Team Tesla

CDR Presentation

Changes made since PDR

Electronics bay:

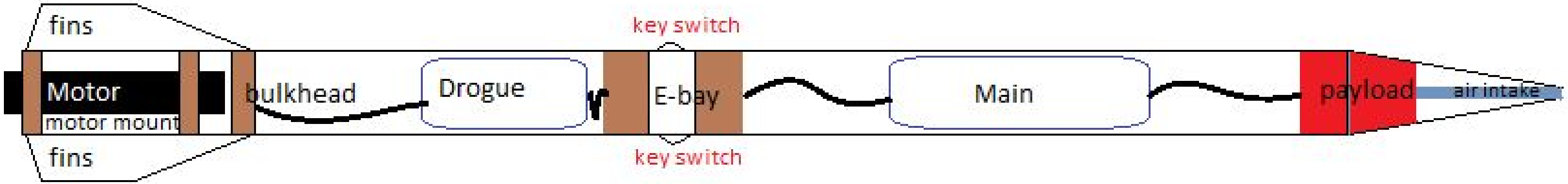
- We decided to put both key switches on one side of the E-bay in order to save space. This change made it easier to move the sled in and out of the E-bay.

Vehicle Materials:

- We are now using a fiberglass body tube instead of a fiberglass wrapped phenolic. The fiberglass is stronger and will make our rocket more durable.
- We are also using a fiberglass nose cone with a metal tip. The fiberglass is stronger than the old plastic nose cone and the metal tip just looks sweet.

Rocket Design

- Nosecone and air intake
- payload
- Front Body Tube
- Ebay
- Rear Body Tub
- Motor mount
- Centering rings and motor mounts
- 3d printed Fins



