

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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PERSPECTIVES FOR THE USE OF NEW SOLUTIONS IN THE CREATION OF SUBORBITAL
LAUNCH VEHICLES

Abstract

This work is devoted to the problem of finding more affordable means of delivering payloads to target altitudes. It is proposed to consider suborbital rockets as such means. The scope of application of modern suborbital launch vehicles is quite wide. Such rockets are used in the study of the atmosphere and near-Earth space, conducting experiments in various fields of science, working out structural elements and electronic equipment for orbital launch vehicles and space vehicles, education and solving other problems. Often, suborbital rockets are an intermediate step towards the creation of orbital launch vehicles of an ultralight class. In cooperation with Space Labs Noosphere Engineering School and Oles Honchar Dnipro National University, scientific and design activities continue to create a family of small suborbital rockets capable of carrying payloads to altitudes in the range from 2 to 100 km and above. At the moment, five rockets are in the process of development – both on solid and liquid propellants. Four solid-propellant rockets have reached the stage of flight tests, while the rocket on liquid monopropellant is at the stage of testing the propulsion system. Basing on the experience gained during the creation of suborbital rockets and the analysis of existing trends in the segments of creating suborbital rockets, ultralight orbital launch vehicles and small spacecraft, we have identified a number of promising areas for improving the effectiveness of means for launching payloads in this segment. Among the main factors determining the cost of launch services in this case there are the level of complexity of creating and testing the designs of the rocket and the ground segment, the ratio between the energy characteristics of the propellant and its cost, as well as the possibility of implementing the task of launching the payload in the shortest possible time. As specific solutions, the use of various variants of monopropellants as a direct alternative to traditional rocket fuels is envisaged. The advantages of the developed monopropellants are their environmental friendliness, sufficiently high density, safety and availability. The use of monopropellants can significantly simplify the propellant feeding system and the rocket system as a whole. A comparative assessment of the efficiency of using monopropellants as the main propellant for suborbital rockets is provided. Special attention is paid to the search for more environmentally friendly alternatives to modern solid mixed propellants.