7-2011

Astro Camp Presentation

Get Away Special Team 2011

Utah State University

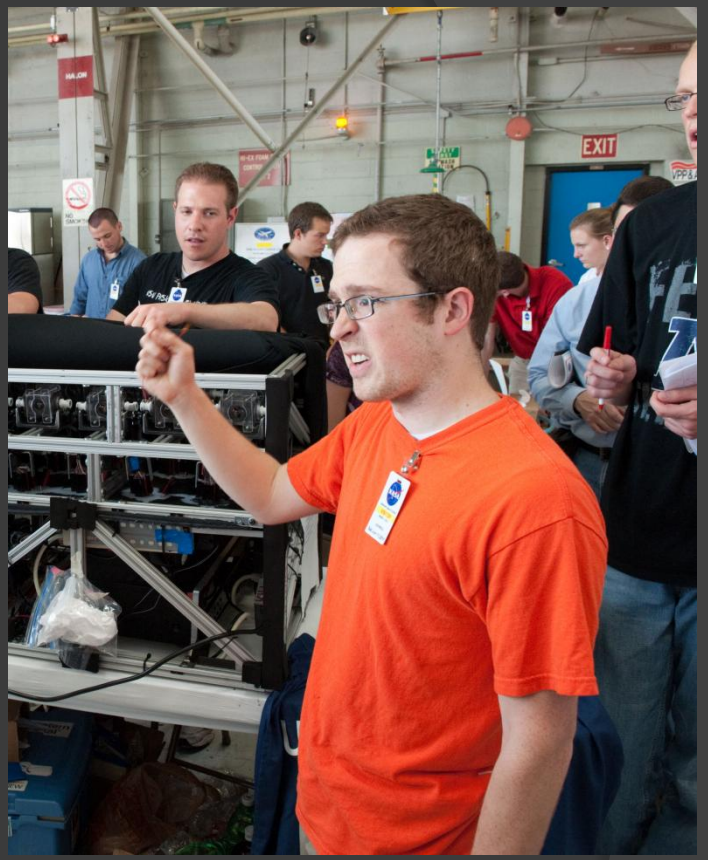
GET AWAY SPECIAL TEAM

The Team

Undergraduate & Graduate Students

- **Mechanical & Electrical Engineers**
- **Physicists**
- **Journalists**

Troy Munro



- Senior
- Mechanical & Aerospace Engineering

Ryan Martineau

- Junior
- Mechanical & Aerospace Engineering

Landon Hillyard

- Sophomore
- Mechanical Engineering

Jenica Sparrow

- Freshman
- Mechanical & Aerospace Engineering

Everyone Else

Phil Anderson – Graduate, MAE

Iggy Matheson – Freshman, MAE

Rob Barnett– Senior, Electrical Engineering

Matt Wallace – Second Bachelor's, MAE

Jeff Taylor – Junior, Mechanical Engineering

Anike Pullens – Junior, Public Relations

GAS Team History

- 1976
- R. Gilbert Moore
- A.k.a. Microgravity Research Team (MRT)
- *The University that has flown more experiments into space than any other university in the world*

Vomit Comet Flight 1999

Vomit Comet Flight 2010

What do we do?

We are a group of students who are involved with space research in any way we can. We work on the projects mainly on a volunteer basis and receive little to no monetary aid.

Engineering Process

WHAT IS AN ENGINEER?

