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Author: Mrs. Valentina Ivanova
Yuzhnoye State Design Office, Ukraine

ENSURING MAXIMUM STABILITY OF EARTH REMOTE SENSING CONDITIONS WITHOUT USING ORBIT CORRECTION

Abstract

A wide range of research and application tasks is solved on the basis of Earth Remote Sensing data processing by Space crafts (SC). The stable Sun-Synchronous Orbits meet the requirements for illumination of the surface under test and variations in height on which survey is performed. Besides, SSO are suitable in the best way possible for charging SC solar batteries as well as planning of communication sessions for data transmission from research equipment and survey results. Under the influence of initial (due to injection error) and flight disturbances the SSO undergo secular (increasing) changes that gradually results in violation of the required sensing conditions. With propulsion system available at SC the orbit parameters are periodically updated. But if during calculation of SSO initial parameters the set of flight disturbances is properly considered during the period of satellite lifetime, then the number of corrections can be significantly reduced, and corrections for the missions with mild requirements for variations in orbit functional characteristics (in the majority of cases) can be excluded. The report: - provides the results of research conducted by the authors associated with influence of the different disturbing factors on evolution of SSO parameters; - justifies analytical correlations for calculation of deviation values of the orbit parameters under the influence of flight disturbances over the period of satellite lifetime; - formulates recommendations on selection of initial values of the perigee argument, eccentricity and SSO inclinations which ensure minimization of deviations in flight altitude of the spacecraft above the surface of Earth ellipsoid as well as local solar time of the ascending node of the orbit. Efficiency of the method proposed by the authors is illustrated by the comparative chart of design changes in SSO functional characteristics (deviation in altitude above Earth ellipsoid and local solar time of the ascending node) during “classical” calculation of SSO initial parameters and calculation on proposed correlations. The obtained conclusions are confirmed by Egypsat spacecraft observation results.