LunaDome

Principal Investigators

Name	Qualification	Institution
Elliot Robinson	1st year, Aerospace Engineering	University of Bath, UK
Nicholas Doughty	3rd year, Aerospace Engineering	University of Bath, UK
Samuel Brass	3rd year, Aerospace Engineering	University of Bath, UK

Scientific Objective

The objective is to understand the requirements to build a life-sustaining habitat on celestial bodies away from earth. LunaDome is an experiment that inflates a flexible dome to atmospheric pressure, maintaining it for the entire lifetime of the experiment. Solar radiation and leakage will cause the pressure in the dome to vary so a pneumatic control system has been designed to accommodate for these changes. This data will be critical to understanding how the system can be scaled up to become habitable by in the future.

Figure 1: Lab2Moon - LunaDome

Specifications

Dimensions: Φ110mm x 65mm

Mass: 250 grams

Power: 3W

Operating Voltage: 5V

Operating Temperature: 10°C to +80°C

Storage Temperature: 10°C to +60°C

Data Interface: RS-485

Capability: Observing atmospheric conditions on the moon

Mission Description

Immediately after landing, the experiment will begin to function. Images will be captured by the rover. The pneumatic control system consists of an electronically actuated shut-off valve upstream of the dome and a mechanical relief valve downstream.

The system will maintain the dome pressure between 90kPa abs and 110kPa abs (between 3.5 feet below sea level and an altitude of 3200ft). This is achieved using a pressure sensor within the dome sending data to an electronic circuit to be processed by a PIC microcontroller. When the pressure falls below the lower limit the circuit commands the actuator to open the inlet Shut-Off Valve (SOV) and when the pressure rises above the upper limit, the spring force in the relief valve will be overcome, releasing some gas from the dome.