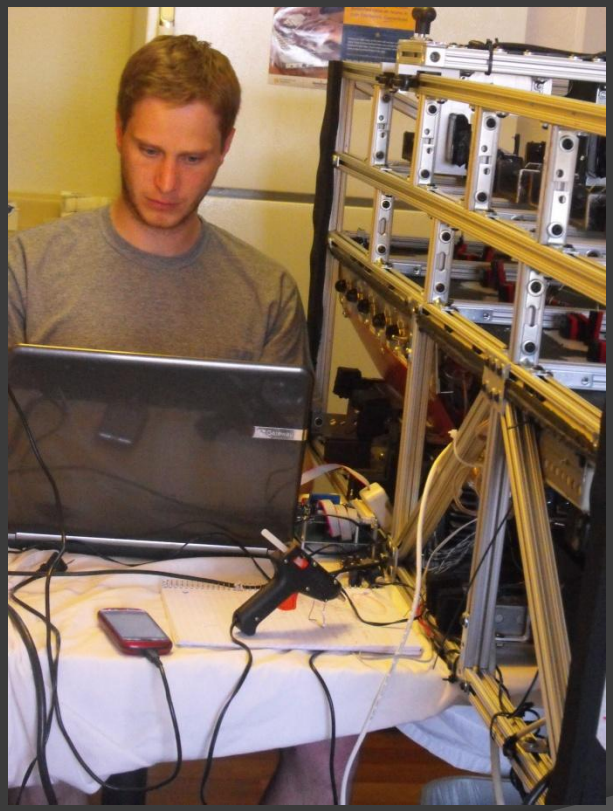
An ENGINEER…

- Designs
- Builds
- Solves Problems
- Creates

…Makes the World go ‘round

Step 1: Brainstorm

- Research...READ & WRITE!
- Proposal
- Analysis



pulses ranging from 5 to 50 µs and reported symmetric bubble growth and collapse behavior with a maximum period of 24 µs (40,000 Hz). FUNBOE 2.0 seeks to capitalize on the growth of microbubbles and does not want formed bubbles to re-condense. Due to this goal, the test parameters for the microchip heaters of FUNBOE 2.0 are: a pulse frequency ranging from 500 to 1000 Hz with the heating width of the pulse lasting between 0.5 and 1.0 ms.

1.5.4 Experiment Setup

1.5.4.1 Summary of Original Experiment (expressed in Figure 5)

FUNBOE, as flown in June 2010, was set up such that 30 cells were housed in a storage container mounted to the airplane (Figure 5). Also located on this fixed structure were three power supplies and a mount for the umbilical connecting to the free-floating structure. The data acquisition system and boiling chambers were located within the free-floating structure.

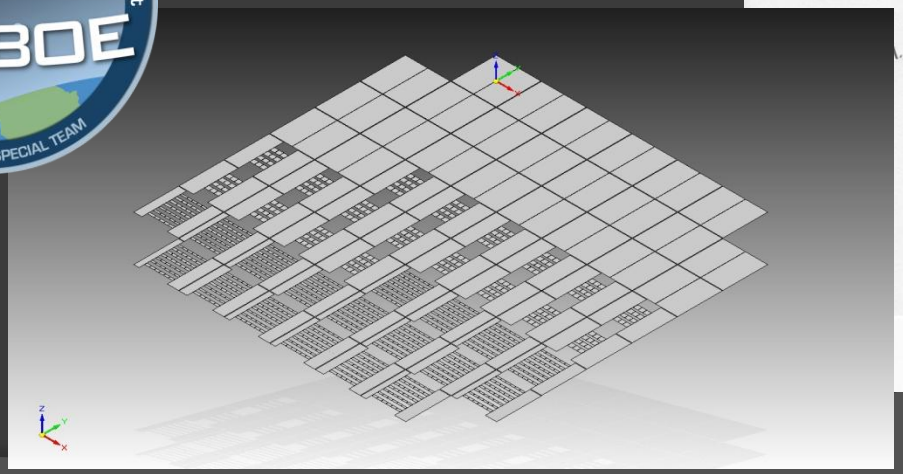
Figure 5 - WBS and equipment used during original FUNBOE

