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

Author: Prof. Garri A. Popov
Research Institute of Applied Mechanics and Electrodynamics (RIAME), MAI, Russian Federation, riame@sokol.ru

Dr. Vladimir Obukhov
RIAME, Russian Federation, riame@sokol.ru
Mrs. Victoriya Svotina
RIAME, Russian Federation, riame@sokol.ru
Prof. Andrey Nadiradze
Moscow Aviation Institute (National Research Institute, MAI), Russian Federation, riame@sokol.ru

# MODELING OF FORCE IMPACT ON LARGE-SIZED OBJECT OF SPACE DEBRIS BY ION INJECTION

**Abstract**

A method of removing large-sized space debris, waste spacecraft including, by an ion beam (Ion Shepherd) may be extremely efficient, especially in GEO. Efficiency of force impact on space debris by an ion beam depends on the distance between the service spacecraft with an ion gun (IG) on board, and the divergence angle of the beam generated by IG. The beam divergence half-angle is presented as a function of its perveance. This dependence was obtained by calculations for a two-electrode ion extraction system of IG. It is shown that divergence with the half-angle of 3 deg may be obtained with the ion energy of about 4 keV. A beam of ions with such energy and the current of 0.5  generates thrust of about 50 mN. For the sake of definiteness, the ion beam interaction of space debris was modeled by the example of waste spacecraft of “Express” type. Forces acting on spacecraft and spatial distribution for the flow of products of ion sputtering of the space debris material towards the spacecraft were defined.