Team Tesla Full Scale Rocket

Length of Vehicle: 85.25 inches

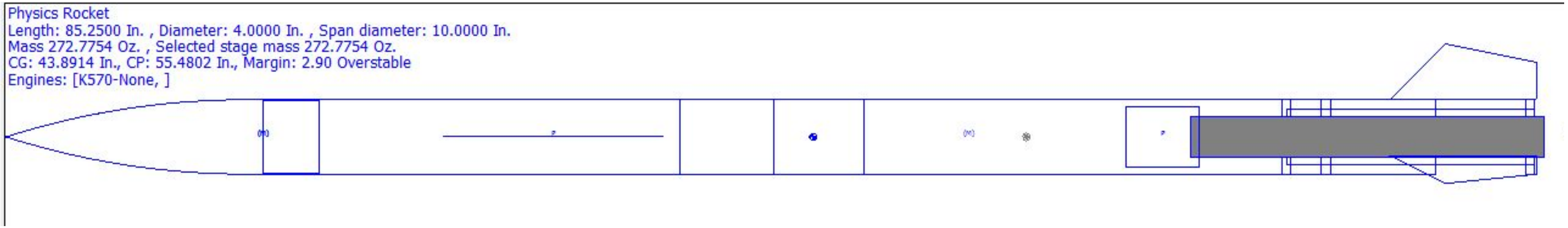
Mass of Vehicle: 12.29 pounds

Diameter: 4.00 inches

Body Tube Material: Full-Fiberglass

Recovery System: Two PerfectFlite StratoLogger cf's igniting 3.5 grain charges

Rail Size: 15x15 10' Long Rail



Mission Performance Predictions

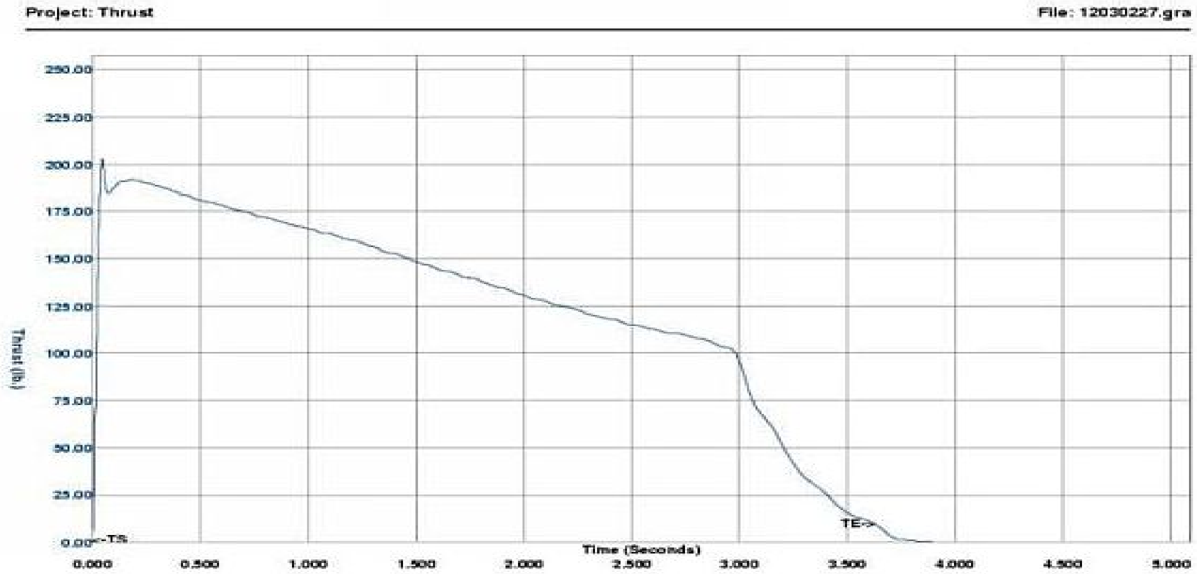
Mission Performance Criteria:

- Rocket is projected to reach 6,525 feet
- Our height value is over 5,280 feet because we are expecting a large drag increase caused by the payload which is supported by data from our subscale flight.
    - We can expect a loss in overall height of about 20%.
- When our rocket leaves the pad, it will stay on its flight path upwards for about 19.66 seconds
- The rocket is expected to be in the air for about 20 seconds based off of descent velocity values and other drag calculations.
- Center of Pressure: 55.48 Inches
- Center of Gravity: 43.89 Inches
- Static Stability Margin: 2.90

Wind Speed (mph)	Total Drift (ft)
0	0
5	512.072
10	1301.22
15	2236.28
20	2680.33

Final Motor Selection

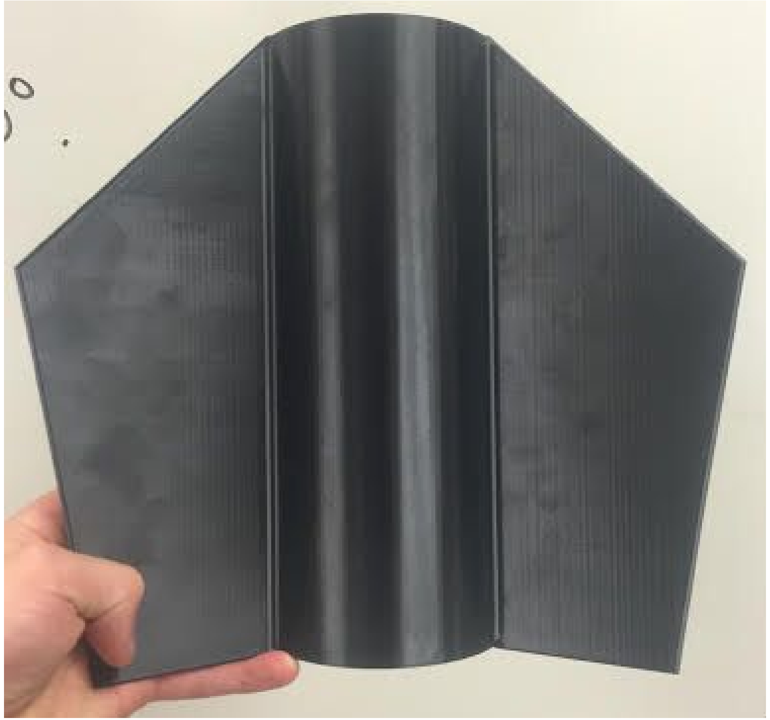
- Our final motor selection for Team Tesla's full-scale rocket will be the K-570 motor made by Cesaroni Technologies Incorporated.
- Total Impulse of 2062.90 Newton/Seconds
- 2.13 x 19.21 inches

