
Techniques of shaping steady near-circular solar-synchronous orbits for the long term existence of the spacecraft

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Nowadays in the sphere of creation of perspective space systems for remote sensing of the Earth there is a tendency for increasing the periods of their active existence to 7–10 years and more. Ensuring the stability of the solar illumination of the flight path during a long period of active existence is one of the most important requirements for the normal operation of space systems placed in solar-synchronous orbits. The analysis of the effect of perturbing factors on the evolution of the parameters of the solar synchronous orbit showed that the deviation from the condition of solar synchronism was mainly due to the secular drift of the plane inclination caused by the action of the gravitational attraction of the Sun on the spacecraft provided that the average orbital altitude is maintained. The article proposes the rational way of maintaining orbit solar synchronism. It provides the required conditions of the solar illumination of the flight path during a specified period of spacecraft active existence with a minimum amount of correction of the orbital plane inclination because of introduction of two corrections to the nominal values of the inclination of the solar synchronous orbit plane and the launch time of the spacecraft. The correction values depend on the spacecraft service life. Application of the developed algorithms allows generating the initial values of the solar synchronous orbit parameters ensuring the constancy of the orbit altitude profile above the terrestrial ellipsoid and the minimal extreme altitude difference in flight orbits.

Keywords: remote sensing of the Earth, solar synchronous orbit, program orbit, stable orbit, frozen orbit

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