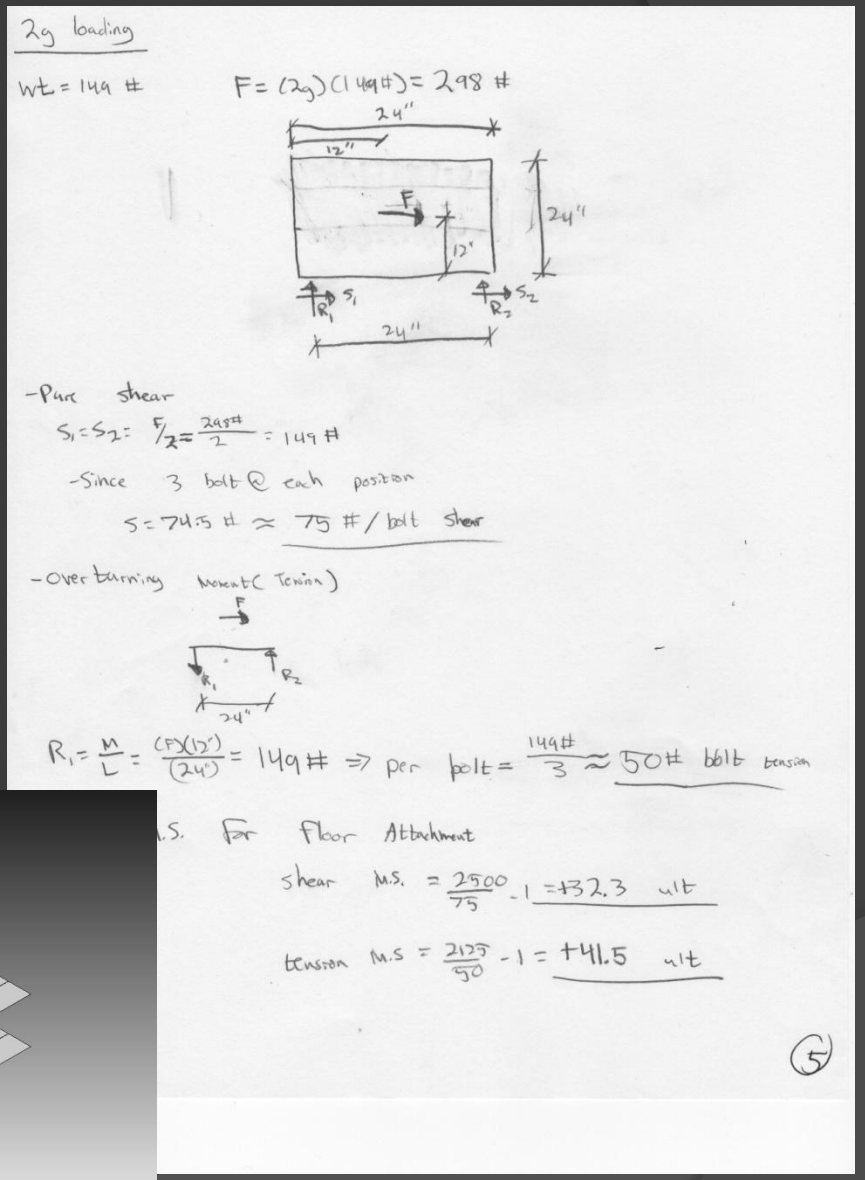
1.5.4.2 Changes from Previous Flight

FUNBOE 2.0 (Figure 6) will use many of the same basic components as the original FUNBOE system; however, due to the experiences of the flyers in June 2010 and lessons learned from analyzing the resultant data, modifications have been made to enhance FUNBOE 2.0's performance and sample throughput. The original FUNBOE experiment incorporated a free-floating structure to minimize the effects of vibrations transmitted from the airplane on the bubble dynamics. However, logs of the microgravity acceleration amplitude in the fixed and free floating segments of the 2010 FUNBOE flight found that the forces from vibration were negligible and would not affect the experiment. FUNBOE 2.0 will thus be mounted directly to the airplane, drastically reducing flyer interaction with the experiment.