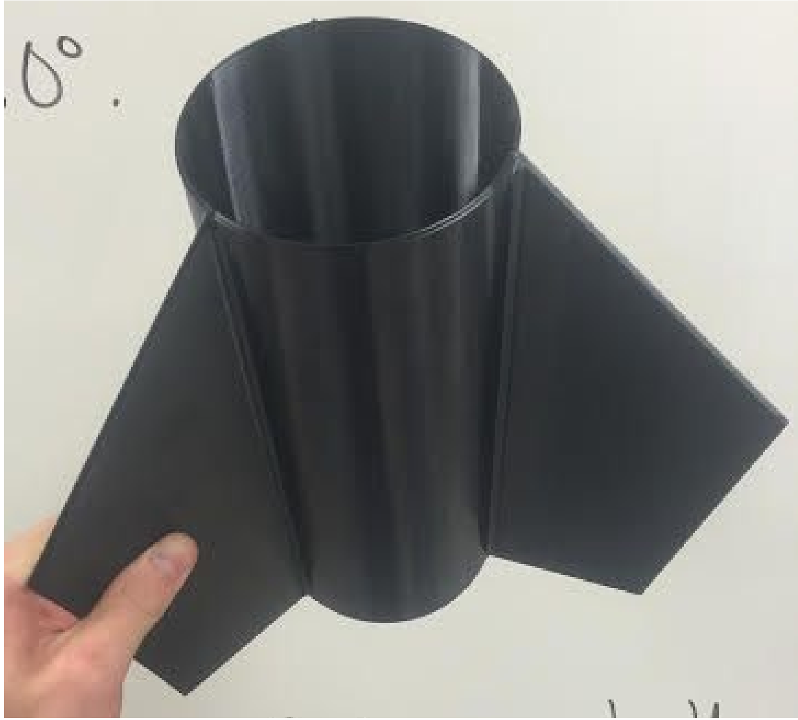


Fin Can

- We are using a 3D printed fin can as our fin system.
- The fin can system will be attached with six screws in total with the six screws having a maximum total tensile strength of over 3,000 pounds. Their will be 2 screws in between each fin with 3 sets of 2 screws total. The screws will be drilled through the fin can and back body tube and secured into wood slots that run in the back body tube placed between the motor casing and the body tube.

Fin Can





Payload

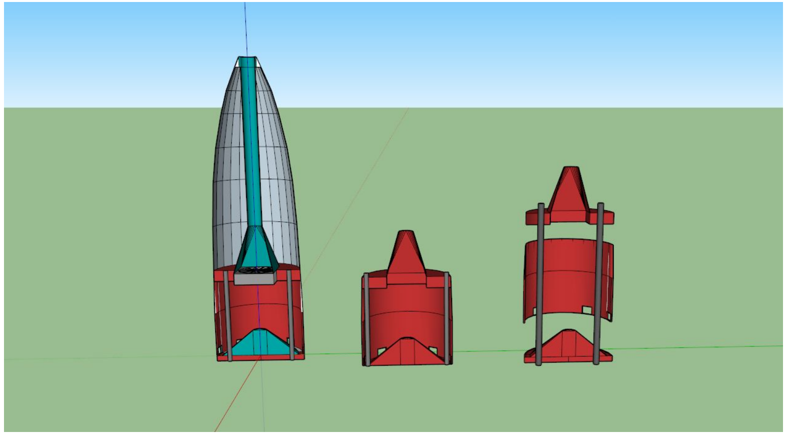
- The payload will be half in the nose cone half in the body tube.
    - This positioning will allow for the easiest access to airflow.
    - A small metal “straw” will run from the tip of the nose cone to directly above the computer fan.
- The payload is testing velocity vs. current generated.
- We will be using a small computer fan as the impeller in our payload.
- The computer fan will be wired to an ammeter to record current.

