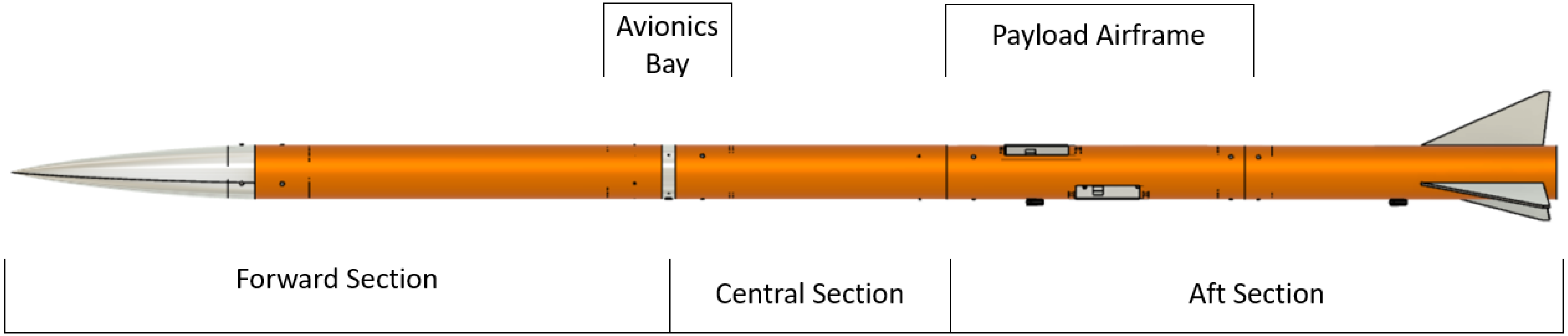
University of Florida

Preliminary Design Report

NASA Student Launch

Vehicle Dimensions

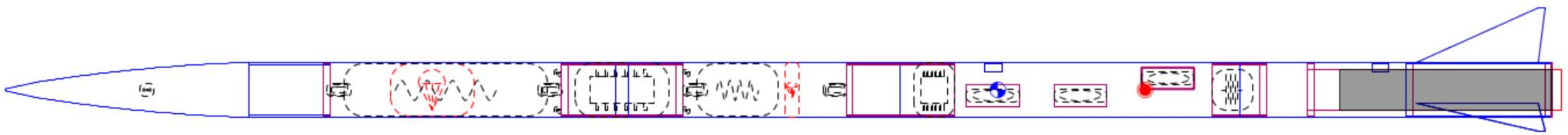


Section	Exterior Length (in)	Overall Mass (oz)
Forward	45	77.9
Central	21	74.0
Aft	49	246.1
Total	**115**	**398.0**

