

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Future Space Transportation Systems (4)

Author: Mr. Dmitry Goropaev  
Central Research Institute for Machine Building (JSC TSNIIMASH), Russian Federation,  
goropaev@yandex.ru

DESIGN PARAMETERS OPTIMISATION OF THE UNIFIED SERIES OF REUSABLE  
INTERORBITAL TUG WITH ELECTRICAL PROPULSIONS AND NUCLEAR POWER SYSTEM OF  
MEGAWATT CLASS IN NEAR EARTH TRANSPORT OPERATIONS FOR HEAVY PAYLOADS AND  
SATTELITE TRANSPORTATION TO F

**Abstract**

In paper presented the process of a comprehensive project analysis in the form of successive solution of a number of optimization problems, which allows to consider, at the initial stage of designing a large number of variants inter-orbital and interplanetary tugs (IIT) on the basis of the transport and power module (TPM) with a powerful nuclear electric propulsion system (NEPS) and to choose a rational option for further development. Is considered the prospects for use of the IIT on the basis of the TPM with NEPS in solving high-energy transport tasks on delivery of cargo to orbit of the Moon artificial satellite, geo stationary orbit (GSO), and trajectories toward the planets of the solar system, including Mars. Reusable IITs on the basis of TPM with a powerful NEPS is a new complex electrical propulsion system, which combining high efficient electric rocket engines with a powerful space nuclear power plant (NPP) with power level from hundreds of kilowatts to tens of megawatts, this vehicle is intended for inter-orbital transportation of different kinds of payloads from low earth orbit to low moon orbit, GSO and to far distant planets, asteroids, comets and so on of Solar system. The presence on IIT board of powerful NPP provides the possibility of using it for power supply of payload, as in transportation operation, as after delivery on orbit of destination. That is why IIT with NEPS is unified propulsion-electricity system, which can be used for solving the scientific technical and technological problems, socio-economic challenges as propulsion system, and as electric power system. Developing of nomenclature of disposable and reusable inter-orbital tugs with NEPS connected with the solution to a number of scientific technical and technological problems, which would be impossible to solve without the realization of complex of actions IIT based on TPM with NEPS and is also determined by the fact that the lack of justification of the adopted variant and NPP parameters at the initial design stage will be connected with significant expenses of time and means for their elimination in the future. Therefore, the stage of comprehensive studies of such products should include consideration of many of the technical solutions in order to make informed choices for prospective IIT of the most preferable number of NPPs for their subsequent more detailed study of the design Bureau, and the development of an integrated long-term program of the creation of reactor facilities.