Payload

- The payload will be made partially out of coupler tube.
  - For the part that slides into the body tube.
- 3D printed parts will also be incorporated into the payload. The 3D printed parts will mostly be used to house the computer fan.
- We will use ABS plastic to 3D print the payload parts from the club's own 3D printer.

Payload

- The first image in the payload connected, and inserted, into the nose cone.
- The second image in the main section of the payload pulled out of the nose cone. All thread will run the whole way through the payload.
- The final image is the payload parts separated for easy access to the electronics.



Recovery System

- Deploys a 36 inch drogue parachute at apogee, and a 72 inch main parachute at 600 feet
- The altimeter will record maximum altitude of rocket
- Checks for continuity within itself and its components
- Ready to set off second ejection charge if first one fails
- Outputs signal to simplify tracking
- Is capable of separating parts of the rocket without damaging any of them
- Makes the rocket recoverable and reusable!
- PerfectFlite StratoLogger altimeters can fulfill all these require

Recovery System

- Rocket airframe houses all parts of rocket needed for launch, stabilizes rocket as a whole, is smooth and aerodynamically sound with little resistance
- Rocket airframe provides the necessary strength for surviving landings and making the rocket reusable = functional recovery system!
- Airframe also maintains intended flight path with minimal deviation
- Our fiberglass body tube from Public Missiles Ltd provides rigid stability, strength, and minimal air resistance

Recovery System

Main Parachute

- ❖ 72 inches
- ❖ Descends at 13.16 ft/s

Drogue Parachute

- ❖ 36 inches
- ❖ Descends at 71.5618 ft/s

- ❖ Recovery harness 1 inch tubular nylon

Recovery System

Kinetic energy at key phases (landing)

Main

- Section 1 235.9
- Section 2 314.5
- Section 3 681.4

Drogue

- Section 1 18.2
- Section 2 24.2
- Section 3 52.5

Electronics Bay Schematics

- Made out of fiberglass coupler tube
- Capped off with ¼ inch bulkheads on each side of the tube
- Bulkheads use ¼ inch U-bolts to attach the nylon shock cord
- Each bulkhead contains two ejection caps, crafted from PVC piping, to achieve redundancy
- The entire electronics bay will be held together by two ¼ inch all-thread rods
- Inside the tube an ⅛ inch wooden sled rides on the inside
- Key switches mounted on the outside of the coupler tube

Electronics Bay Schematics

- The altimeters will be carried on the wooden sled
- There will be two altimeters to maintain the redundancy
- One altimeter will be wired to one charge on each end of the electronics bay
- The other altimeter will be wired to two charges on each end
- The detonation from both charges will give the necessary force to separate the rocket and drogue with main chute following