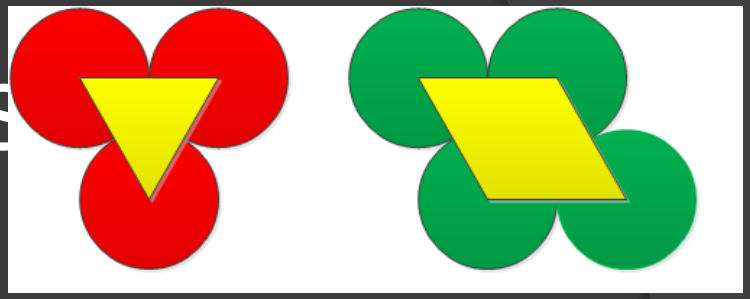
Step 2: Design

- Design
- Pull ideas together
- Iterations

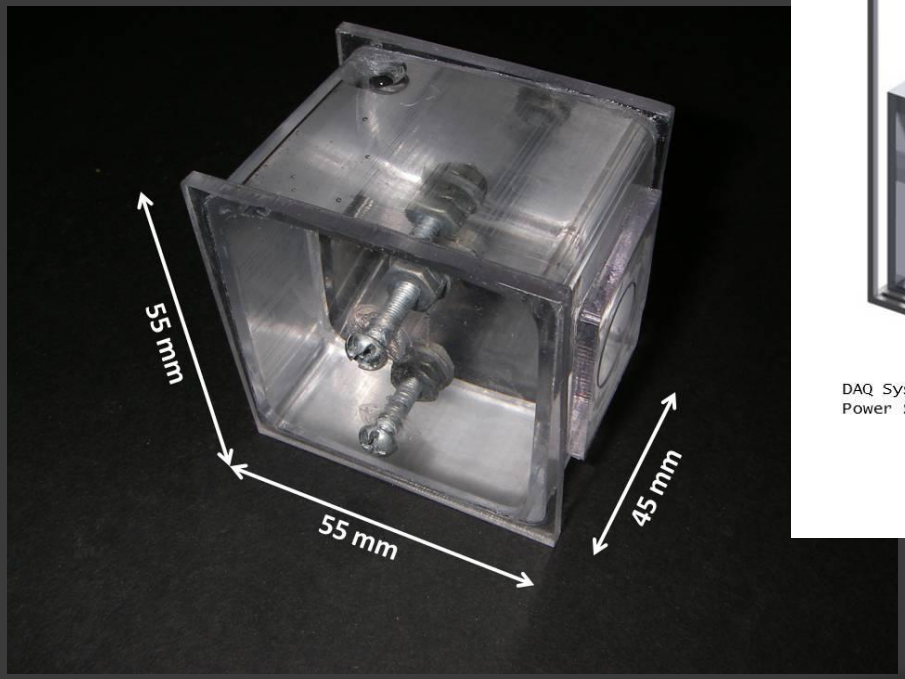


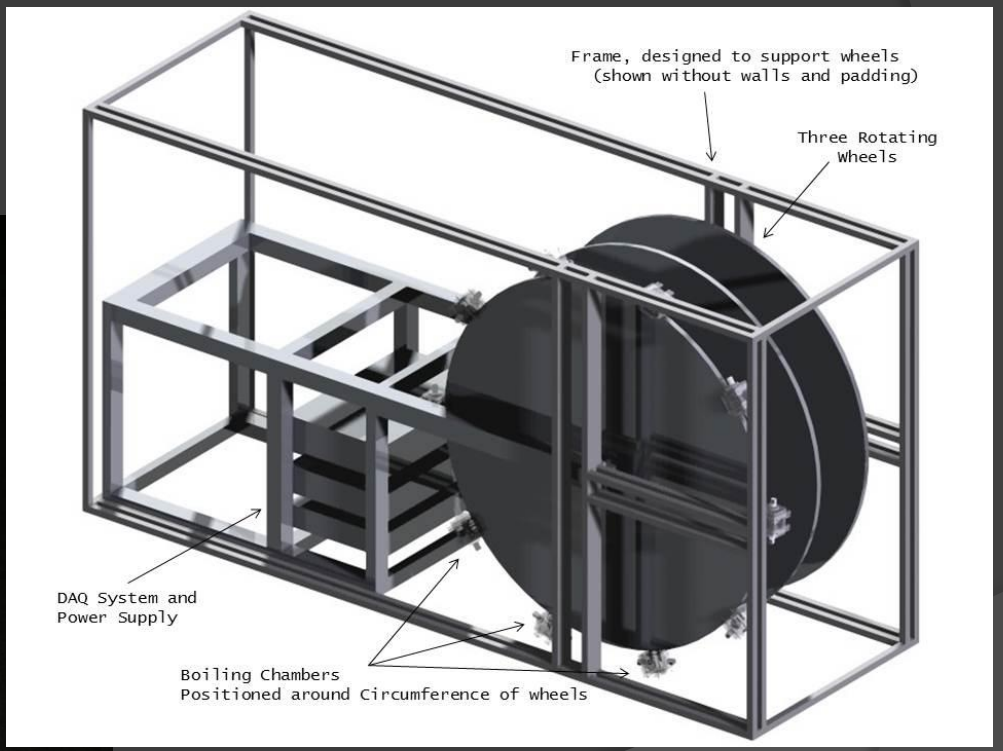


Step 3: Prototypes



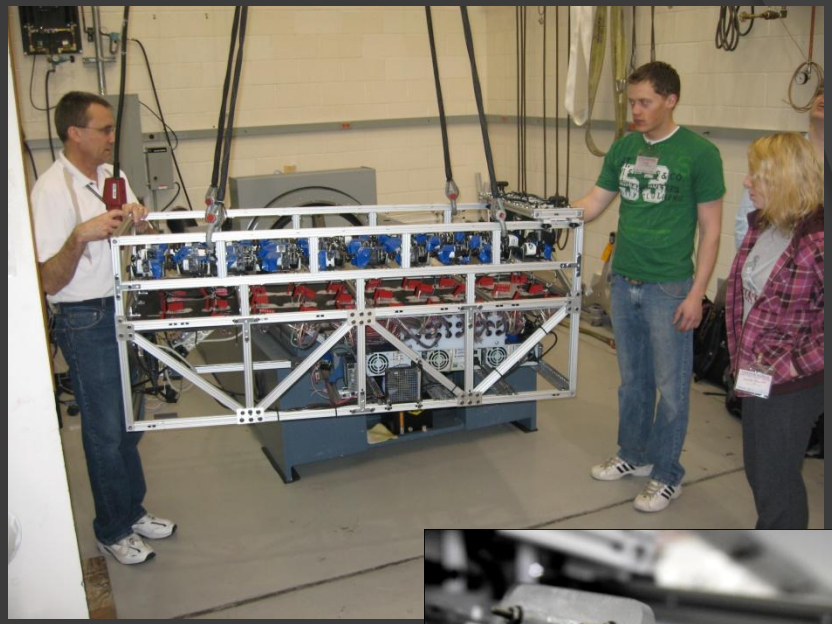
- Sample Designs
- Revisions

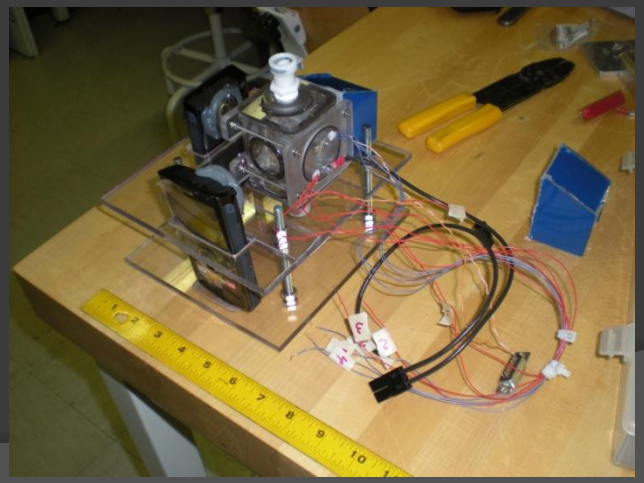


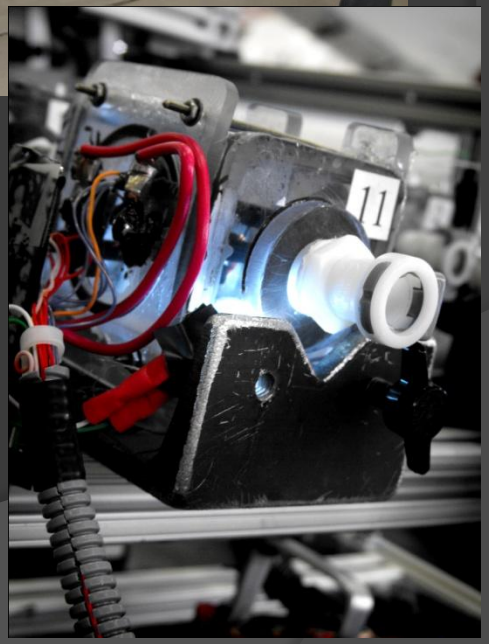


Step 4: Build

- Testing
- Lots of changes
- Refine ideas
- Solidify Structure

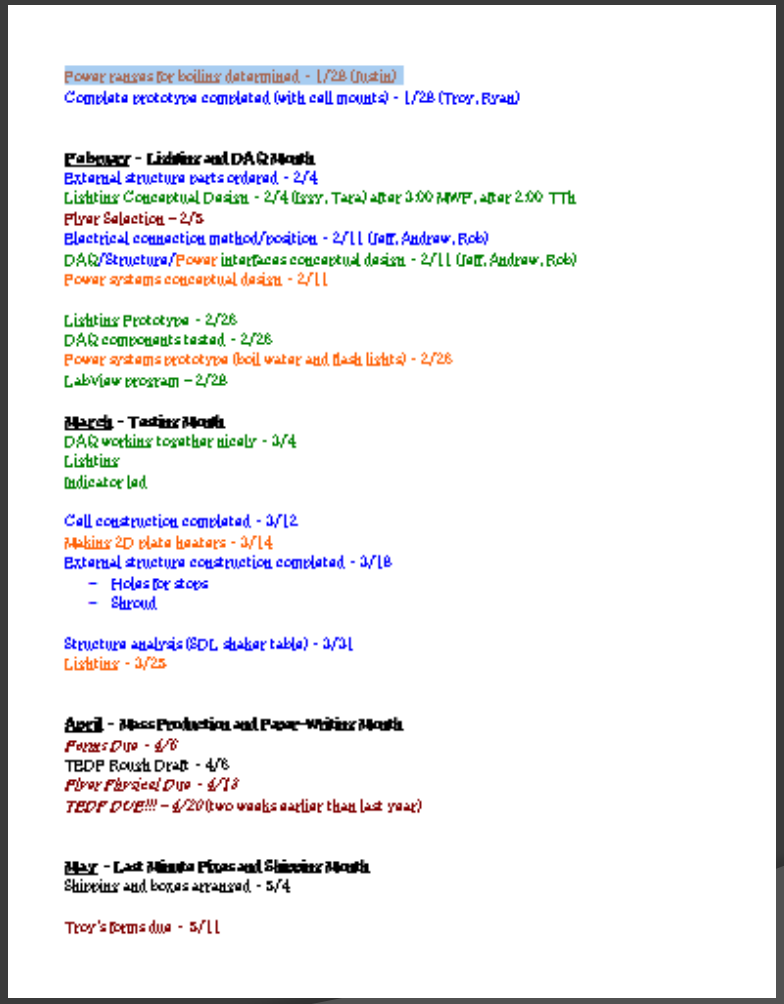






Step 5: Deadlines

- Schedule
- Goals
- Why?



