

SPACE SYSTEMS SYMPOSIUM (D1)  
Innovative and Visionary Space Systems Concepts (1)

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TECHNICAL APPROACH TO SELECT DESIGN PARAMETERS OF THE AIR-LAUNCHED SPACE  
SYSTEMS

**Abstract**

It is suggested to consider the air-launched space system for orbital payload insertion without the need of launch site, reducing payload launch costs and increasing the efficiency for payload to reach orbit. The technical approach described below was suggested to consider different options of the air-launched space system. Selection and classification of the launch vehicles take up the first phase. Its purpose is to offer the overall picture of the existing concepts and consider the possible options of the realization in principle of the launch vehicle. First phase outcome is represented as framework of projects, sorted by specific categories. Such categories are launch technique, number of stages and reusability of the launcher. Category systematization versus the required goal is analyzed in the second phase. Examined are benefits and drawbacks of launch techniques, number of stages and partial and full reusability of the launcher depending on number of stages and launch technique. Second phase will be completed with generation of the list of principal parameters of ALSS to place microsatellites into low orbits with various inclinations. Detailed analysis of selected category prototypes that will impact selection of design parameters takes up the final phase. Among the ALSS design parameters are: orbit parameters, payload relative mass, stages distribution of mass, type of propulsion system and propellant for each stage, performance at the stage separation point, type of control system and number of launches per year. Third phase will be completed making a list of ALSS design parameters. As a result of analysis with this approach, the system is suggested capable of accomplishing the mission at the least cost. It is two-stage system that features horizontal takeoff from regular runway. Reusable high-altitude hypersonic UAV will be used as the first stage. UAV features mixed power plant that combines two types of air-breathing jet engines: turbojet and ramjet. Second stage is an expendable integrated launch vehicle (ILV), designed as three-stage rocket, powered by solid-propellant engines. Prior to reaching the launching point, in flight ILV is covered with the fairing to ensure better airflow. Stabilizers are installed on the ILV Stage 1 to control the ILV in the phases of drop and ignition. This technical approach enables first approximation estimate of the configuration and performance of the space launch vehicle.