Team Darwin
FRR Powerpoint Presentation
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Changes Since CDR

Motor;

- After Testing with K1200 motors we changed to K750 Smoky Sam

Ejection;

- Lessening black powder in drogue ejection charges

Construction;

- Adding shear pins to front half

Full Scale Launch

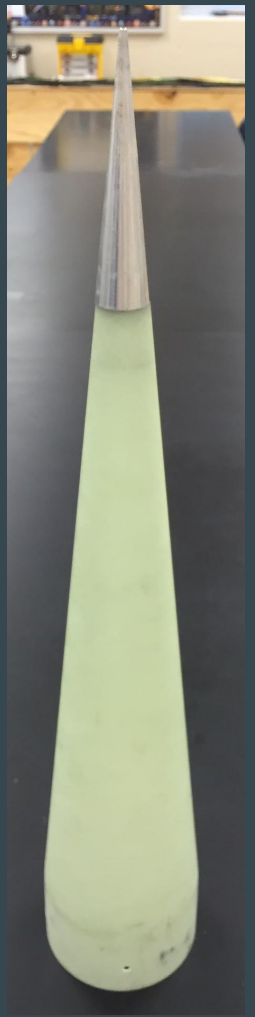
- We've launched the 2 rockets a total of 4 times (main rocket 3, back-up 1)
- March 12-13 we launched both rockets 1 time each
- The launch with our main rocket the first day and was successful but was not as close as we wanted. Height was only 4585 ft.
    - This launch main came out at apogee and we spent a lot of time finding it
- The launch with our backup rocket the second day was a very successful launch
    - This is the launch that we changed the motor to the K750 Smoky Sam
    - Flew drogueless due to cloud cover but main was successfully deployed at 600 ft. like it was programmed to. Height was 4981 ft.

Overall Rocket Design

- Payload and Nosecone Combination
- Front Body Tube
  - Main Parachute
- Electronics Bay
- Rear Body Tube
  - Drogue Parachute
  - Motor Mount
  - Fins

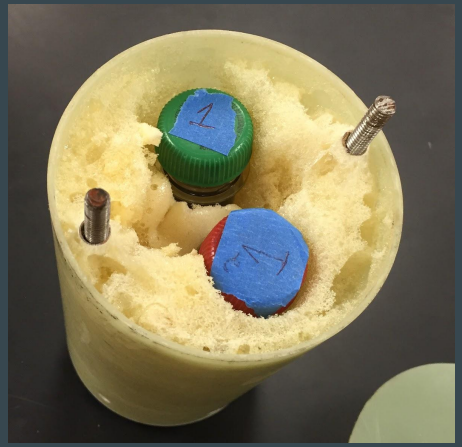
Nosecone and Payload

- We are still using a fiberglass nosecone with the solid aluminum tip
- 4 inch diameter base
- The payload is built from coupler tube and is inserted into the bottom of the nose cone
- The 2 parts are held together by multiple pop-rivets to ensure they stay together through ejection
- The shock cord in the front half is secured to U-bolt on the bottom of the payload by a steel quick link
- The payload is closed tightly and secured shut by 2 pieces of all-thread that run through it and has wingnuts on each end



Payload Continued

- Due to the space we have in the payload we place 2 test tubes in the payload instead of 3 or 4
- Test tubes secured by the expanding foam inside and the bulkhead on the end that is secured to shockcord
- Test tubes are filled with water and the cut planaria are placed inside
- The Payload is then secured to the front body tube by shear pins