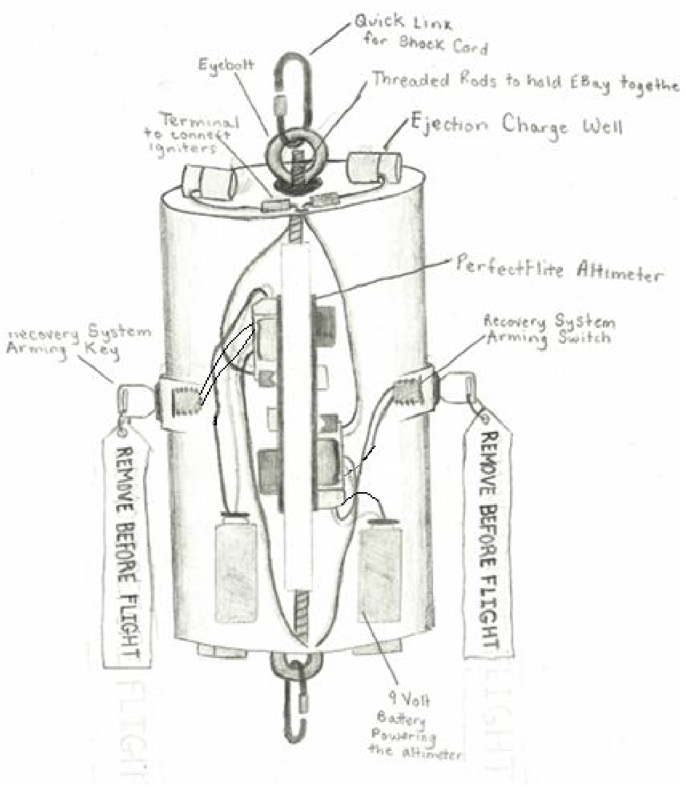
Electronics Bay Schematics

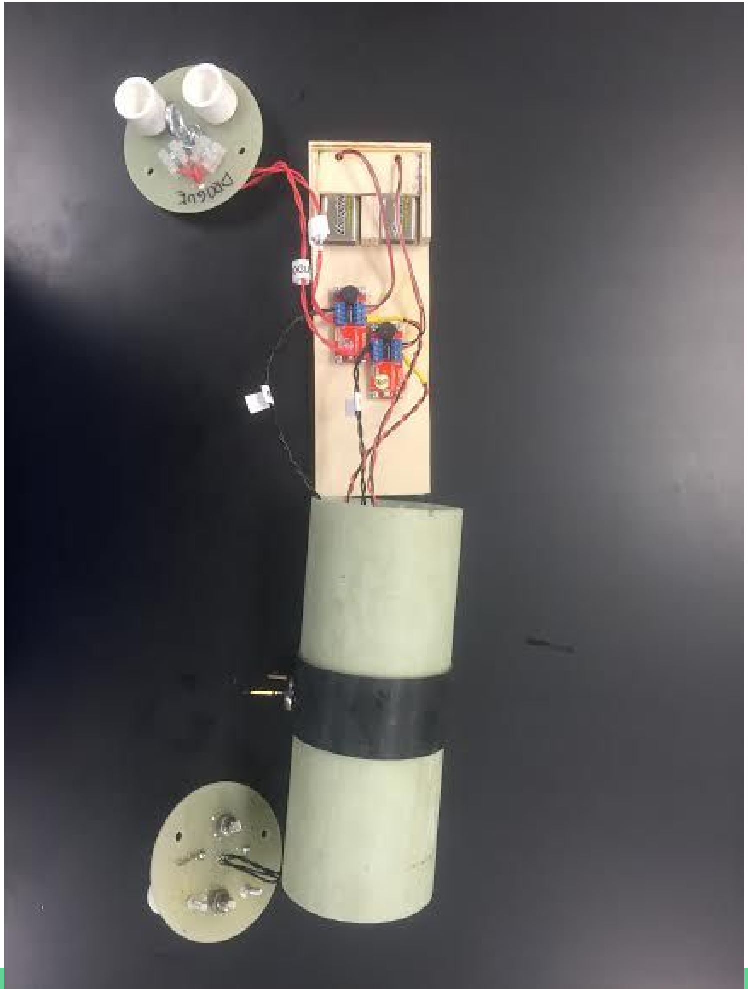
A. power in terminals.
B. Switch
C. Main chute
D. Drogue
E. PC Data Transfer port
F. Audio addon port
G. Speaker
H. Program switch

