



New Mexico State University Convection Inhibiting Vapor Layers (CIVL)



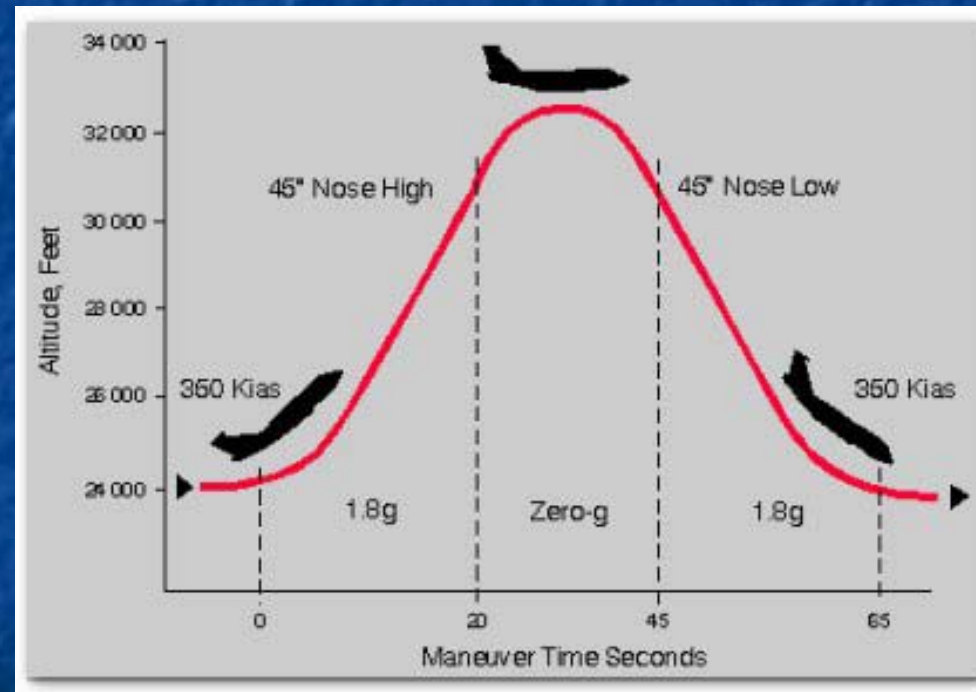
NASA Reduced Gravity Student Flight
Opportunities Program, Spring 2003

KC-135 Program General Overview

The NASA Reduced Gravity Student Flight Opportunities is a highly competitive and unique program that allows student organized university teams to propose, design, assess, fabricate and carry out their experiment aboard Johnson Space Center's KC-135 or "*Weightless Wonder*".

KC-135 "Weightless Wonder"

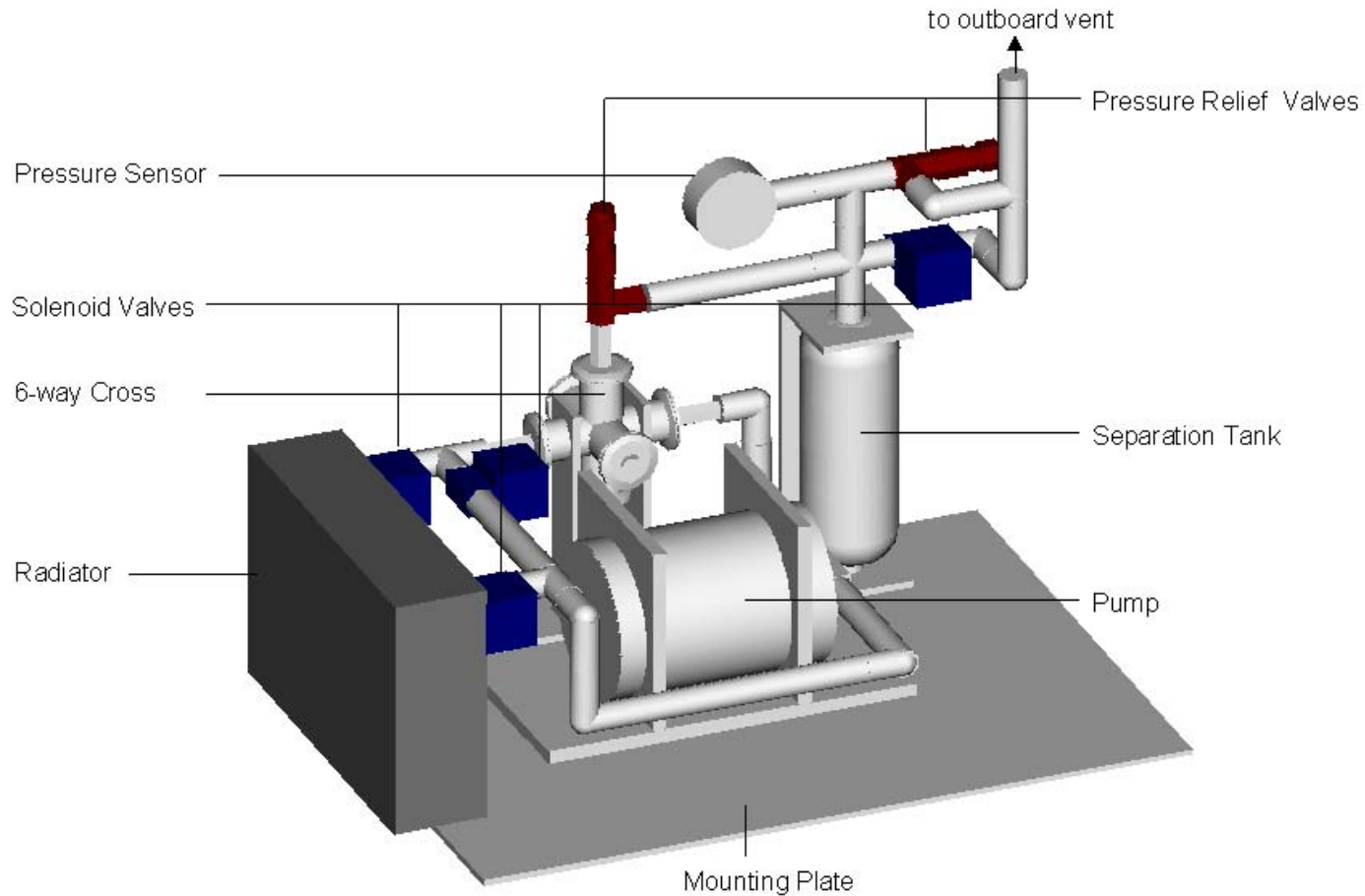
- 32 Parabolas per flight
 - 30 Zero-G
 - 1 Lunar-G
 - 1 Martian-G
- 2 flights per team
- 2 team members per flight



