



Sounding Rocket Safety Document

Spring Grove Area High School


Project Aether

Rocket Design



- Airframe Material - 1/16 inch Phenolic Tubing
- Fin Material – Ultem 3D Printed Fin Can
- Nosecone material – Fiberglass
- Adhesives Used - Rocket-Poxy, 5-Minute Epoxy, and JB Weld.
- Rail Guides – Linear Rail Guides
- Bulkheads – 1/16 inch fiberglass
- Motor Tube – 1/16 inch fiberglass
- Parachute selection- 36 inch elliptical parachute from Fruity Chutes for main and drogue parachute They're protected by Nomex heat shields and Nomex shock cord sleeves.
- 36inch elliptical parachute from Fruity Chutes for main and one for the drogue parachute
- 7/16 inch tubular Kevlar (50 feet)
- 880 lb. limit quick links and swivels
- Key Switch - Type 2, made by CNK
- U Bolts
- Wires
- Ejection Wells – 1/4" PVC caps

Rocket Design

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- **A drawing of the rocket identifying all of its components and their dimensions– (see rocket diagram slide)**
 - **On the pad weight:**
 - Primary Motor- Cesaroni I350 (170.8oz)
 - Backup Motor- Cesaroni I540 (170.16oz)
 - **Location of Center of Pressure (CP) from the tip of the nose cone-**
 - 50.03 inches from nose cone
 - **Location of Center of Gravity (CG) from the tip of the nose CG:**
 - Primary motor --33.45 inches from nose cone (stability of 5.53)
 - Backup motor –33.35 inches from nose cone (stability of 5.56)



Rocket Diagram

Sounding Rocket
Length: 65.0187 In. , Diameter: 3.1300 In. , Span diameter: 10.7686 In.
Mass 170.2596 Oz. , Selected stage mass 170.2596 Oz.
CG: 33.3647 In., CP: 50.0338 In., Margin: 5.56 Overstable
Engines: [I216-CL(I)-None,]

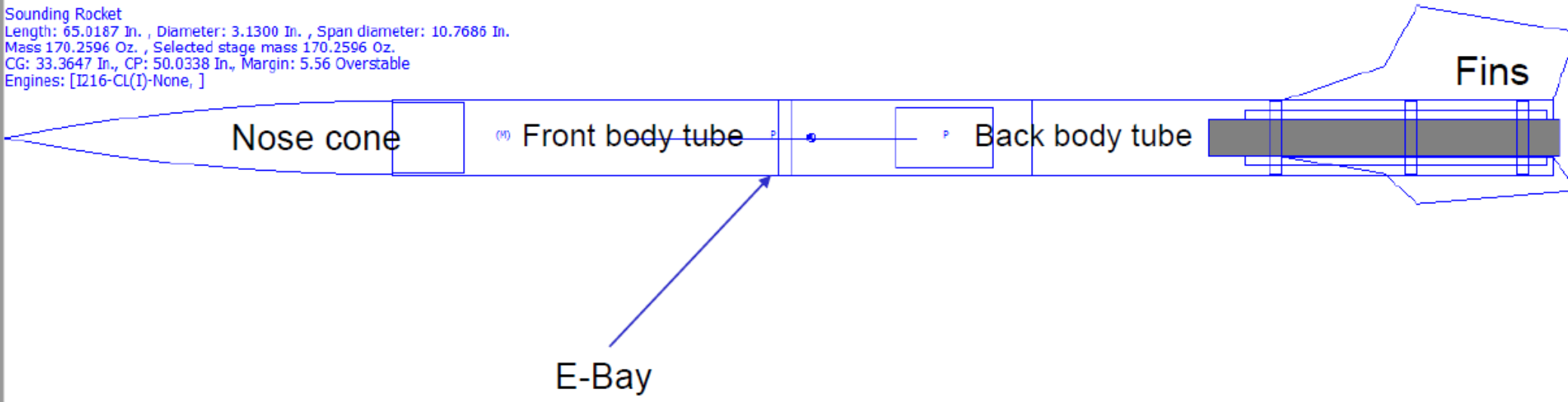
Nose cone

(M) Front body tube

Back body tube

Fins

E-Bay



Primary and Secondary Motors



- **Cesaroni I350**


- Active motor retention. Motor retainer used is an Aeropack motor retainer
- TWR: 7.42:1

- **Cesaroni I540**

- Active motor retention. Motor retainer used is an Aeropack motor retainer
- TWR: 11.4:1

Engines loaded	Max. altitude Feet	Max. velocity Feet / Sec	Max. acceleration Feet/sec/sec	Time to apogee	Velocity at deploym Feet / Sec	Altitude at deploym Feet
[I350SS-None]	1955.65	356.85	644.90	11.46	0.04	1955.65
[I540WT-None]	1993.58	371.66	644.96	11.30	5.05	1993.58

