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Space Vehicles – Mechanical/Robotic/Thermal/Fluidic Systems (7)

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THERMAL SUBSYSTEM DESIGN AND TESTING FOR THE HOPE PROBE (EMIRATES MARS
MISSION)

Abstract

The Hope Probe will be the first probe to provide a complete picture of the Martian atmosphere and its layers when it reaches the red planet's orbit in 2021. The United Arab Emirates has entered the space exploration race with the announcement of Emirates Mars Mission (EMM). Through this mission, an unmanned probe, called Hope probe was launched to Mars in July 2020, reaching the red planet by 9th February 2021 to coincide with UAE's 50th anniversary. The mission is unique and aimed for novel and significant discoveries that contributed to the ongoing work of the global space science community. The design of the Emirates Mars Mission observatory will include 3 instruments to study the Martian atmosphere named EXI, EMUS, and EMIRS. The scientific objectives for the Hope Mars Mission, as agreed upon by the global Mars science community, are aimed at providing a complete picture of the Martian atmosphere. The probe will study the climate daily and through seasonal cycles, the weather events in the lower atmosphere such as dust storms, as well as the weather on Mars different geographic areas. The success of the mission relays varying aspect, including the thermal systems. The Sun heats up one side of the spacecraft, and the deep space on the other side pulls the heat out. This paper will outline the thermal design and analysis and validation of results from the TVAC testing through varying cycles of thermal balance and vacuum tests. The thermal balance tests used for validation and model correlation purposes, whereas the thermal vacuum cycling tests used to simulate the spacecraft in an orbit-like thermal conditions.