

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Vehicles – Mechanical/Thermal/Fluidic Systems (7)

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ACTIVE THERMAL CONTROL SYSTEM FOR VENUSIAN LANDER. NEW PROPOSAL

Abstract

In 2011 the Russian space research program of Solar system has been updated. In particular term of start of a space vehicle for Venus investigation has been moved with 2016 for 2023-2025. Design of perspective space vehicle "Venus-D" includes the landing device. The stock on time in connection with carry of the project enables to consider alternative variants to conservative lander design (projects VEGA, 1985), where thermal accumulators with phase transition for heat leaks compensation from the outside were used. In 2011 the concept of active thermal control system for the landing device to Venus, based on application of a refrigerator, has been presented at first. Argon has been chosen as a working fluid. The refrigerating unit works on an open return cycle of Brighton and compensates 120 W heat leaks from the outside. Top level of working temperature +110. A deficiency of such system is high energy consumption, nearby 860 W. There are some ways to decrease this quantity. The first way is a reduction heat leaks from the outside due to reduction of the sizes of the landing device or due to application of more effective isolation. The second way is an application of the high-temperature electronics, working long time at temperatures nearby +250. And the third way is optimization of refrigerating cycle and finding of a working fluid with performances, the best than argon. In offered work the estimation of use a krypton as a working fluid of a refrigerator will be lead. It is necessary to consider a problem of decrease energy consumption of active thermal control system below 500 W level.