
Study the possibility of indirect flight into the restricted orbit around the Earth—Moon's L2 libration point

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The paper analyzes the possibility of flight into the orbit around the translunar libration point using gravity-assist maneuver near the Moon. The orbits, which spacecraft can enter without the use of intermediate maneuvers after the flyby of the Moon, are studied. The flight from a parking low-Earth orbit into different orbits is simulated. Color maps of characteristics dependent on the parameters of the flyby point and the map showing the areas on the plane corresponding to the quasi-halo orbit, moving on which the spacecraft does not go to the penumbra of the Moon are constructed.

Ключевые слова: libration point, gravity-assist maneuver, lissajous orbit, quasi-halo orbit.

REFERENCES

- [1] Folta D.C., Pavlak, T.A., Haapala A.F., Howel K.C., Woodard M.A. *Acta Astronautica*, 2014, no. 94 (1), pp. 421–433.
 - [2] Burns J.O., Kring D.A., Hopkins J.B., Norris S., Lazio T.J. W., Kasper J. *Advances in Space Research*, 2013, no. 52 (2), pp. 306–320.
 - [3] Farquhar R.W. The control and use of libration-point satellites. *Technical Report R-346*. NASA, 1970.
 - [4] Howell K.C., Pernicka H.J. *Journal of Guidance, Control, and Dynamics*, 1993, no. 16 (1), pp. 151–159.
 - [5] Bober S.A., Aksenov S.A., Nikolaeva Yu.A. Issledovanie zavisimosti formy ogranichennoy orbity kosmicheskogo apparata ot nachalnogo vektora sostoyaniya v okrestnosti toчки libratsii L2 sistemy Solntse–Zemlya [Study of the Dependence of the Restricted Spacecraft Orbit Form on the Initial State Vector in the Vicinity of the Sun – Earth's L2 Libration Point]. *Materialy Vosemnadtsatogo nauchno-tekhnicheskogo seminara "Novye informatsionnye tekhnologii v avtomatizirovannykh sistemakh"* [Proceedings of the eighteenth scientific and technical workshop "New Information Technologies in Automated Systems"]. Moscow, 2015.
 - [6] Nikolaeva Yu.A., Aksenov S.A., Dunham D.W. Raschet okon zapuska kosmicheskogo apparata dlya traektorii Zemlya-tochka L2 sistemy Zemlya-Luna [Calculation of Spacecraft Launch Time Constraints for the Earth — L2 Point Trajectory of the Earth – Moon System]. *Trudy mezhdunarodnoy nauchno-prakticheskoy konferentsii "Innovatsionnye Informatsionnye Tekhnologii"* [Proceedings of the International Scientific-Practical Conference "Innovative Information Technologies"]. Prague, 2013, pp. 22–26.
 - [7] Fedorenko Yu., Aksenov S.A., Dunham D.W. Evaluation time visibility of the spacecraft when moving around L2 libration point of the Earth – Moon system. *Materials of the International Scientific-Practical Conference "Innovative information technologies"*. Prague, 2013, p. 2.
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