Leading Design

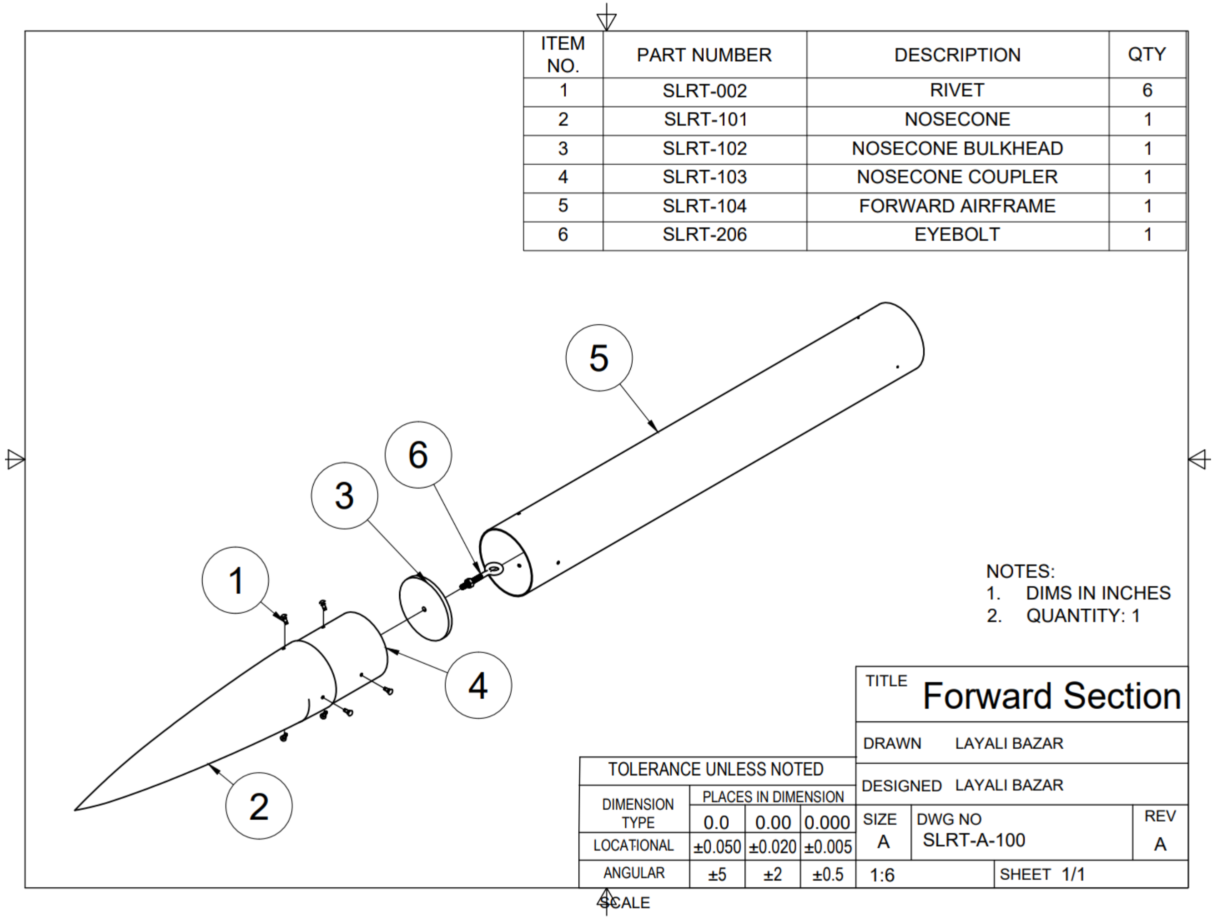
Sections

- Forward Section
  - Nosecone and Forward Airframe
- Central Section
  - Avionics Bay and Central Airframe
- Aft Section
  - Payload Airframe, Aft Airframe, Fins, and Motor Assembly



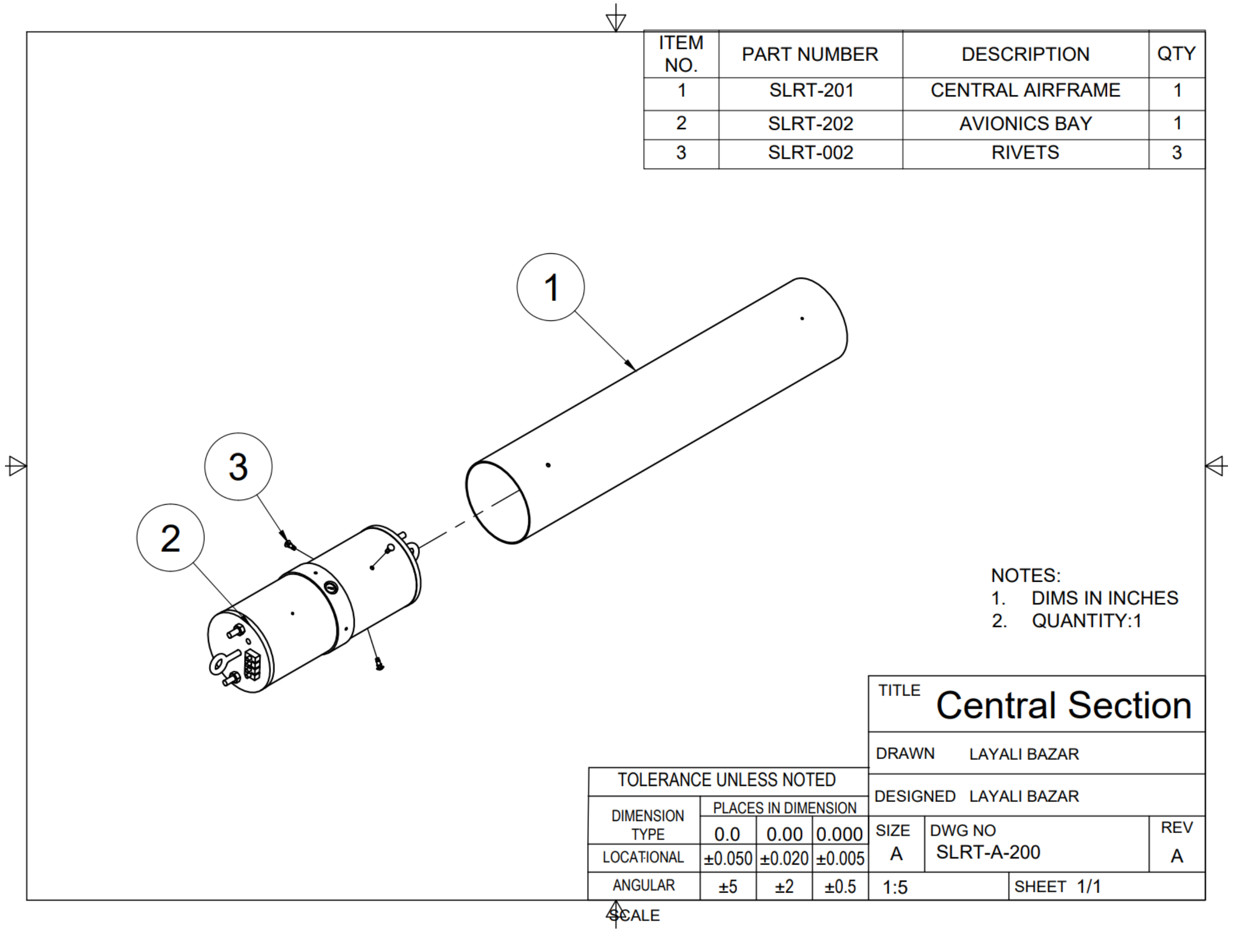
Forward Section

- 4-4.5 Von Karman Nosecone
- Nosecone Shoulder
- GPS
- Bulkhead
- Eyebolt
- Forward Airframe



