

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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POSSIBILITIES FOR EXPANDING THE APPLICATION AREAS OF SUBORBITAL LAUNCH
VEHICLES

Abstract

This work is devoted to the development of suborbital launch vehicles (SLVs). The main application areas and the basic requirements for suborbital launch systems at the present stage are presented. General information on the Ukrainian research team “Rocketry Agency” at Space Labs Noosphere Engineering School and Oles Honchar Dnipro National University aimed at development of a family of suborbital launch vehicles, as well as the main outcomes of works at the current stage are provided.

As part of the search for promising solutions to the problem of low-Earth orbit contamination, the use of SLVs should be considered as a carrier for space debris removal systems (SDRSs). There are proposals to increase the capabilities of the existing powerful SLVs by installing additional stages on them, which allows accelerating the specified SDRSs to speeds comparable to the speed of movement of space debris objects that need to be removed. At the same time, a significant drawback is that due to the installation of an additional stage, the mass of the payload of the rocket (in the perspective of the SDRS) is reduced from hundreds of kilograms (the mass of the payload of the most powerful rocket is 700 kg for an apogee of 705 km) to tens of kilograms (for this rocket up to 55 kg per orbit with an apogee of 600 km and a perigee of 130 km). For this version of the use of the SLVs, it is possible to use active SDRSs built on the basis of an aerodynamic sailing device, installation of braking rocket engines on the object of space debris, etc.

At the same time, this way of using the SLVs does not allow to fully use all the advantages inherent in this class of launch vehicles. Therefore, the idea that consists in the vertical launch of the SDRS into the layer of space debris located in low Earth orbits may turn out to be more promising. At the same time, the SDRS will need acceleration to a speed much lower than the first space speed. This allows either to increase the mass of the SDRS, or to significantly reduce the energy costs for output in comparison with the proposed method of modernizing the SLVs by installing an additional upper stage.