

Cold Chamber Test Plan

Purpose: To obtain a relative range for the temperature drop inside & outside of the cube, for verification that the insulation system can maintain electrical operating temperatures.

Materials:

- Cold Chamber
- 2.27kg Dry Ice
- 3 Thermocouples
- Insulation Cube

Procedure: The verification of the insulation system will be done through six separate tests. Three tests without the electrical components will be run and three tests with electrical components will be run (after modifications to cube from first three tests).

Each test will consist of the following probe placement:

- 1 probe measuring inside temperature of cube
- 1 probe measuring the surface temperature of cube
- 1 probe measuring surrounding air (cold chamber) temperature

Each test will run for 2-3hrs.

Each probe temperature will be recorded every 5 mins.

The temperature variance between the three separate trials consists of the following:

1. **Decreasing Temperature Test** (Idealized Flight)
 - Starting Cold Chamber Temperature: $0^{\circ}\text{C} \leq T_{\text{start}} \leq 20^{\circ}\text{C}$
 - Ultimate Cold Chamber Temperature : $T_{\text{end}} \leq -40^{\circ}\text{C}$
2. **Constant Temperature Test** (Worst Case Scenario)
 - Relatively constant Cold Chamber Temperature: $T_{\text{max}} \leq -40^{\circ}\text{C}$
3. **Increasing Temperature Test** (Extended Landing)
 - Starting Cold Chamber Temperature: $T_{\text{start}} \leq -40^{\circ}\text{C}$
 - Ultimate Cold Chamber Temperature : $0^{\circ}\text{C} \leq T_{\text{end}} \leq 20^{\circ}\text{C}$

Results:

Graph – Temperature Drop

- Y-axis variables - Temperature Difference
 - (Outside of cube to Inside of cube)
 - (Inside of cube @ start and end of test)
 - (Chamber @ start and end of test)

- X-axis variable - Time

Sources:

- Temperatures are predictions from previous VAST data for 2.27kg dry ice cooling.
- Runtime simulates average VAST balloon flight.

Preliminary Drop Test Plan

Purpose: To verify that the external structure can withstand landing impact stresses and analyze design problems from fracture points.

Procedure:

Six separate tests

- Three drops @ 1.524m
- Three drops from Kibbie Dome Rafters (distance to be attained)

Possible use of an accelerometer to record impact

Results:

Basic record of fractures (if any) & design analysis

Graph – Accelerometer Data

Acceleration, Velocity, Position, versus Time