

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

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POSSIBLE SCENARIOS FOR MOON EXPLORATION MANNED MISSIONS AND FIELD OF
EFFICIENT APPLICATION OF UNMANNED TRANSPORT SYSTEMS, LANDING, TAKE-OFF AND
LANDING SYSTEMS TO ENSURE THE DEPLOYMENT AND RESOURCES SUPPORT FOR
VISITED AND SCIENTIFIC INFRAS**Abstract**

A comprehensive lunar exploration program which comprises deployment of a visited lunar base and a permanent scientific infrastructure requires a significantly broader range of spacecraft compared to a program based on onetime landings on the Moon surface. In addition to the Earth-Moon manned transport system development, it is necessary to develop unmanned transport systems including landing and reusable take-off and landing systems, reusable interorbital tugs that could provide regular resources support for infrastructure on the lunar surface and for robotic spacecraft supporting manned missions. At the first stage International cislunar space station Deep Space Gateway (DSG), that is to become a gateway between the Earth, the Moon and the Mars, or reusable electric propulsion tug of Earth-Moon transport system may be used as an interface of interaction between manned and robotic missions.

Flexibility of the lunar research and exploration program can be ensured by the advanced spacecraft scalability and their platforms unification that will allow both solving various scientific problems and granting commercial partners an access to the resource capabilities of the unified platforms. A sequence

of these spacecraft development should be linked to the Moon exploration program stages and allow for testing a number of systems and subsystems required for future missions.

This paper provides an analysis of possible usage scenarios for advanced robotic, landing, reusable take-off and landing platforms and reusable interorbital tugs in order to provide resources for a visited lunar base and permanent scientific infrastructure on the lunar surface. These scenarios are considered within the framework of Russian lunar program manned missions. The possible role, place and contribution of these spacecraft to the lunar research and exploration program are analyzed