

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

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SELECTION OF RATIONAL VERSION OF FLY-BACK ROCKET BLOCK FOR REUSABLE OF
SPACE ROCKET SYSTEM

Abstract

Khronichev Space Center has developed preliminary design for reusable space rocket system (RSRS), designed to launch into reference orbit various automatic spacecraft and piloted space vehicles with mass up to 35 tons. First stage of RSRS is a rocket block for repeated use flying back to the launch point (FBB), second stage is an expendable rocket booster. Ensuring compliance requirements with reliability, operating safety, environmental safety, and FBB efficiency is one of the main factors determining RSRS efficiency. Analyses of design-theoretical results and experiments with various VRB aerodynamic configurations run in aerothermodynamic duct, as well as analyses of performance characteristics of liquid-propellant main engines and other FBB components were performed for the purpose of opting rational FBB embodiment and composition. This report represents comparative analysis with straight pivoting wing and with and tapered wing as well as FBB with liquid-propellant main engines with propellant components LNG (liquefied natural gas)+liquid oxygen and kerosene+ liquid oxygen. Definition of the results data are to be obtained at conducting tests of scaled aerodynamic flight demonstrators at hyper-, trans- and supersonic modes of flight, as well as during flight tests of FBB system demonstrator, designed for complex development test of all FBB systems in the process of full flight cycle and turnaround servicing.