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

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SPACE TRANSPORTATION SYSTEM OF A NEW GENERATION FOR THE LUNAR SPACE EXPLORATION PROGRAM

Abstract

Currently the international community considers different approaches to the development of the Moon and lunar vicinity. Common in these approaches is the use of human spacecraft (SC), launched from Earth and returning to Earth traditional way by landing after braking in the atmosphere similar to Apollo program. As human SC in lunar program are considered American Orion and Russian SC of new generation. Re-entry with second cosmic velocity increased requirements for the control system and heat-shielding coating compared to the re-entry from low-earth orbit. In addition, the mass of the soft landing system for a reusable SC is about one third of the total weight of the returned capsule. The paper proposes an alternative approach that eliminates the need for landing SC on the ground as a result, significantly simplifies the design of SC. Transportation system (TS) is based on reusable human spacecraft (RSC), located on the near-earth orbital station (OS) using the using available space resources. Thus, delivery of crew to the OS and returning may be performed using SC Soyuz, trans-Moon burn provides the upper stage block DM launched into the low earth orbit with launch vehicle Angara-A5 or Proton-M. Before flying to the moon the RSC docked with upper stage block DM. Upon completion of the lunar mission of the RSC by using its own propulsion system performs the burn to return to Earth, and decrease the speed of the Earth up to first cosmic velocity is the method of "braking ellipses", including serial inputs into the Earth's atmosphere at an altitude of about 70-85 km, for which the design of the RSC provides for "umbrella" to serve as aerodynamic brakes. Completes autonomous mission of the RSC after docking with the OS. Coincidence orbital planes of the RSC and the OS is provided the date of performing a Trans-Earth Injection with targeting on the earth b-plane. Further development of the presented approach is the transport system to ensure landing reusable lunar SC (RLSK) in any area of the moon. The work presents the conceptual image of the proposed TS and the possible ballistic scheme of its functioning.