With adding 300g

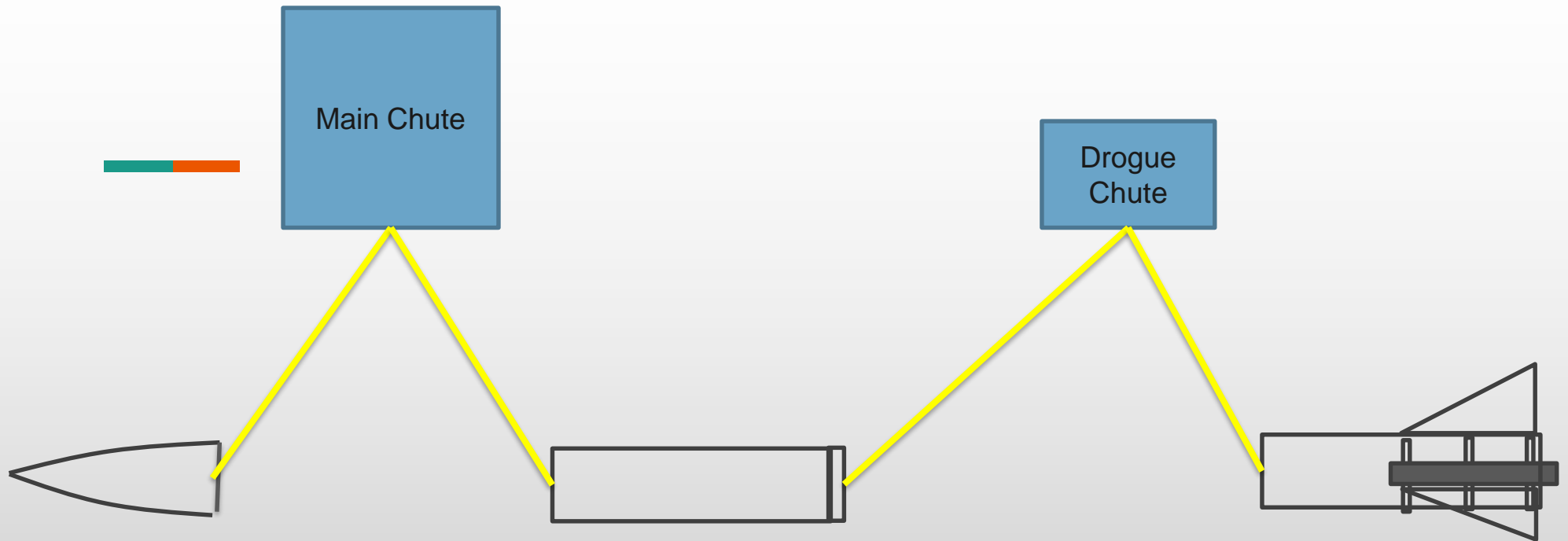


Recovery



- Document method of initiating recovery
 - Electronics Bay is used for ejection charge initiations.
- Parachute
 - 36inch elliptical parachute from Fruity Chutes for main and one for the drogue parachute
 - For main, a safe decent is less than 20ft/s. We used RockSim to calculate the decent rate.
 - To protect the parachutes, we're using Nomex heat shields and Nomex shock cord sleeves.

Recovery



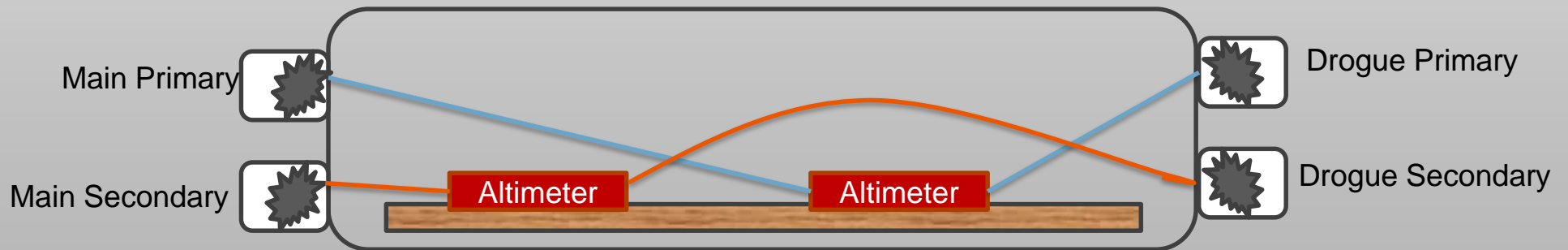
- 1/8 inch tubular Kevlar, 1200 lb. max
- Swivel and quick links. 880 lbs. max
- U-Bolts are mounted to the E-bay bulkheads with washers and lock nuts, and then epoxy overtop. This stops the nuts from coming loose, or anything un-attaching

Recovery Electronics



- Identify commercial altimeter(s) that will be used
 - Stratologger CF from PerfectFlite

- Show wiring diagram of altimeters with charges



Recovery Electronics



- Three 1/16 inch portholes were drilled
- The altimeter will be prepared by replacing batteries within an hour before launch, and testing continuity.
- Drogue – 2.6 grams of black powder was tested and was successful
- Main – 2 grams of black powder was tested and was successful
- Specify the volume of the section to be pressurized with calculated pressure level
- Drogue – 137.80 in²
- Main – 100.37 in²
- Specify how sections are secured before the ejection charges separate sections
 - shear pins – 0.075" (x3)
- Identify how charges are fired
 - e-matches