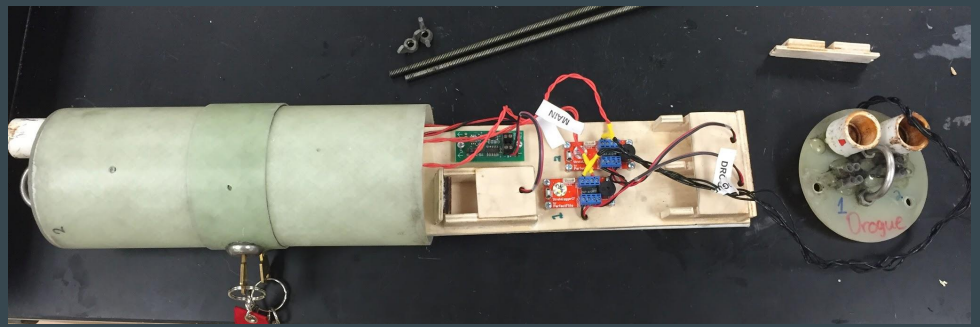


Front Body Tube

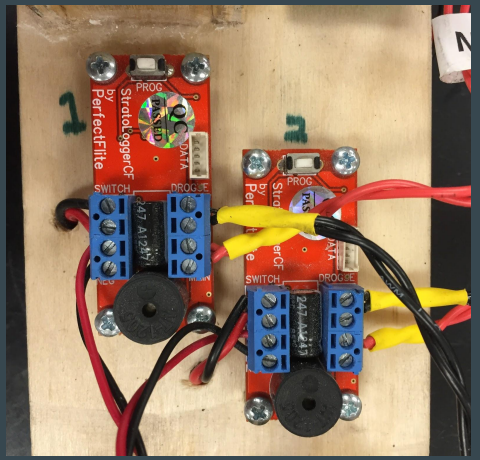
- Front Body tube is 4 inch diameter fiberglass body tube
- It is secured on the front end to the payload by shear pins
- It is secured on the back end to the front of the electronics bay be multiple pop-rivets to ensure the body tube does not eject from the payload when the ejection charges go off
- Inside the front body tube the main parachute and the shock cord for the parachute is housed
- The shock cord is secured to the front of the electronics bay, the main parachute, and to the payload by quick links

Electronics Bay

- Electronics bay is housed in the middle of the rocket between the front and back body tubes
- The electronics bay houses;
  - 3- 9 volt batteries and battery terminals
  - 2- Altimeters; 1 main and 1 backup
  - 2- Key Switches
  - 1- Accelerometer
  - 4- Wire terminals
  - 4- Ejection wells
    - Wires attaching everything



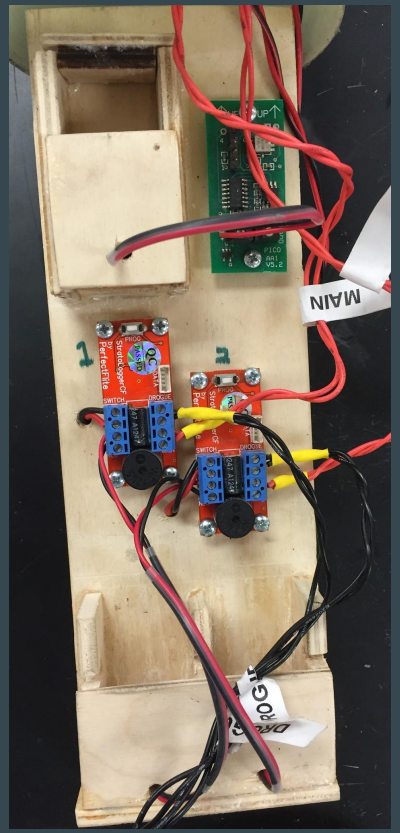
Electronics Bay Continued



- Batteries;
  - 3 batteries power the power the accelerometer and altimeters
    - Each has its own battery
- Altimeters;
  - 2 altimeters control the ejection charges at each end
    - One is the main altimeter that fires 1 ejection charge for the drogue parachute at apogee and 1 ejection charge for the main at 600ft.
    - The other is a redundant altimeter that fires 1 ejection charge for the drogue parachute at a 2 second delay from apogee and 1 ejection charge for the main parachute at 550ft.
  - Wires are run from each altimeter to each end of the rocket to run power to the ejection charges and to ensure they go off at proper times

More Electronics Bay

- Key Switches;
  - There are 2 key switches on the same side of the electronics bay
  - Each switch turns on and off the power source for one of the altimeters
  - Each switch is wired to its own altimeter
  - The switches don't get turned on until they are on the pad to prevent and early ejection
  - There is no key to the accelerometer because it uses so little power
- Accelerometer;
  - The accelerometer is kept turned on the entire time the battery is connected

