SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Removal Issues (5)

Author: Prof.Dr. Valeriy Trushlyakov
Omsk State Technical University, Russian Federation

THE DEVELOPMENT OF AUTONOMOUS ONBOARD SYSTEMS FOR THE CONTROLLED DEORBITING OF STAGES SEPARATING PARTS OF SPACE LAUNCH VEHICLE

Abstract

This paper deals with the suggest of the development of autonomous onboard systems for controlled deorbiting separating parts (SP) stages of space launch vehicle (SLV) with main liquid propulsion engine (LPE) in the specified areas of the fall, including the orbit payloads, as well as the trajectories of their elimination, based on the use of: - energy, contained in unused liquid rocket fuel component (RFC) in the tanks, implemented using a gasification system and the rocket engine (AOS); - the accumulated kinetic and potential energy in the launching of the payload with the upper stage (US) and SLV in an area with high density SP, launched earlier (SP – target, space debris), with an additional vehicle docking module (AVDM), containing controlled tether systems, space micro tug (SMT) with a docking and capture system (DCS), such as a pin. 1. The proposed design process and design decisions are based on AOS supply of heart carrier (HC) in the form of hot gas from the autonomous gas generators into the fuel tanks with the remnants of RFC, further feeding gasified product (a mixture of gases aspirated, evaporated RFC and HC) in the rocket engine working on a scheme "gas-gas." Realization of the impulse of characteristic velocity due to gasified residues RFC allows to solve the following tasks: - operative control deorbiting orbital SP of the protected areas of near-Earth space (NES); - a full using RFC in the tanks of SP; - reduction of the area in the fall of the lower SP of SLV with main LPE; - expansion of the range of possible launch azimuths of SLV with LPE by providing the ability to maneuver of the SP of first stage in a given area of impact, thereby reducing the cost of energy to maneuver changes the angle of inclination of the orbit of launching. AOS for testing in the first phase is planned to use the block A (second stage) SLV type of "Soyuz-2". 2. The scheme proposed deorbiting of SP-T, which are in the vicinity of the orbit of the ascent current of the payload, using AVDM: - after payload separation, upper stages with AVDMS made to maneuver of the far guidance in the area of the selected SP-T, located in the immediate vicinity; - when the set point is reach, from upper stages separates space micro tug, associated with unwinding tether by upper stages...