Power ranges for boiling determined - 1/28 (Justin)
Complete prototype completed (with cell mounts) - 1/28 (Troy, Ryan)

February - Lighting and DAQ Month
External structure parts ordered - 2/4
Lighting Conceptual Design - 2/4 (Izzy, Tara) after 3:00 MWF, after 2:00 TTh
Flyer Selection – 2/5
Electrical connection method/position - 2/11 (Jeff, Andrew, Rob)
DAQ/Structure/Power interfaces conceptual design - 2/11 (Jeff, Andrew, Rob)
Power systems conceptual design - 2/11

Lighting Prototype - 2/28
DAQ components tested - 2/28
Power systems prototype (boil water and flash lights) - 2/28
Labview program – 2/28

March - Testing Month
DAQ working together nicely - 3/4
Lighting
Indicator led

Cell construction completed - 3/12
Making 2D plate heaters - 3/14
External structure construction completed - 3/18
- Holes for stops
- Shroud

Structure analysis (SDL shaker table) - 3/31
Lighting - 3/25

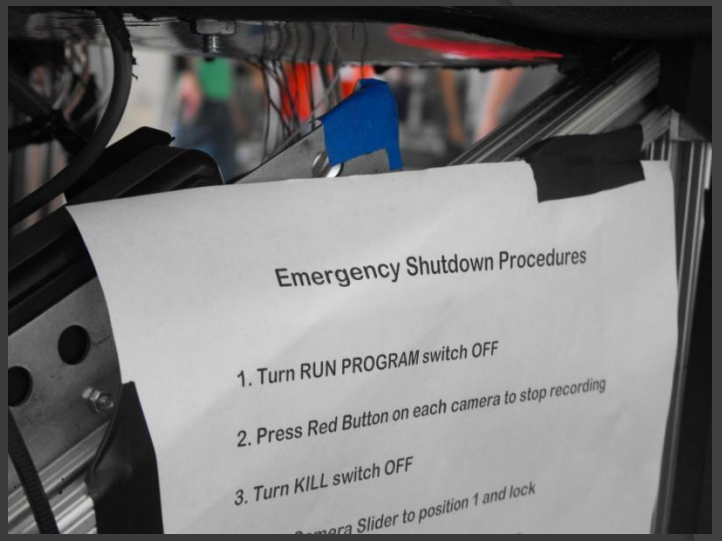
April - Mass Production and Paper-Writing Month
Forms Due - 4/6
TEDP Rough Draft - 4/6
Flyer Finished Due - 4/13
TEDF DUE!!! – 4/20 (two weeks earlier than last year)