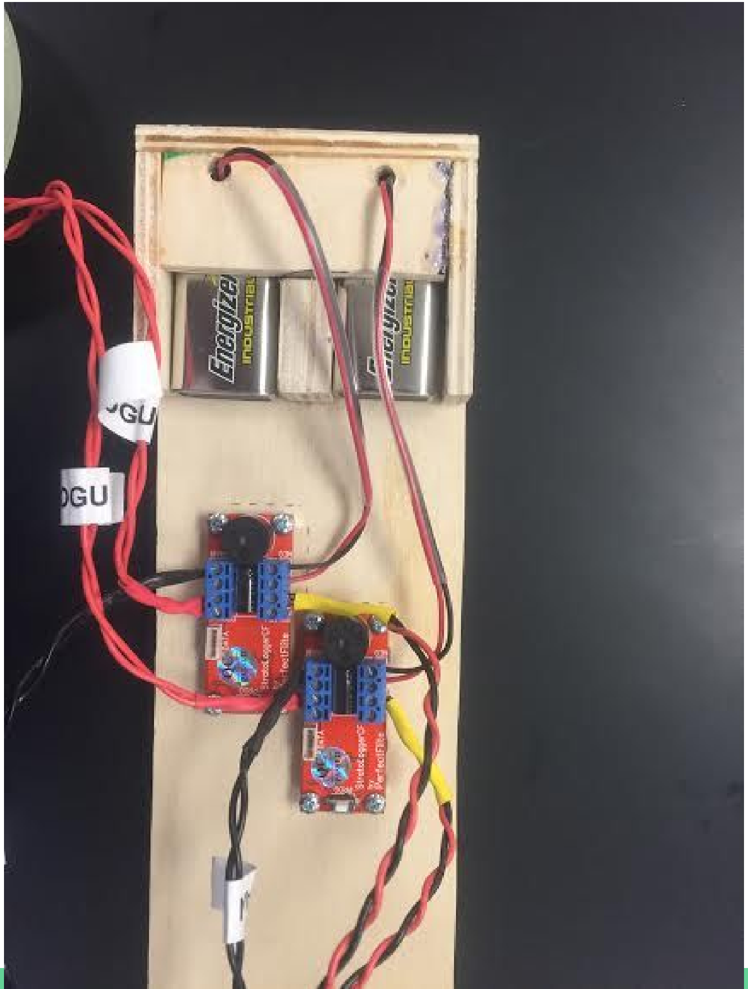
StratoLogger Altimeter that our electronics bay will hold

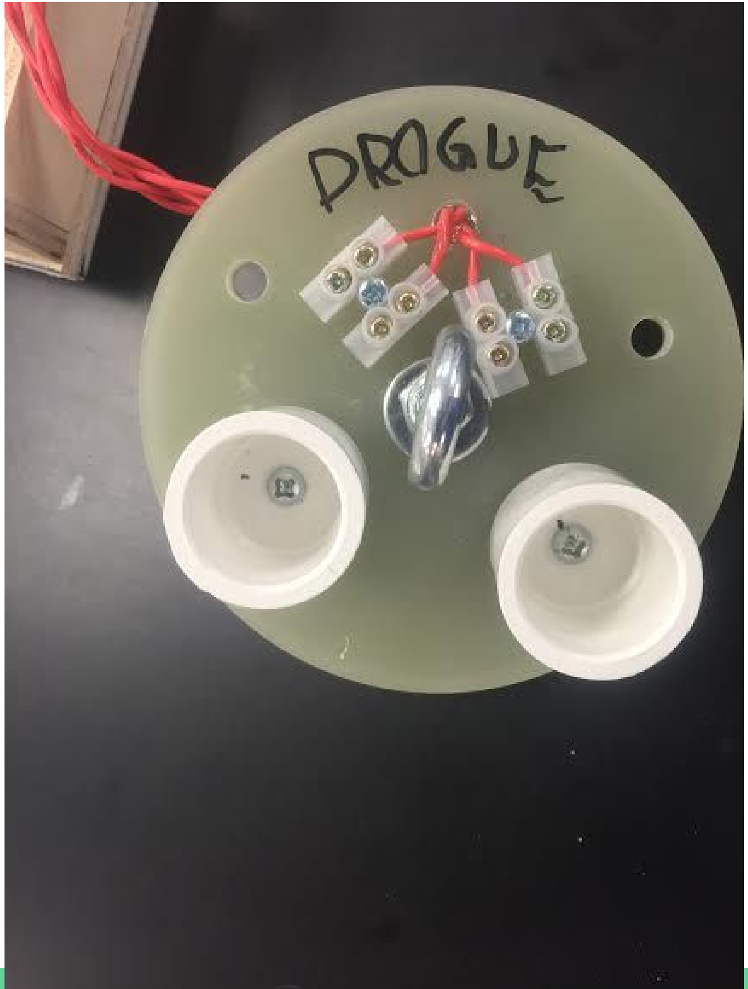
Electronics Bay Schematics

- This is a picture of the electronics bay
- 9 volt batteries are used to power both altimeters
- The arming switches are connected to their respective altimeters and ejection charges






Energizer
INDUSTRIAL


DROGUE

Safety

- Our team tries to put safety as our main concern.
- All our machines we use have a risk with using them and we try to eliminate.
- Our safety officer will also look over the use of the machines to keep everyone safe.

