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

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ESTIMATION OF CAPACITY OF DEBRIS COLLECTOR WITH ELECTRIC PROPULSION SYSTEM CREATION TAKING IN A COUNT ENERGY RESPONSE OF THE EXISTING LAUNCH VEHICLES

Abstract

Analysis of the development of the space debris problem was carried outSize grading was performed and pollution sources were catalogued. Feasible consequences of impacts of active apparatus with orbital debris were reviewed.

According to the documents of NASA, ESA, State Space Agency of Ukraine, Russian Federal Space Agency limiting the insertion of the objects debris'corigin was areenged: General Requirements for Mitigation of Near-Earth Space Debris population orbital debris' origin was arranged. It's necessary not to commit the generation of new debris and to get rid of the existing one to meet the requirements of these documents.

Debris collector (DC) is proposed to provide the space clearance capturing all-size orbital debris.

Results of the calculation of the offered space vehicle's basic characteristics depending on power possibilities of the used launch vehicle were given. Weight and radius of passive catching element of small space debris defined with the use of thrust and power-mass characteristics calculation procedure for DC with electric propulsion system were criterion of estimation of characteristics. Collector is considered to be functioning at the most polluted orbit at the range of 800 – 1200 km. For this purpose it is placed into a high circular orbit of 1200 km. Passive catching element spreads out, braking electric propulsion system is activated, DC travels progressively to a low Earth orbit whose height is defined by the ratio of aerodynamic drag and electric propulsion system's thrust. During maneuver the particles of space debris are being collected by passive catching element or are being braked and travel to orbits with shorter lifetimes.

Energy capacities of the state-of-art launch vehicles were studied to provide orbital injection of debris collector with the required characteristics. Calculation analysis of unit weight and time characteristics of a near-earth clearing way by using special space vehicle –DC which is supplied by electric propulsion system was presented. For DC creation launch vehicles' power possibilities designed by the USA, France, the Russian Federation and Ukraine in a wide range of load-carrying capacity from 12 to30 tons were investigated. The maneuver which is carried out by DC over its functioning was offered: DC is injected in the selected high orbit with launch vehicle and accelerator block help and moves cyclic from the specified orbit to low eliminating debris and back till the actuating medium is over. Recommendations about possible debris gatherer's mass and electric propulsion system characteristics are given.