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ON THE CHOICE OF THE BALLISTIC PARAMETERS OF AN ON-ORBIT SERVICE SPACECRAFT

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At present, a significant increase in the cost of spacecraft is observed. Due to this fact the requirements for their active life duration, operational reliability, and operational cost reduction become more and more stringent. A promising way to meet these requirements is the introduction of on-orbit service (OOS). OOS allows one to solve technical and economic problems by performing service operations in space. The introduction of OOS contributes to extending the active life of spacecraft, increasing their operational reliability, and reducing the service maintenance cost of orbital satellite systems of various purposes. OOS programs on the deorbit of used or damaged spacecraft help in the mitigation of space debris problem. The composition of an OOS system depends on the service tasks to be performed and the ballistic capabilities of disposable or reusable service spacecraft. The realizability and character of the ballistic maneuvers of service spacecraft are largely determined by the type and characteristics of their sustainer engines. The aim of this paper is to assess the ballistic potential of modern and prospective OOS spacecraft and to develop a methodology for planning rational OOS routes. Various ground- and space-based OOS systems are considered and analyzed. The expediency of their use is estimated depending on the service tasks to be performed. The most promising OOS schemes are identified. A technique for planning a rational sequence of orbit transfers between the orbits of the spacecraft to be serviced is proposed and illustrated by the example of a test calculation. The technique is based on the solution of a multi-criteria traveling salesman problem, which is formulated in terms of integer linear programming and reduced to a single-criterion problem by the additive convolution method. The novelty of the proposed technique lies in reducing the original problem to a multi-criteria traveling salesman problem. The results obtained may be used in the justification, planning, and implementation of service space operations.

Keywords: *traveling salesman problem, spacecraft, multi-criteria optimization, on-orbit service, route planning***.**

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