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Образец для цитирования:

Рязанов В. В., Ледков А. С. Увод наноспутника с низкой орбиты с помощью ионного потока // *Изв. Сарат. ун-та. Нов. сер. Сер. Математика. Механика. Информатика*. 2019. Т. 19, вып. 1. С. 82–93. DOI: <https://doi.org/10.18500/1816-9791-2019-19-1-82-93>

Descent of Nanosatellite from Low Earth Orbit by Ion Beam

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The work is devoted to the problem of contactless CubSat3U nanosatellites removal from low Earth orbit by means of an ion beam, which is created by the engine of an active spacecraft. The advantage of this method is that there is no need for additional means of docking and gripping. A mathematical model of the nanosatellite plane motion under the action of the ion beam and gravitational forces is developed. Two approaches are used to simulate the ion beam impact on nanosatellite. The first one involves the use of known dimensionless aerodynamic coefficients. The second approach is based on the division of the body into triangles and the calculation of the effect of the beam on each of them. Wherein the hypothesis of a complete diffuse reflection of particles from the surface of the body is used. The descent of the nanosatellite from a low Earth orbit to the surface has been simulated. It is shown that both approaches give close results, in particular, the difference in the descent time from an altitude of 500 km does not exceed 4 %. The closeness of the results allows



to use aerodynamic characteristics at the stage of preliminary design of the non-functioning satellite removal missions. The obtained results can be used for the ion beam control development and for modeling the motion of the system of contactless space debris removal.

Keywords: space debris, noncontact method, ion beam, aerodynamic coefficients, nanosatellite.

Received: 28.05.18 / Accepted: 15.09.18 / Published online: 28.02.2019

Acknowledgements: This work was supported by the Russian Science Foundation (project no. 16-19-10158).

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Cite this article as:

Ryazanov V. V., Ledkov A. S. Descent of Nanosatellite from Low Earth Orbit by Ion Beam. *Izv. Saratov Univ. (N. S.), Ser. Math. Mech. Inform.*, 2019, vol. 19, iss. 1, pp. 82–93 (in Russian). DOI: <https://doi.org/10.18500/1816-9791-2019-19-1-82-93>