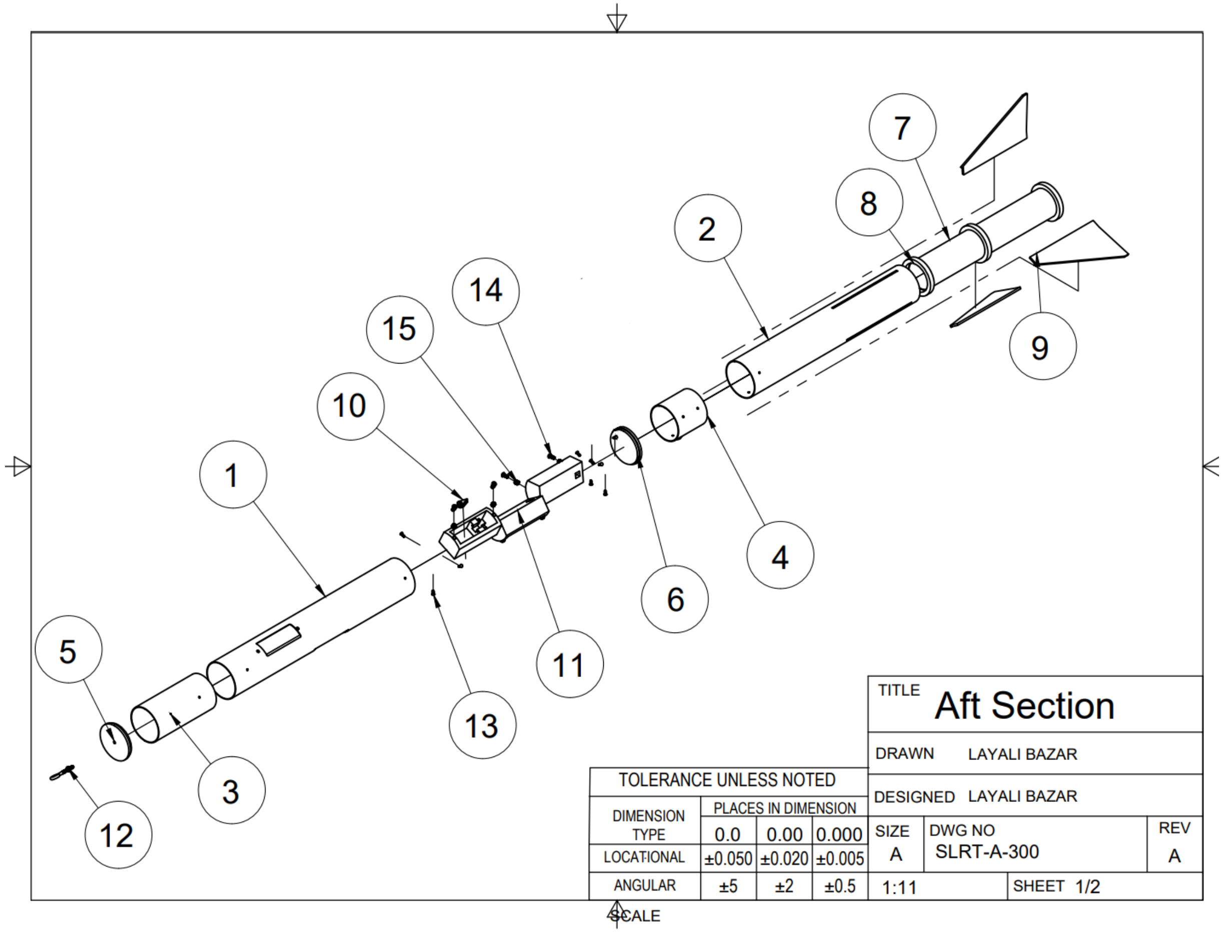
Central Section

- Central Airframe
- Avionics Bay



Aft Section

- Payload Airframe
  - Contains 3 Payload Housings
- Aft Airframe
  - Motor Assembly
    - Motor Tube
    - Centering Rings
  - Fins



Nosecone Material Selection

Nosecone			Polypropylene			G12 Fiberglass		
Objective	Weighting Factor	Parameter	Mag.	Score	Value	Mag.	Score	Value
Cost	0.10	USD	24.75	10.0	1.00	75.90	3.3	0.33
Density	0.30	lb/in^3	0.03	4.9	1.48	0.067	10.0	3.00
Tensile Strength	0.60	ksi	6.50	0.6	0.34	115	10.0	6.00
Overall value					**2.82**			**9.33**

Airframe/Coupler Material Selection

Airframe			Blue Tube			G12 Fiberglass		
Objective	Weighting Factor	Parameter	Mag.	Score	Value	Mag.	Score	Value
Cost	0.17	USD/in	0.92	8.04	1.34	2.12	3.49	0.58
Density	0.17	lb/in^3	0.05	10.00	1.67	0.07	6.19	1.03
Compressive Strength	0.50	ksi	4.28	1.43	0.71	30.00	10.00	5.00
Machinability	0.17	experience	good	8.00	1.34	okay	6.00	1.00
Overall value					**5.1**			**7.6**
Airframe			**Phenolic**			**Quantum Tube**		
Objective	Weighting Factor	Parameter	Mag.	Score	Value	Mag.	Score	Value
Cost	0.17	USD/in	0.74	10.00	1.67	0.87	8.51	1.42
Density	0.17	lb/in^3	0.05	9.83	1.64	0.05	9.42	1.57
Compressive Strength	0.50	ksi	13.50	4.50	2.25	18.20	6.07	3.03
Machinability	0.17	experience	good	8.00	1.34	good	8.00	1.34
Overall value					**6.9**			**7.4**

