T0014-P Microgravity Heat Pipe Limits Experiment

Problem Statement

- To date, empirical data of heat pipe limits in microgravity is nonexistent. This adds significant risk to future heat pipe thermal control systems.
- The parabolic flights allow access to lunar, Martian, and zero gravity environments in the same flight. This provides an excellent opportunity to gain the required knowledge through this research.
- HEMD and SMD are current and future customers utilizing nuclear power for space.

Technology Development Team

- Marc Gibson, NASA GRC; marc.a.gibson@nasa.gov
- Project: Nuclear Systems; Project Manager: Don Palac; d.palac@nasa.gov
- Potential Partners: Advanced Cooling Technologies, Thermacore, Creare Inc.

Proposed Flight Experiment

Experiment Readiness:

- The experiment is 100% ready for G force 1flights.

Test Vehicles:

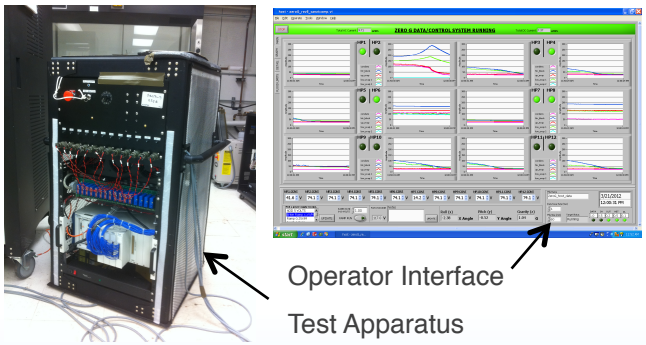
- G Force 1
- SpaceLoft XL
- Virgin Galactic Space Ship II

Test Environment:

- Lunar, Martian, Zero

Test Apparatus Description:

- Test is completely automated with safety shutdowns and operator control interface
- 12 heat pipes are independently controlled to allow collection of multiple data points during flight



Technology Maturation

- This is a fluids research experiment to provide TRL4 for future technology demonstrations.
- Future plans are to utilize this research knowledge to build advanced prototypes for future reduced gravity experiments and achieve TRL6.
- TRL6 is needed by Sept. 2013 to be used in full scale (2m X 3m) demonstration of heat pipe radiators for Fission Power Systems.

Objective of Proposed Experiment

- Define the maximum heat transport limits of heat pipes in the reduced gravity environment.
- Similar to the maximum strength of materials, these heat transport limits will be used as an upper limit for spacecraft thermal control engineers and provide risk reduction in large heat rejections systems.

Technology Areas: TA14 Thermal Control Systems, TA02 In-Space Propulsion, TA03 Space Power and Energy Storage, TA09 Entry, Descent, and Landing (EDL) Systems

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