

ASTRODYNAMICS SYMPOSIUM (C1)
Mission Operations (3)

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OPERATIVE PLANNING OF FUNCTIONAL SESSIONS FOR MULTISATELLITE OBSERVATION
AND COMMUNICATION SYSTEMS

Abstract

An important control aspect of modern satellite observation and communication systems is the control of the functional processes. Functional sessions proceed under conditions of restricted technical ability, large amounts of information to be processed by the on-board equipment, practice inequality of the received information, intentions of system management and operators, interests of customers and other factors. A large number of satellites in orbital segment is one of the most important factors affecting the functional process also. Besides that some modern projects of satellite systems are multifunctional that is mixed operations of observation and communication. Therefore the functioning of satellites on-board equipment must be accurately co-ordinate. That is why the problem of operative planning the functioning of these systems, while directly affecting the efficiency of the system, is very complex and actual at present. A methodical approach and software package for operative planning of functional processes for satellite observation and communication systems, including multifunctional projects, are considered in the report. The base scheme of this approach consists of four main stages: stage 1 - modeling of satellites orbital kinematics and dynamics; stage 2 - modeling of system functional processes with all kind of restrictions and criterion function values; stage 3 - solving an optimization tasks by numerical applicable algorithms and constructing the optimal (or accuracy) plans; stage 4 - repeated plan optimization (different variants) and analyzing. Such scheme is the result of authors practical research which have been realized during last 15 years by the operative planning as for any kinds of single satellite as for satellite systems with different structure of orbital segment. The research helps to unify the procedure of operative planning, to formulate basic principles and approaches for its solving, to develop special software package. The main aspects of the approach proposed are illustrated in the report. The results of the calculations of applied planning problems are presented. The objects of research in these problems are: projects of "CBERS" observation systems (1-3 satellites); the system of "Resource-DK", "RbView3", "Terra", "AlSat", "UK-DMC", "NigeriaSat", "BilSat", "Beijing" observation satellites; projects of "Monitor" observation systems (1-7 satellites); projects of "Iridium" (66 satellites), "Koskon" (50 satellites) and "Teledesic" (288 satellites) global communication systems; project of "Odyssey" communication system (12 satellites, 7 base and 10 retranslate land stations); project of "RosteleSat" multifunctional system (24 middle-orbit satellites, 91 low-orbit satellites). The report is realized under the support of Russian Foundation for Basic Research.