Motor Tube Material Selection

Motor Tube			G12 Fiberglass			Blue Tube		
Objective	Weighting Factor	Parameter	Mag.	Score	Value	Mag.	Score	Value
Cost	0.17	USD/in	1.20	3.33	0.56	0.40	10.00	1.67
Density	0.17	lb/in^3	0.07	6.87	1	0.06	7.80	1.30
Compressive Strength	0.50	ksi	37.10	10.00	5	5.08	1.37	0.68
Machinability	0.17	experience	fair	4.00	0.67	good	8.00	1.34
Overall value					**7.37**			**4.99**

Motor Tube			Phenolic		
Objective	Weighting Factor	Parameter	Mag.	Score	Value
Cost	0.17	USD/in	0.71	5.63	0.94
Density	0.17	lb/in^3	0.05	10.00	1.67
Compressive Strength	0.50	ksi	13.50	3.64	1.82
Machinability	0.17	experience	fair	4.00	0.67
Overall value					**5.10**

Bulkhead Material Selection

Bulkhead			Structural FRP Fiberglass			Plywood		
Objective	Weighting Factor	Parameter	Mag.	Score	Value	Mag.	Score	Value
Density	0.22	lb/in^3	0.06	3.3	0.7	0.02	10.0	2.2
Tensile Strength	0.56	ksi	18.50	10.0	5.6	9.20	4.3	2.4
Machinability	0.22	experience	Fair	4.0	0.9	Fair	4.0	0.9
Cost	0.11	USD/ft^2	27.89	1.50	0.2	20.41	10.00	1.1
Overall value					**7.3**			**6.6**

Bulkhead			Type II PVC		
Objective	Weighting Factor	Parameter	Mag.	Score	Value
Density	0.22	lb/in^3	0.05	3.9	0.9
Tensile Strength	0.56	ksi	6.15	6.7	3.7
Machinability	0.22	experience	Great	10.0	2.2
Cost	0.11	USD/ft^2	8.42	4.90	0.5
Overall value					**7.4**

Centering Rings Material Selection

Centering rings			Structural FRP Fiberglass			Plywood		
Objective	Weighting Factor	Parameter	Mag.	Score	Value	Mag.	Score	Value
Density	0.30	lb/in^3	0.06	3.3	0.99	0.02	10.0	3.00
Cost	0.10	USD/in^2	4.67	0.7	0.07	0.31	10.0	1.00
Shear Strength	0.30	ksi	21.50	10.0	3.00	2.00	0.9	0.28
Machinability	0.30	mins	13.00	3.8	1.15	5.00	10.0	3.00
Overall value					**5.2**			**7.3**

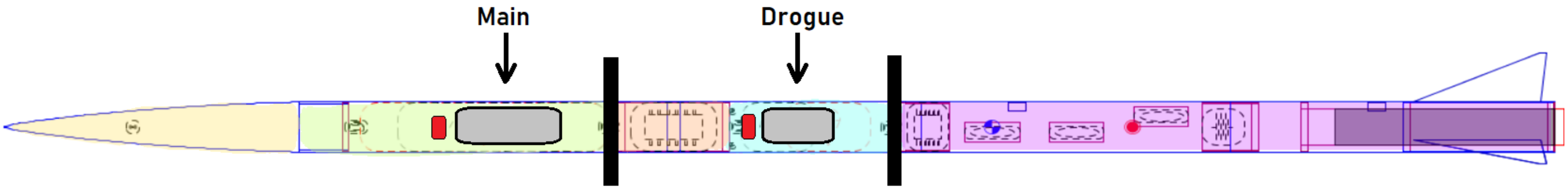
Centering rings			Type II PVC		
Objective	Weighting Factor	Parameter	Mag.	Score	Value
Density	0.30	lb/in^3	0.05	4.0	1.21
Cost	0.10	USD/in^2	2.18	4.7	0.47
Shear Strength	0.30	ksi	1.50	0.7	0.21
Machinability	0.30	mins	25.00	2.0	0.60
Overall value					**2.5**

Fins Material Selection

Fins			Structural FRP			Plywood		
Objective	Weighting Factor	Parameter	Mag.	Score	Value	Mag.	Score	Value
Shear Strength	0.33	ksi	21.50	10.0	3.3	2.00	0.9	0.3
Cost	0.17	USD/ft^2	27.89	1.5	0.2	4.10	10.0	1.7
Density	0.17	lb/in^3	0.06	4.0	0.7	0.02	10.0	1.7
Impact Strength	0.33	ft-lb/in	8.00	6.7	2.2	3.70	3.1	1.0
Overall value					6.5			**4.7**

Fins			G10 Fiberglass		
Objective	Weighting Factor	Parameter	Mag.	Score	Value
Shear Strength	0.33	ksi	21.50	10.0	3.3
Cost	0.17	USD/ ft^2	62.75	0.7	0.1
Density	0.17	lb/in^3	0.07	3.7	0.6
Impact Strength	0.33	ft-lb/in	12.00	10.0	3.3
Overall value					**7.4**

