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DEVELOPMENT OF AN AUTONOMOUS ONBOARD DEORBITING SYSTEM OF SLV STAGES WITH LPE

Abstract

To stopping the flow in the protected area near Earth space man-made long space debris, in this case an upper stages of SLV with liquid propulsion engines (LPE) once they complete their mission, and to reduce the impact of lower stages in the impact areas and dramatic downsizing impact areas (and possibly reduce their number) considered the development of an autonomous onboard deorbiting system (AODS), which provides deorbiting maneuver. As an example, SLV type "Souz-2.1.B" on propellants "oxygen-kerosene." To implement the deorbiting maneuver suggests the use of the energy resources contained in unused remains of liquid propellant in the tanks of stages SLV after main LPE off. Proposed AODS close to its basic purpose to the systems to used the second stage LPE: RL-10B-2 (SLV "Delta-4), LE-5B-2 (SLV H-IIB), HM7-B (SLV Ariane 5 ") for propellants" oxygen - hydrogen "are also implemented deorbit stages from orbit. On main mode these LPE using liquid propellants, and when its restart, after the separation of the payload by gasified products. Full-scale successful experiments in controlled deorbiting of the second stages SLV "Delta-4" (11.06.2006), H-IIB (22.01.2011.), "Ariane 5" (23.03.2012) showed almost the use of this type of energy source. Differences between the proposed schemes from the famous russian scheme are as follows: - instead of using a cryogenic hydrogen fuel high-boiling kerosene (russian SLV type "Souz", advanced "Angara"), which leads to the need for a multiple increase of heat input to the tank with fuel for the gasification of kerosene; - to implement the pulse in the AODS developed special gas propulsion engine (GPE), which has small dimensions and mass ; - having regard to the russian specifics stages to bring in impact areas with dramatically reduced size, suggests the use of AODS both the first and the second stages of SLV; - additional placement of propellant on board to get the heat-carrier levels can guarantee to provide testing of the specified impulse. The main critical technology to create AODS is gasification of residues of liquid kerosene as they are in an uncertain boundary condition after the sustainer LPE off. The proposed gasification system is based on the feeding of the hot gas (heat-carrier) in the propellant tanks.