SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – missions current and future (3A)

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PERSPECTIVE AND CONCEPTUAL PROJECTS OF MARS EXPLORATION

Abstract

Lavochkin Association is the leading Russian company in the field of design, development and operation of scientific automated space complexes and has a wide heritage and experience in design and development of spacecraft and instrumentation for Mars research missions. In 1970s – 1980s automated interplanetary stations were designed and launched. These stations performed the first in the world soft landing on the Mars surface (Mars-3 station), conducted analysis of the atmosphere and surface imaging from the orbit of the Red Planet (Mars-5,-6 stations), studied Mars satellite – Phobos (Fobos-1,-2 stations).

At present time one more Martian system (Mars and its moons, Phobos and Deimos) two-phase research project – Expeditsiya-M ('Expedition-M') program is included into the Russian Federal Space Program for 2016-2025 in addition to joint Russian-European Exomars mission implementation.

The first phase is a mission with the working title Boomerang aimed at delivery of soil samples from Phobos. It is planned to start Preliminary Technical Requirements development in 2016. These works will be conducted in cooperation with the European Space Agency. Russian and European experts work up questions of scientific programs coordination, form proposals on distribution of responsibility areas at the spacecraft modules level.

Such cooperative approach not only continues general logic and concepts of the ExoMars project but also helps significantly optimize space complex development expenses of each side, increase scientific efficiency of the whole mission as well as develop and lay the groundwork for the implementation of the next phase – delivery of the soil samples from Mars.

The program first phase is scheduled for implementation in 2024.

The second phase of the Expeditsiya-M program has a working name Mars Samples Return and is intended for delivery of the soil from the Mars that is a more complicated engineering task. Experience of the two previous missions (ExoMars and Boomerang) will be taken into consideration during design and development of this phase. The groundwork laid in frame of ExoMars program implementation will mainly be used for development of means for delivery of the payload to the Mars surface as well as to reach engineering objectives on development of thermal protection, throttable braking engines and the soft landing equipment. As for continuity in design and development of Mars Sample Return mission orbiter as well as delivery to the Earth means (return and descent vehicles), the Boomerang mission experience will be applied.