Student Safety Officer

- David Williams is our teams student safety officer.
- He overviews the construction of the rocket to make sure all procedures are done safely.
- David will also go out and retrieve the rocket after the launch.

Environmental Concerns

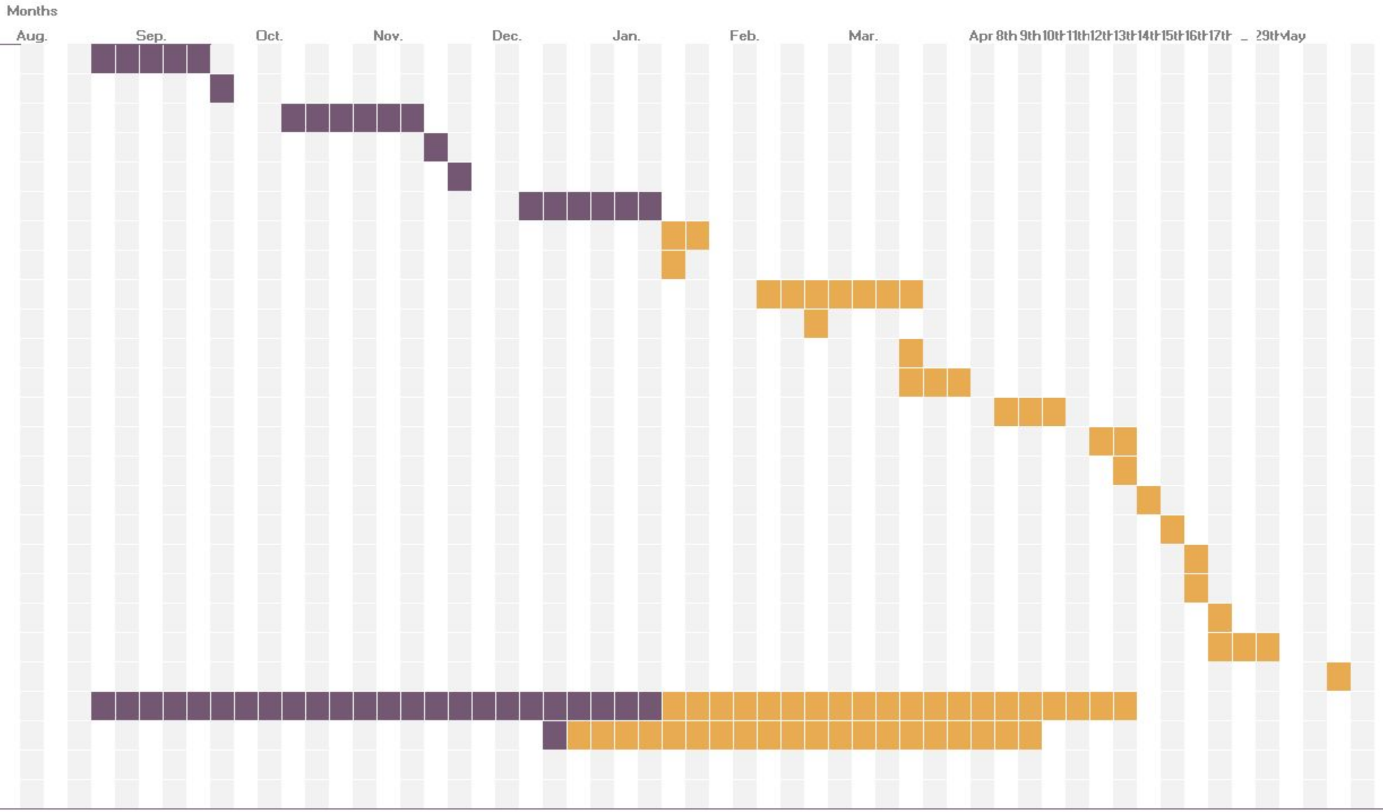
- Our teams rocket is very environmentally safe.
- our toxic gases are minimal with the amount of black powder we are using.
- The only other way our rocket could be affect the environment is if the rocket is unrecoverable.
- Animals may be affected as well if the rocket becomes unrecoverable.