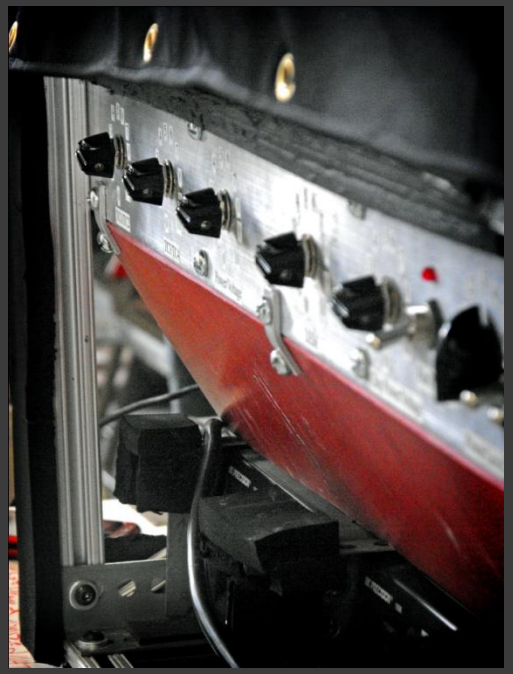
May - Last Minute Fixes and Shipping Month
Shipping and boxes arranged - 5/4

Troy's forms due - 5/11

Step 6: Test

- Experiment Procedures

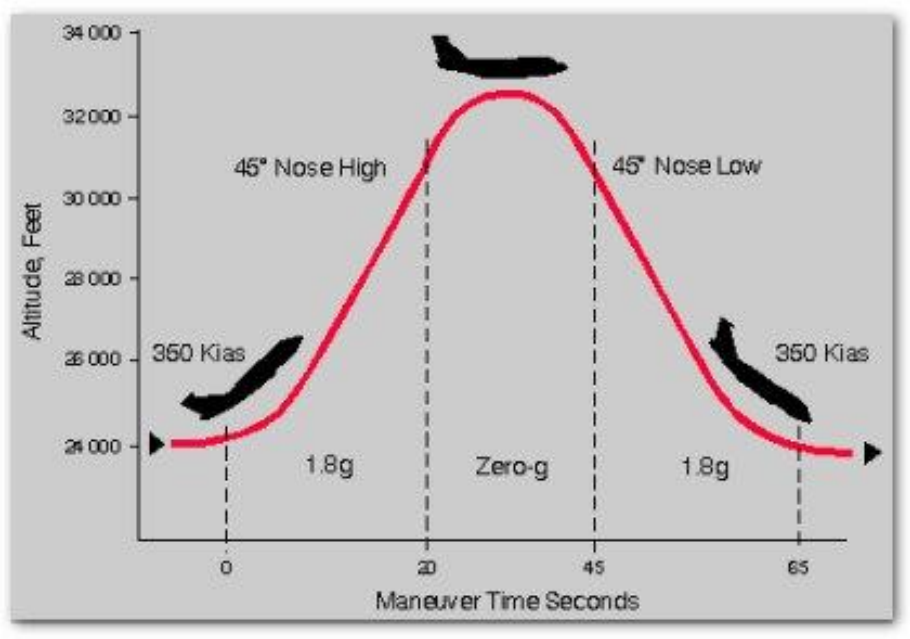




NASA TIME!!