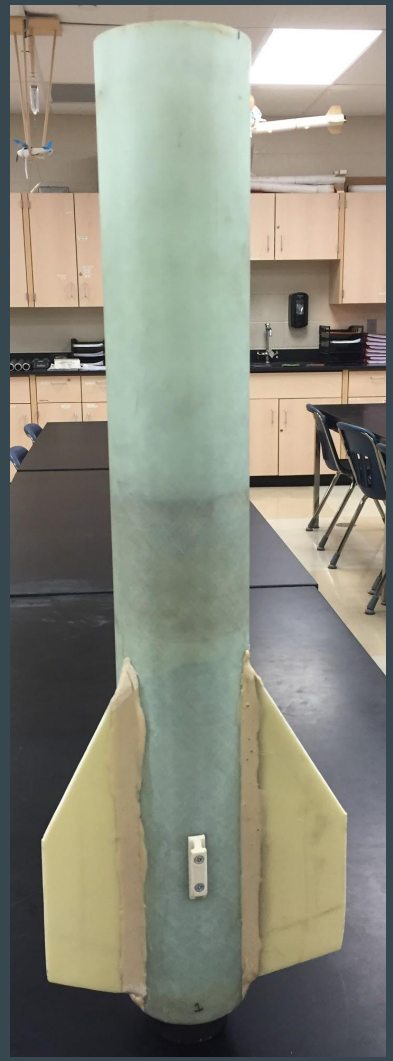


One Last Electronics Bay

- Wire Terminals;
  - 2 wire terminals on each bulkhead connect power from electronics bay wires to the wires on the E-matches that light the ejection charges
- Ejection Wells;
  - Each bulkhead has 2 PVC pipe caps that hold the black powder charges for the ejections
    - 1 well on each end holds the ejection charge for the main altimeter and 1 hold the ejection charge for the backup altimeter

Back Body Tube

- Back Body tube is 4 inch diameter fiberglass body tube
- It is secured to the back half of the electronics bay
- It is secured to the back end of the electronics bay with a few shear pins just as a redundancy to ensure it wouldn't come apart
- The shear pins break from the ejection charge for the drogue parachute
- Inside the back half the motor mount, shock cord, and drogue parachute are housed
- The shock cord is secured to the back end of the electronics bay by a quick link and is secured to machined eye bolt piece in the end our motor casing by another quick link



Motor Mount and Fins

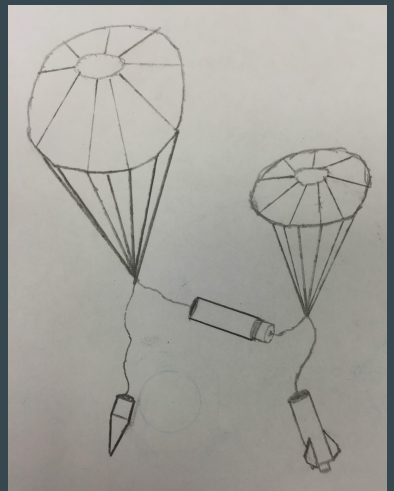
- Motor mount is constructed out of 3 wood centering rings and a 54mm fiberglass body tube piece that acts as the motor tube
- The centering rings are secured to the motor tube with 2 part rocketpoxy
- The motor mount is then secure to the back body tube with rocketpoxy as well
- There is then a motor retainer on the end of the motor tube
- The rocket has 3 fiberglass fins secured through the wall of the body tube and secured inside to the motor tube

Recovery System

- We are using a 2 parachute recovery system with a drogue parachute that ejects at apogee and a main parachute that ejects at 600ft.
- We have 2 altimeters that 1 is programed as the main altimeter and the other is a redundant altimeter. The main fire the heights above and the other altimeter is a redundant altimeter that fires the drogue at a 2 second delay and fired the main at 550ft.
- These second ejection charges are just to ensure that we have full separation of the pieces of the rocket
- We place trackers inside the rocket with 1 in each half so in the event of it falling where we can't see, we will still be able to recover the rocket