Separation Points

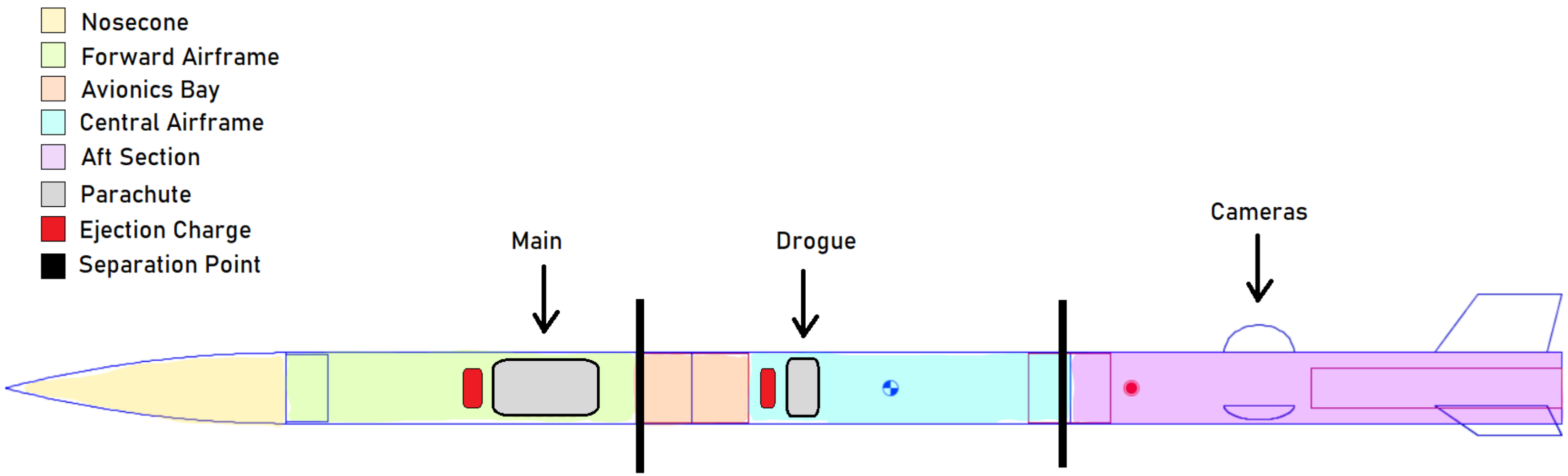


Component		Description
Main Ejection Charge	Primary	2.5 g at 600 ft AGL
	Secondary	3.1 g at 550 ft AGL
Drogue Ejection Charge	Primary	1.6 g at apogee
	Secondary	2.0 g at 1s after apogee

All ejection charges are black powder

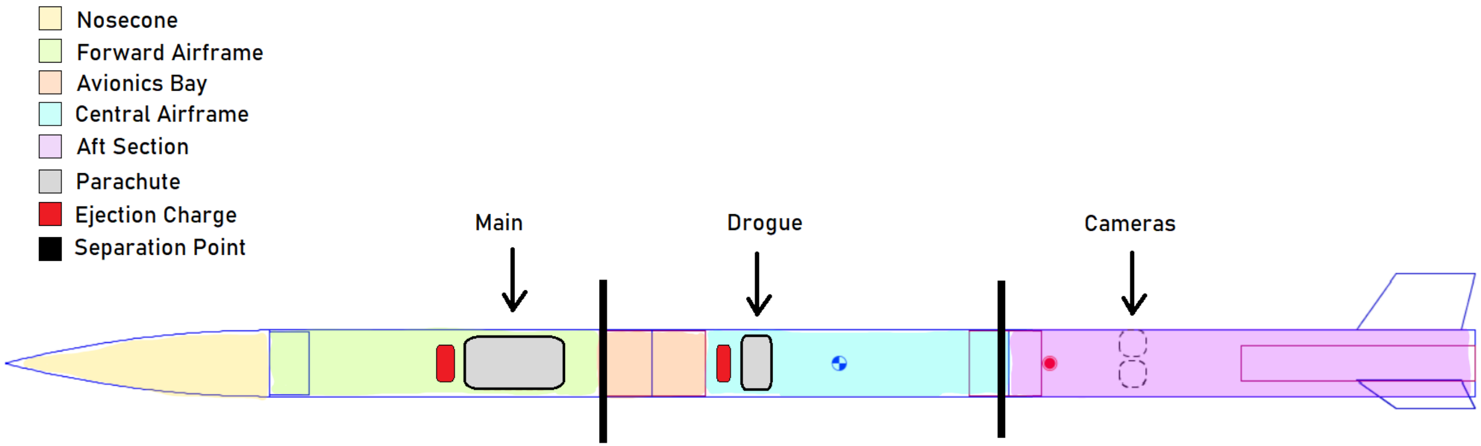
Alternative Designs - Externally Mounted Cameras