PARABOLAS

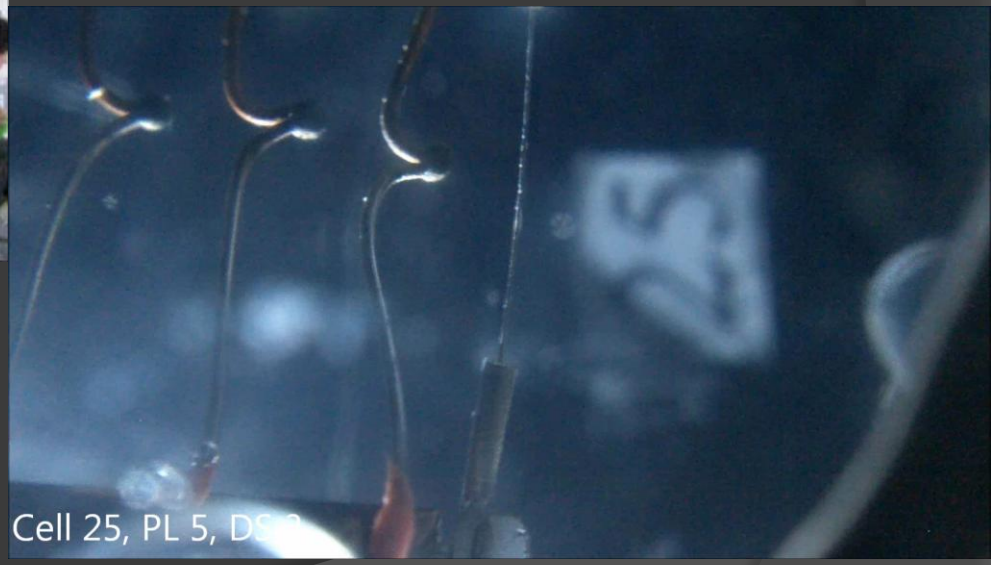
- Free Fall
- 15-20 Sec Microgravity
- 32 Parabolic Arcs



The Flight: Research & Fun

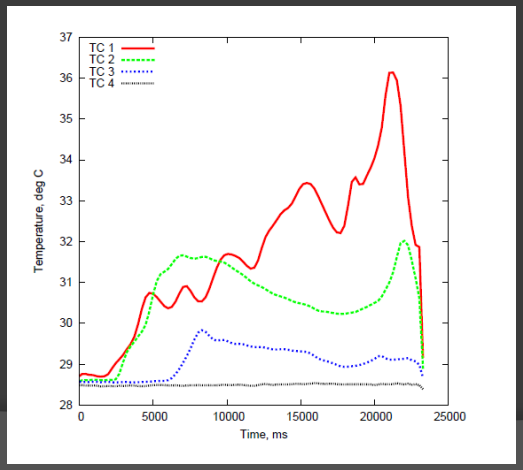
- Heat Transfer
- Experiencing Microgravity

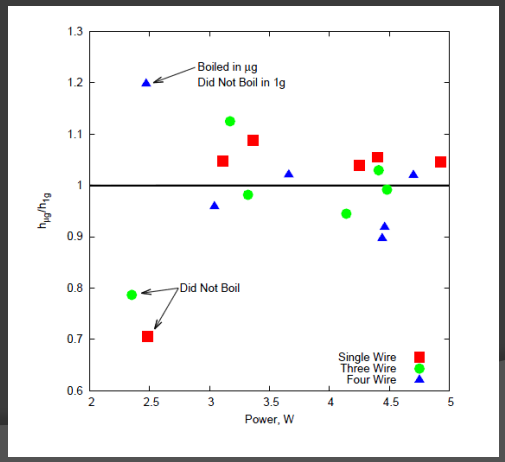
Videos



Step 7: Evaluate

- Results
- Learning
- Most exciting
- Accomplishment
- Iterate





What Now?

Start over with a new idea or from a previous project. The Engineering process is a continuous circle of Design, Development, and Analysis. This process has helped the world progress in thousands of ways to become the society we are today.

What it takes:

- Determination
- Goal Setting
- Good Study Habits
- Willingness to help
- Desire to learn
- Patience for improvement

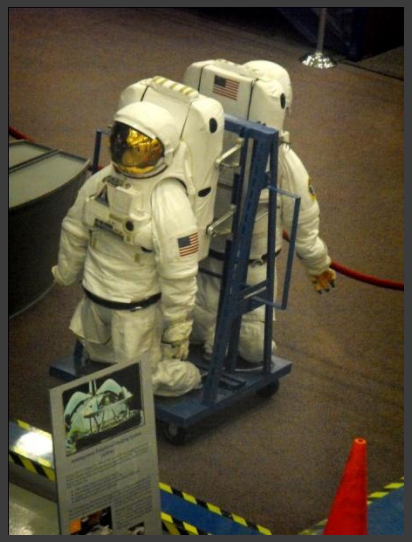
Accomplishing & Achieving Success

- Self confidence
- Potential
- New Ideas

What you can do now!

- Set goals
- Create a Life plan
- Find something you love to do
- Learn to be responsible
- Be a good team member
- Be reliable

It is up to you!



YOU CAN BE WHO YOU WANT TO BE!