Experiment Goals

- Boil a coolant using an electric heating element
- Observe vapor bubble creation and collection
- Observe the creation of an insulating vapor layer
- Record the insulating effects of this layer using temperature sensors throughout the system
- Use a pump to cause a flow of coolant past the heating element
 - This would theoretically break the vapor layer, and allow for proper cooling in a micro-g environment

Experiment Layout



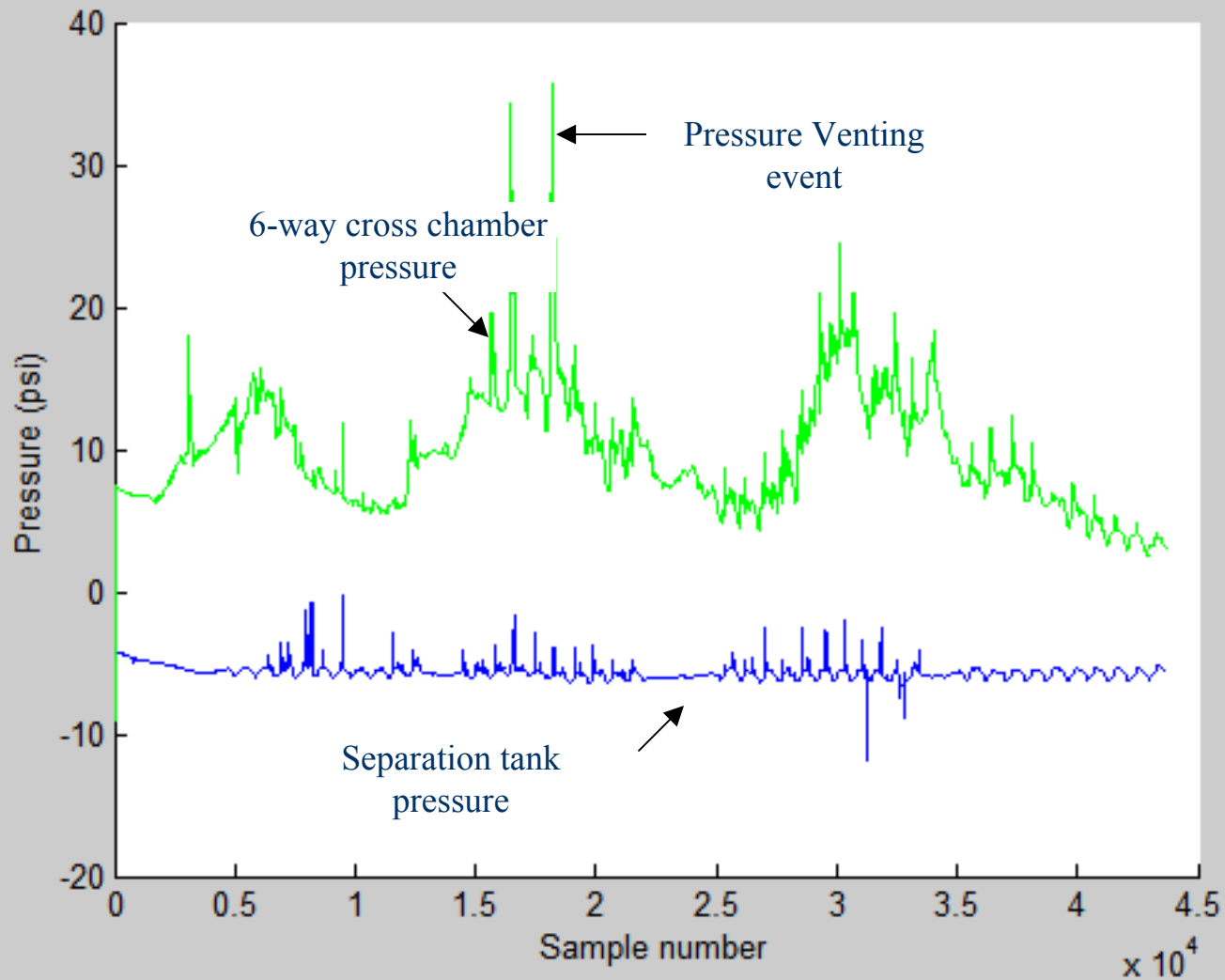
Data Recording

- Recorded 7 temperatures, 3 pressure sensors, and other parameters to disk at 10Hz sampling rate
- Based on these real-time inputs the software controlled various hardware elements for optimum performance and safety