- Three cameras, each aligned with a fin
- Clear cover over the camera

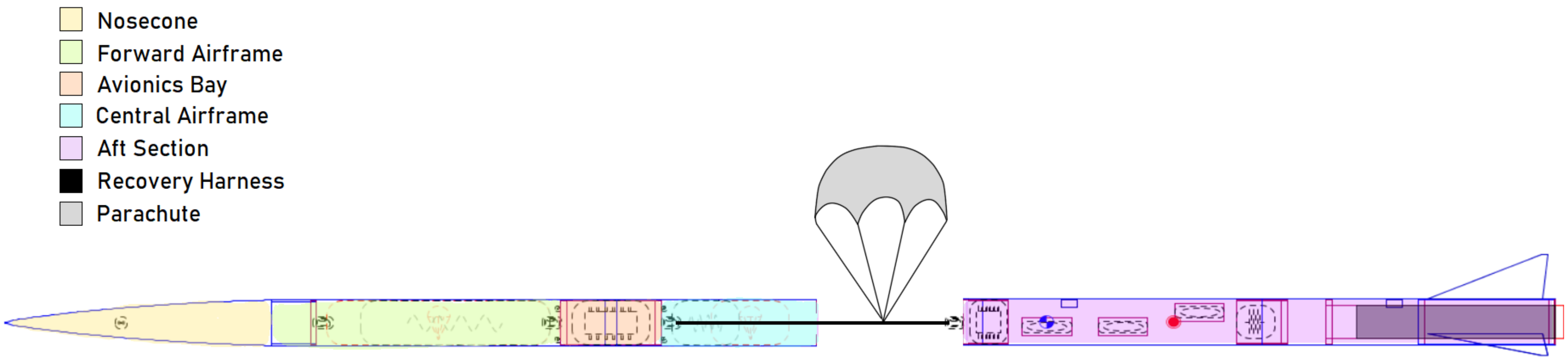


Alternative Designs - Linear Extension

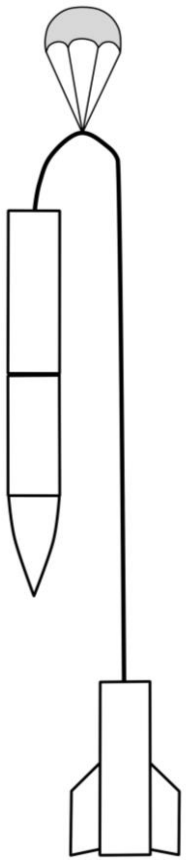
- Three cameras, each aligned with a fin
- Camera raised by linear actuators radially



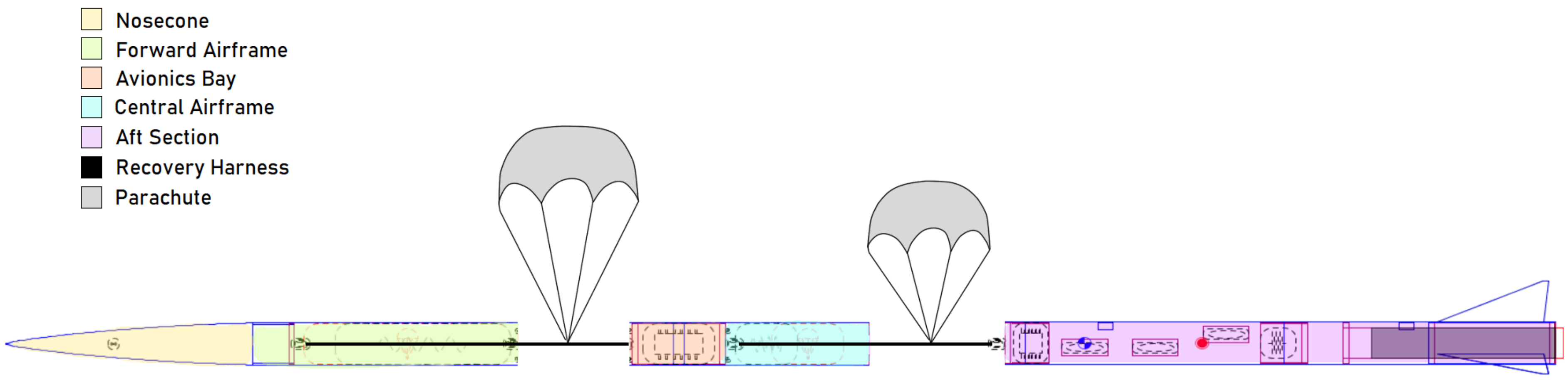
First Separation Event

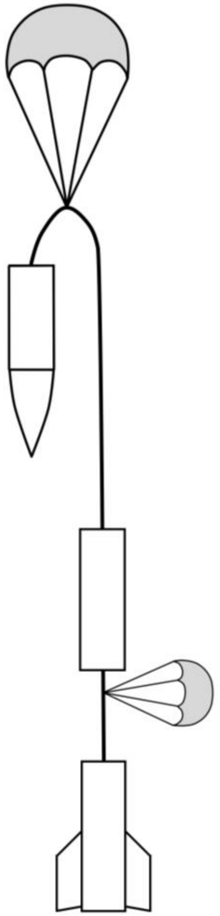


Component Type	Component Name	Location	Descent Rate (ft/s)
Drogue Parachute	24" Rocketman Standard	Central Airframe	80.1
Aft Recovery Harness	Fruity Chutes 5/8" Kevlar, 24 ft long	Central Airframe	N/A



