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SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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SYSTEM-DEFINED FLIGHT DEMONSTRATOR OF REENTRY LAUNCH VEHICLE' BLOCK WITHIN REUSABLE SPACE LAUNCH VEHICLE CONFIGURATION

Abstract

Khrunichev SRPSC is developing preliminary design for reusable space launch vehicle configuration (RSLVC) to put into reference orbit spacecraft for various purposes and cosmonaut-inhabited space vehicles with mass up to 35 tons. The first stage of RSLVC is reentrable the launch vehicle' block (RLB) for multiple reuse, the second stage is the single use launch vehicle booster.

Top requirements to the reliability indices, operational and environmental safety and economic efficiency of RSLVC provides for the development of pivotal technologies and innovative design solutions with the use of ground and flight demonstrators. This enumeration includes: • procedure of application and operational use of new construction materials; • procedure to servicing between its flights, for servicing its units and assemblies, including air rocket-jet propulsion system and liquid propellant main engines. • aerodynamic scheme for RLB, ensuring its stability and controllability and minimizing thermal loading of launch RLB throughout its flight; • emergency protection system for reusable liquid propellant engine; • control system for reentry flight of RLB, • safety system for RSLVC.

The ground demonstrators include laboratory models for tubing tests and experimental benches.

Flight demonstrators are supposed to include scaled aerothelmaldnamic demonstrators to study hyper-, trans- and supersonic modes of flight, flying laboratories for testing the reentry flight modes. The system-defined flight demonstrator of RLB is designed for comprehensive tests of all RLB systems throughout the full flight cycle and servicing between flights. In addition to it, the tests of design solutions and technologies are envisaged for reuse of liquid propulsion main engines, manufactured at scale 1 to 5 in thrust in comparison with liquid propellant engine of RLB.

On the basis of system-defined demonstrator it is prospecting to create the super light class launch vehicle for putting onto orbit payloads weighing from 100 to 300 kg.

These hypotheses are based on the availability of research, technical and experimental capacities and bench base available in the industry.