More Recovery System

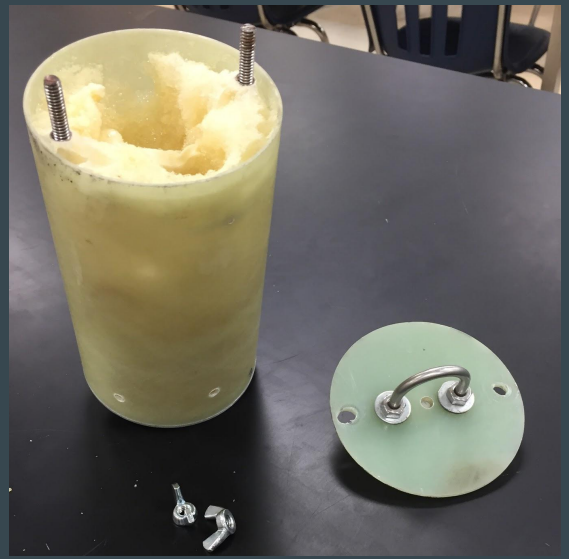
- The 2 parachutes are the drogue, a 24 inch nylon parachute, and the main, a 72 inch iris ultra, are secured to the shock cord with quick links
- In the event that the main parachute were to eject at apogee we may have significant drift and will use the trackers to pick up signals to find the rockets
- Due to our dilemma at our last practice launch we may decide to purchase and use GPS tracking devices instead

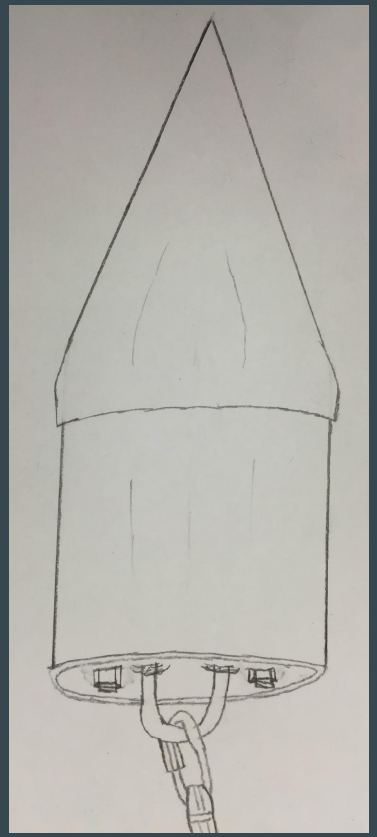


Payload

- The payload is constructed inside a coupler tube with 2 bulkheads as caps
- The payload is comprised of 2 pieces of all-thread, 4 wingnuts, 2 bulkheads
- Inside it is filled with expanding foam that functions as insulation and it is what holds the test tubes in place and keeps them from moving
- The point of the payload is still to test the effects of acceleration on the regrowth of the planarian
- When preparing, the planarian are cut in half and some are placed in the pre forms to be flown while some are kept on the ground as a control group
- We use 2 liter bottle preforms to hold the water and planarian in the payload
- The pre-forms look like plastic test tubes with caps
- The preforms are placed in the payload and secured shut with the bulkheads on both ends and wingnuts and all-thread tighten each end on sealing it
- Then the planarian are placed in petri dishes to be more easily examined

Payload Images





Safety

- Our team puts safety and safety education as one our top concerns when assembling or modifying our rocket
- All of the machines and tools that we use in our processes assume risk with them which we try our best to eliminate and use as carefully as possible and with much as much caution as possible
- Our safety officer, as well as our other team captain and team mentors, will oversee team members when using these pieces of equipment to ensure safe use

Student Safety Officer

- Team Darwin's Student safety officer is our team member Josh Staley who is also one of the team captains
- Josh oversees the construction of our rocket and any use of power tools to ensure the proper use of the tools and to be sure all team members are using the equipment properly
- Josh is also on the recovery team so that he goes out with other team members to retrieve the rocket, but Josh will be the first one to approach the rocket to confirm that it is in safe condition to recover

Educational Engagement

Presentation at the Middle School

- March 16, 2016
- A survey sheet will also be given out to the students in order for us to get feedback on what we did well and what we can improve on for following years

This Presentation will inform the younger generation about the SLI programs and help insure the continuation of this program.