Second Separation Event

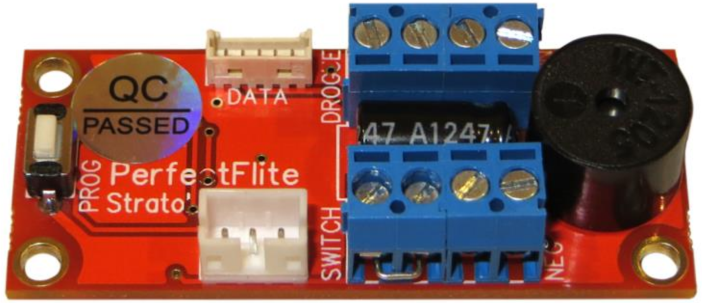


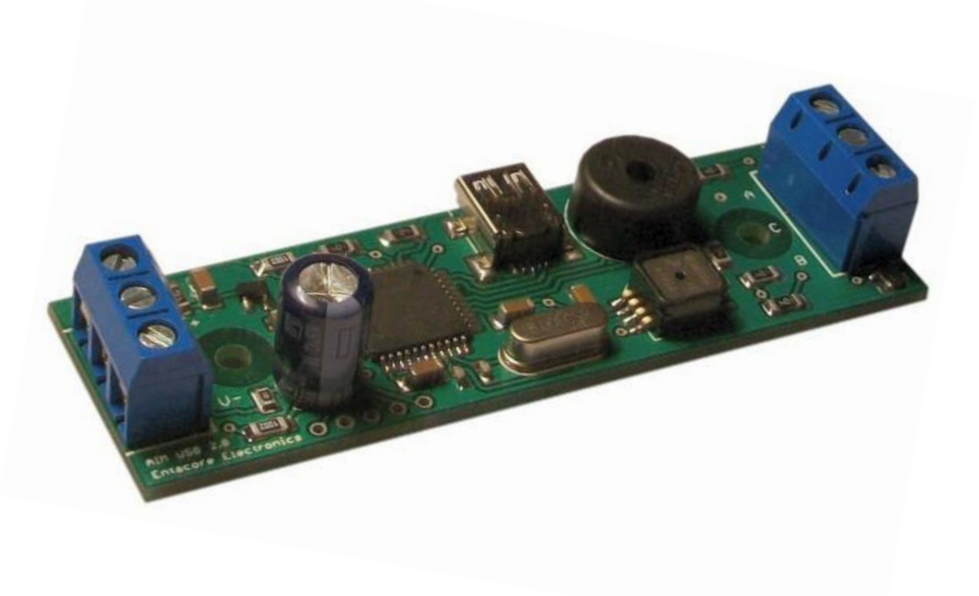


Component Type	Component Name	Location	Descent Rate (ft/s)
Main Parachute	72" Fruity Chutes Iris Ultra	Forward Airframe	17.2
Forward Recovery Harness	Fruity Chutes 5/8" Kevlar, 24 ft long	Forward Airframe	N/A