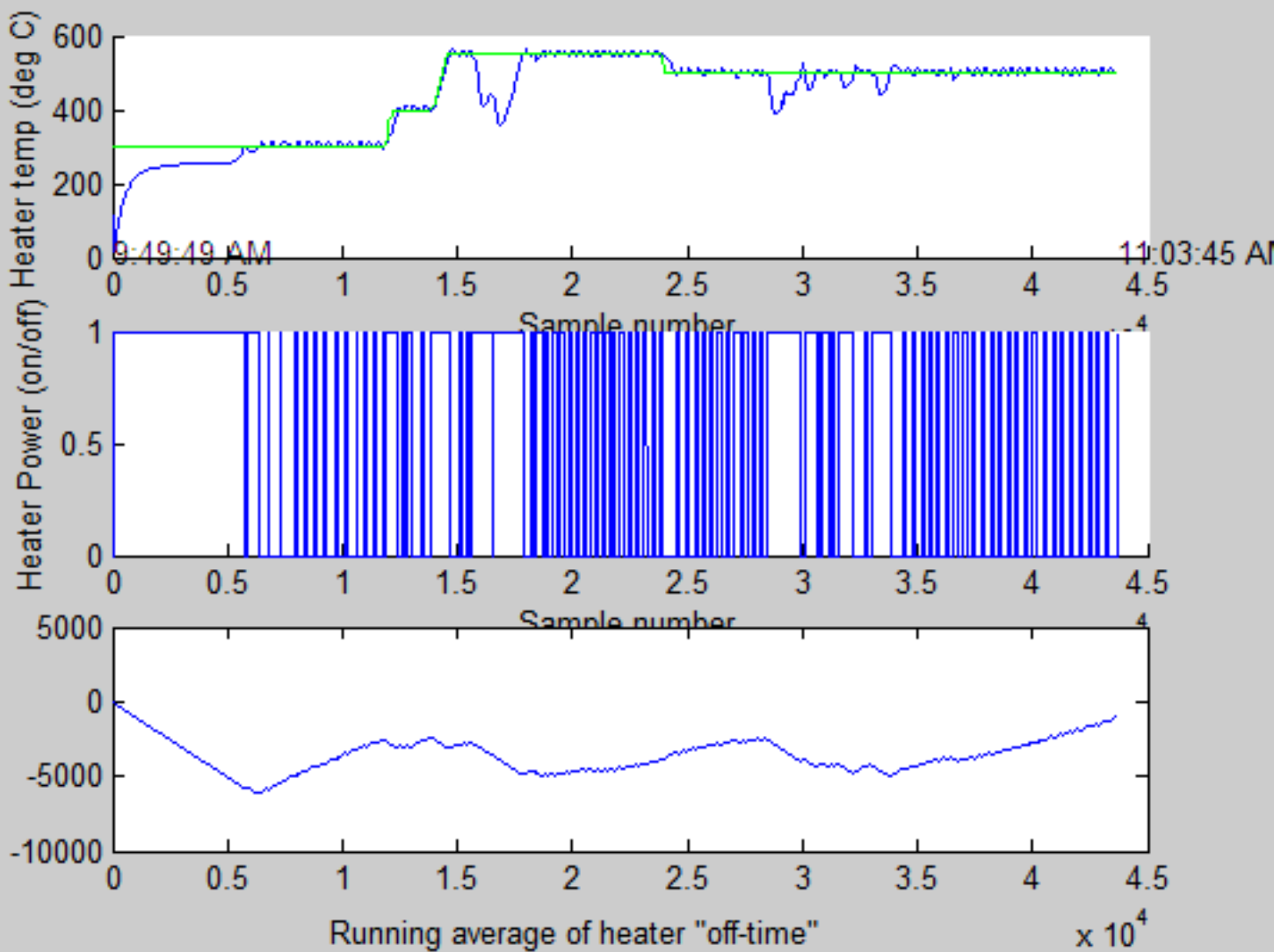
Results

- Expected duty cycle of heater to decrease when a nice vapor layer formed
- Data shows the opposite.

Results



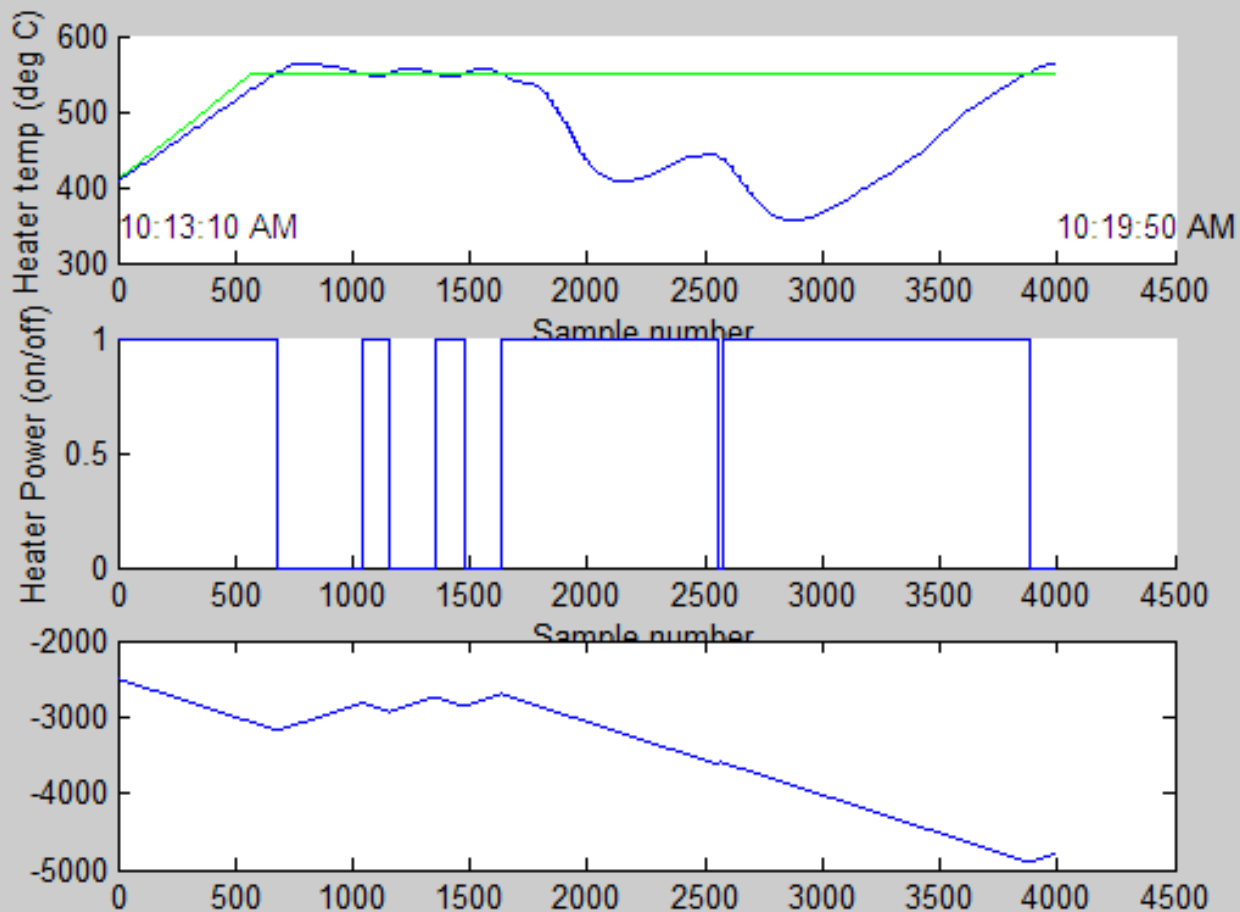
Results



Results (focusing on parabola 13)



Results (focusing on parabola 13)



Conclusion

- Unexpected results were caused by two factors
 - Top section of heater exposed to air pocket during times where gravity is present
 - Energy needed to change phases of water is larger than expected