Exploration of Other Destinations (5)
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DESIGN FEATURES AND ADVANTAGES OF A MANEUVERABLE LANDER TO VENUS

Abstract

Currently, to continue the fundamental Venus research various projects are being considered in Russia and abroad. At the same time, the scientific community is interested in certain areas of the planet that seem to be significant for studying for one reason or another. In this connection, the issues of creating a lander to the planet's surface that can reach these specified areas become relevant, in particular, it seems promising to consider the possibility of using new configurations of landers that can make maneuvers during the descent in order to increase the breadth of coverage of landing areas, to reach the most interesting for studying landing areas and to make an accurate landing in the planned area. Using the landers of spherical (Soviet ones) and conical (American ones) forms at the initial stages of planetary exploration was caused by the simplicity and reliability of their design, as the primary task for the lander was to reach the surface with working equipment. These landers belong to a ballistic type of a lander that are characterized by zero lift-to-drag ratio (aerodynamic quality) at hypersonic velocity range and do not have the ability to make maneuvers during the descent. And if taking into account the expected launch dates and adopted flight scheme of the "Venera-D" project possible landing zones for these landers will be limited. This paper proposes to use "lifting body" type of lander, which, with an allowable complication of the design, have a sufficiently high lift-to-drag ratio at hypersonic velocity range, sufficient to solve the current maneuvering tasks in the planet's atmosphere in order to reach the desired landing area and also to increase the breadth of coverage of potential landing zones while carrying out an expedition to Venus. Possible descent trajectories for the lander of this type are considered, and a comparison of these trajectories with the descent trajectory of a traditionally used ballistic type of a lander is given. It is shown that using a maneuverable lander provides us with a greater breadth of coverage of landing areas as well as allows us to reduce loads and expand the range of scientific tasks and research being carried out.