Spring Grove: Project Plan

Period Highligh 1

Actual | % Complete | Actual (beyond plan) | PLAN

ACTIVITY	PLAN START	PLAN)URATIOI	ACTUAL START	ACTUAL)URATION	'ERCENT)OMPLETE
Project Proposal	Aug. 26	Sep. 11	Aug. 26	Sep. 9	100%
Experience Launc	Sep. 20	All Day	Sep. 20	All Day	100%
PDR	Oct. 7	Nov. 6	Oct. 7	Nov. 6	100%
PDR Teleconferenc	Nov. 9	Nov. 20	Nov. 10	2 hours	100%
Subscale Launch	Nov. 21	Nov. 22	Nov. 21	Nov. 22	100%
CDR	Dec. 4	Jan. 15	Dec. 4	Jan. 8	100%
CDR Teleconferenc	Jan. 19	Jan. 29			0%
Full Scale Launch	Jan. 16	Jan. 17	Jan. 16	Jan. 17	0%
FRR	Feb. 3	Mar. 14			0%
Full Scale Launch	Feb. 20	Feb. 21			0%
Full Scale Launch	Mar. 12	Mar. 13			0%
FRR Teleconferenc	Mar. 17	Mar. 30			0%
Full Scale Launch	Apr. 8	Apr. 10			0%
Travel to Huntsvil	Apr. 12	Apr. 13	Apr. 12		0%
LRR	Apr. 13	Apr. 13	Apr. 13	Apr. 13	0%
LRR & Safety Briefing	Apr. 14	Apr. 14	Apr. 14	Apr. 14	0%
Rocket Fair & MSFC T	Apr. 15	Apr. 15	Apr. 15	Apr. 15	0%
Banquet	Apr. 16	Apr. 16	Apr. 16	Apr. 16	0%
Launch Day	Apr. 16	Apr. 16	Apr. 16	Apr. 16	0%
Back up Launch Da	Apr. 17	Apr. 17	Apr. 17	Apr. 17	0%
PLAR	Apr. 17	Apr. 29	Apr. 17		0%
Winning Team Annou	May. 11	May. 11	May. 11	May. 11	0%
Wed. Work Sessior	Aug. 26	Apr. 13	Aug. 26		59%
Sat. Work Session	Dec. 19	Apr. 9	Dec. 19		6%



Budget Plan

- Closely monitor amount(s) of money, both fundraised and spent.
- Closely monitor how well fundraisers are doing, as well as adding more when necessary.
- Keeping track of and staying under budget, making sure that we are not spending more than we are raising.
- Taking inventory of all things bought.
- We currently have approximately 18,000 dollars fundraised for our project.

Funding Plan

- Yankee Candle
- Nuts About Granola
- Bonus Books
- Paint Night
- Cotton Candy Sales
  - We make and sell cotton candy at every home football game.
- Public Outreach

Educational Engagement

- ★ Presentations
  - Elementary, Intermediate, Middle Schools
    - Elementary
      - based more on visuals with a basic overview of the SLI, TARC, and other STEM programs and a small launch
    - Intermediate
      - based more on the SLI, TARC, and other STEM programs with visuals and a small launch
      - spark an interest in the programs so they may want to join in the future
    - Middle
      - based mainly on the SLI team program and TARC programs with visuals and a small launch
      - includes how they can become involved in STEM programs in high school
- ★ Middle School TARC Team
  - build two rockets and compete in the Team America Rocketry Challenge

Conclusion

In conclusion, we are going to continue our fundraising efforts to reach our goal. We are also going to start and continue to perform test launches for the full scale rocket in order to boost our accuracy on the one mile goal. We work and will continue to work diligently on all aspects of the project, making sure to represent Spring Grove with our best work. Community support for the program is still important and hopefully this support will continue to grow as we near our Huntsville trip and prepare for the final launch.