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SPACE DEBRIS SYMPOSIUM (A6)
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Russian Federation, yfk@mcc.rsa.ruSEARCH FOR THE SHORT-LIFETIME DISPOSAL ORBITS FOR REMOVAL OF THE ROCKET
BODIES, PROVIDING THE GSO INSERTION, FROM THE GTO REGIONS**Abstract**

After providing the spacecraft's insertion into the geosynchronous orbits, space-rocket hardware (the upper stages of launch vehicles, rocket boosters, etc. hereinafter called as rocket bodies = RB) remain on the geosynchronous transfer orbits (GTO) with altitudes: H_{max} 35680 km, H_{min} ; 8000 km, gradually increasing a population of space debris in GTO area, and as a result creating the safety problems for both the future launches of space crafts into GSO and fulfillment of the realized mission in LEO, MEO and GTO regions. The purposes of the present activity were as following: the examination of a behavior and features of the long-term evolution of the used GTOs as well as the elaboration of the proposals for formation of the disposal GTOs supplying a short-lifetime for the RBs remaining in the GTOs that will promote refinement of the maintained GTO areas from the large space debris. On the basis of the information about space objects collected in the Roscosmos Automated System on near-Earth Space Hazard Warning's databases, the distributions of large man-made space objects within the GTO regions were obtained. Analysis of these distributions has allowed marking out those GTOs where the maximum quantity of RBs was accumulated. These GTOs became an object of the detailed investigation. The main results of the carried out investigations are as following: a) estimations of long-term evolution of GTOs in which flying the real RBs supplying launches of space crafts in GSO under various schemes of injection; b) qualitative and quantitative analysis of the influence of various disturbances on orbital parameters of the used GTOs in dependence on the initial values of these parameters as well as the influence of the initial orientation of the given orbits relative to the Sun and the Moon; c) dependences of the disposal orbits lifetime on the pericenter's altitude and the longitude of an ascending node of this orbits as well as on an epoch of a RB's transfer into given orbits; d) proposals both for selection of the short-lifetime disposal orbit for the used GTOs and for formation of ballistic schemes of transfers into these orbits of removed RBs. The characteristic velocity, demanded on realization of indicated transfers, was estimated as well.