDELINES FOR SPACE DEBRIS MITIGATION

Abstract

Since 1964, Italy has placed in LEO 28 objects: 26 payloads, 1 rocket body and 1 mission related object. 18 are still in space: the IRIS rocket body, in a 293 x 3334 km orbit, and 17 payloads, 6 of which operational. 16 objects were deployed in space before the approval, in 2002, of the IADC Space Debris Mitigation Guidelines and 1 further payload was launched before the ASI signature of the European Code of Conduct for Space Debris Mitigation, in 2005. This paper addresses the compliance of the disposal of the Italian satellites in LEO with the current international guidelines, in order to show if and how they affected the choice of the operational orbits, the mission design and the end-of-life procedures. So far no object was maneuvered to reduce its residual lifetime, but, due to the operational orbits chosen and area-to-mass ratios, 17 of them decayed or will reenter in less than 25 years after mission completion, in agreement with current recommendations. This corresponds to a compliance of 71% for the objects placed in orbit before the ASI signature of the European Code of Conduct, and of 83% for those launched afterwards and whose mission is already or nearly over. So, since 2005, after the projects had enough time to adjust to the IADC mitigation requirements, only one violation of the 25 years rule has occurred and the 50 years residual lifetime threshold has not and will not be violated by any of the 11 satellites launched since then, even in case of spacecraft failure before disposal. Previously, a residual lifetime of more than 50 years had occurred 3 times, i.e. in 18% of the cases, none of them involving ASI satellites. Concerning the risk on the ground associated with uncontrolled reentries, just one satellite decayed so far had a mass greater than 1000 kg, and at that time (2003) reentry predictions and alert time windows were provided to the countries overflown. Among the satellites presently in orbit, only the four COSMO-SkyMed operational spacecraft have a mass exceeding one ton, but it is not yet clear if they will present a casualty expectancy in excess of 1/10.000, the alert threshold adopted at the international level. Anyway, their reentry is still many years in the future, the details depending on the outcome of the end-of-life disposal, and plenty of time will be available for comprehensive risk analyses and preparations.