Rocket workshop

- Parent meeting- information about the rocket workshop will be on April 3rd held in room 220 from 5:00-5:30PM
- Sign ups for the workshop will be in the guidance office
- The workshop will be in scheduled in March based on the weather and interest

A hands on experience will further explain what SLI does while giving the kids a new aspect rocketry.

Sign Up for the Rocketry Workshop!

- It's free!
- Sign up in the guidance office today!
- Sign up on your own or with friends! 4 students per group!
- Work with the SLI Team to build and launch a model rocket!
- No rocketry experience required!

Rocketry Workshop Parent Meeting April 3rd!

- Students and parents interested in the Rocketry Workshop may come!
- Question and Answer Session Available!
- Sign up for the Rocketry Workshop in the Guidance office today!
- In room 220 at the high school!
- Goes from 5:00 – 5:30 pm!

Rocket Building  Permission Slip

Dates will be scheduled in March 2015 depending on interest and weather.

Start Time: **_3:00pm_** End Time: **_5:00pm__** at the high school.

My child, _____, has permission to participate in the rocket building session at the high school in March 2015.

Grade: _____ Homeroom Teacher:

_____

Emergency contact person is _____.

Contact numbers: (home) _____ or (cell)

_____

Does the child have any allergies or medical concerns? (Please list below)

_____

_____

Activities: (Children will be supervised at all times by a Mentor and, a Student Launch or TARC Team Member)

- Students will be building a mini model rocket to launch
  - They will be using tools such as super glue, modeling knife, scissors, and epoxy
- Learning about the rocket building process and engineering principles
- Weather permitting, the rocket will be launched

_____

_____

I give permission for my son/daughter to participate in the above referenced activity. I understand and am fully aware of the risks involved with this activity including but not limited to: property damage or loss, minor bodily injury, severe bodily injury, and death. My child is voluntarily participating in this

activity with the knowledge of the risks involved. I hereby agree to accept any and all inherent risks of property damage, bodily injury, or death while my son/daughter is participating in this activity. I hereby release, acquit, discharge, indemnify and hold harmless the Spring Grove Area School District ("the School District"), its directors, officers, employees, and agents from any and all causes of action, including but not limited to personal injury, illness, death, and property damage, costs, charges, claims, demands and liabilities of whatever kind, name or nature in any manner arising out of or in connection with my son/daughter's participation in this activity.

_____

_____

Parent/Guardian Signature Date

ROCKET WORKSHOP

open to all 7th & 8th grade students

Return your parent permission slip to your homeroom teacher by February 20 to qualify.

Dates for the workshops will be scheduled in March depending on weather and interest.

For more information call 225-4731 ext.7220 or email hastingb@sgasd.org

NASA Student Launch

Educational Engagement Presentation Survey

Choose YES or NO

1. Did you have any prior knowledge of rocketry?
   YES NO
2. Did the presentation make you interested in learning more about rocketry?
   YES NO
3. Did you learn anything new about rocketry after our presentation?
   YES NO
4. Would you be interested in joining TARC or the NASA Student Launch program?
   YES NO
5. Do you understand the goal of the NASA Student Launch program?
   YES NO
6. What part of the rocket is the arrow pointing to? Circle One

NOSE CONE MOTOR CASING COUPLER

Please complete and return to your homeroom teacher when finished.

Budget

The budget for Spring Grove's NASA Student Launch Initiative (SLI) includes costs for trips, launches, parts, food, fundraising supplies, and any other necessities to fully complete Team Darwin's project.

Final Budget: $16463.48

Fundraisers

- Cotton Candy
- Bonus Books (www.bonusbook.com)
- Yankee Candle (www.yankeecandle.com)
- Nuts About Granola (fundraising@nutsaboutgranola.com)
- Rocket Real Estate
- Donations

Project Plan

A GANTT Chart neatly expresses the important dates and time periods surrounding the due dates and progress of the following, which surround Team Darwin's Project.

- Fundraising
- Launches
- Deadlines for the proposals, PDR, CDR, and FRR
- Teleconferences
- Question and Answer Sessions
- Weekly Meetings and Sessions

GANTT Chart with Dates