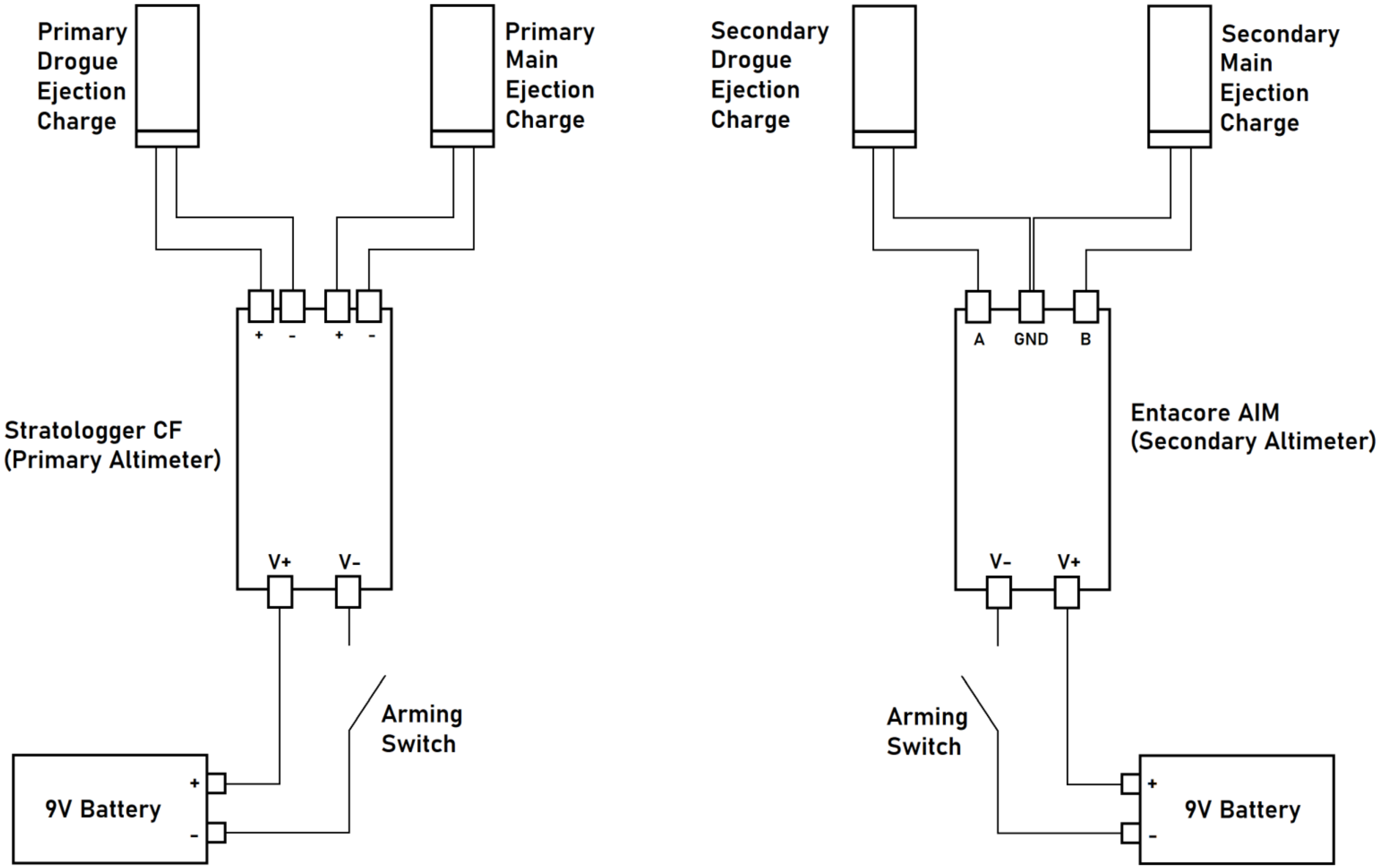
Selected Altimeters and GPS

Component Type	Component Name	Location
Primary Altimeter	Stratologger CF	Avionics Bay
Secondary Altimeter	Entacore AIM	Avionics Bay
GPS	Big Red Bee 900	Nosecone

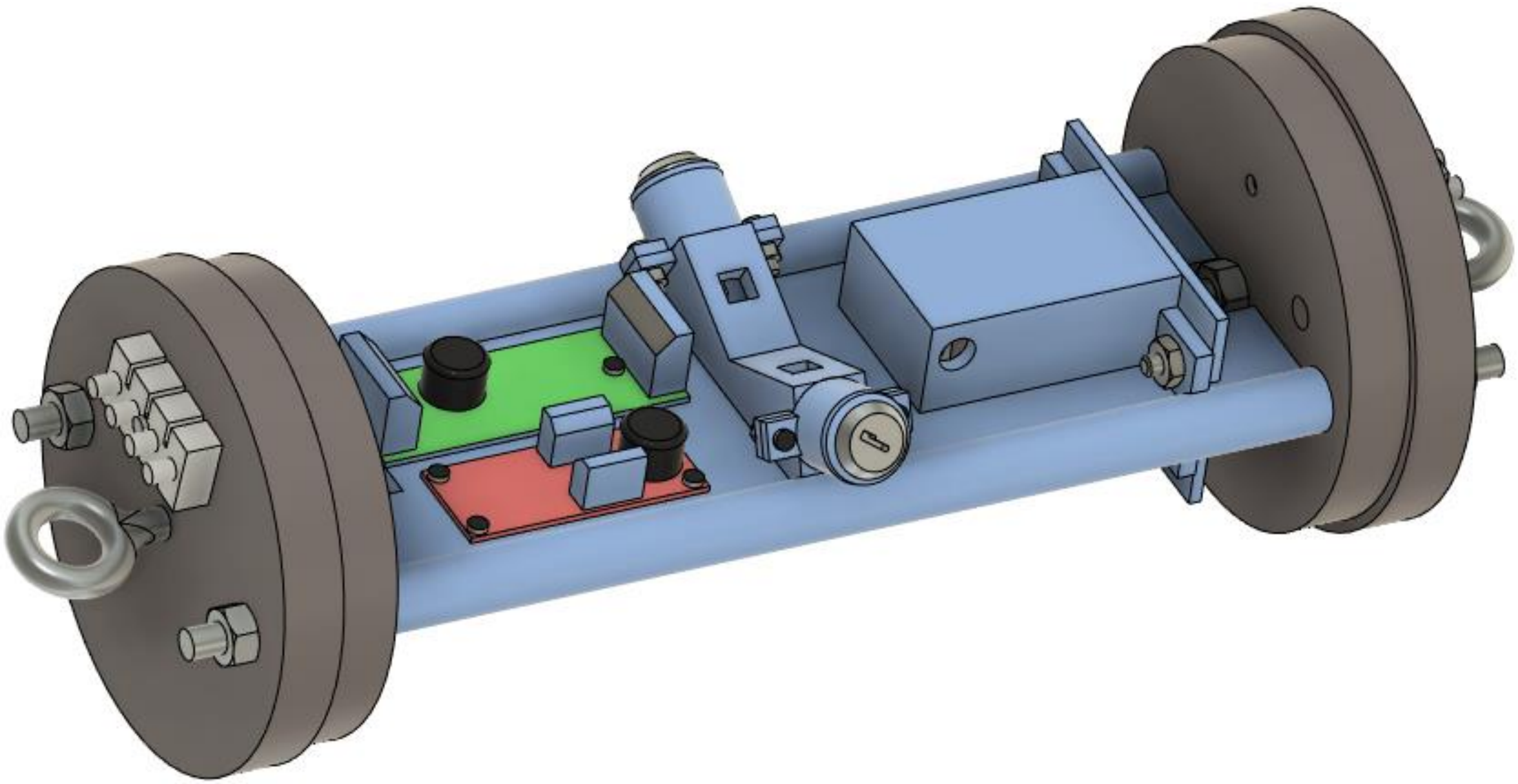




Altimeter Wiring Diagrams

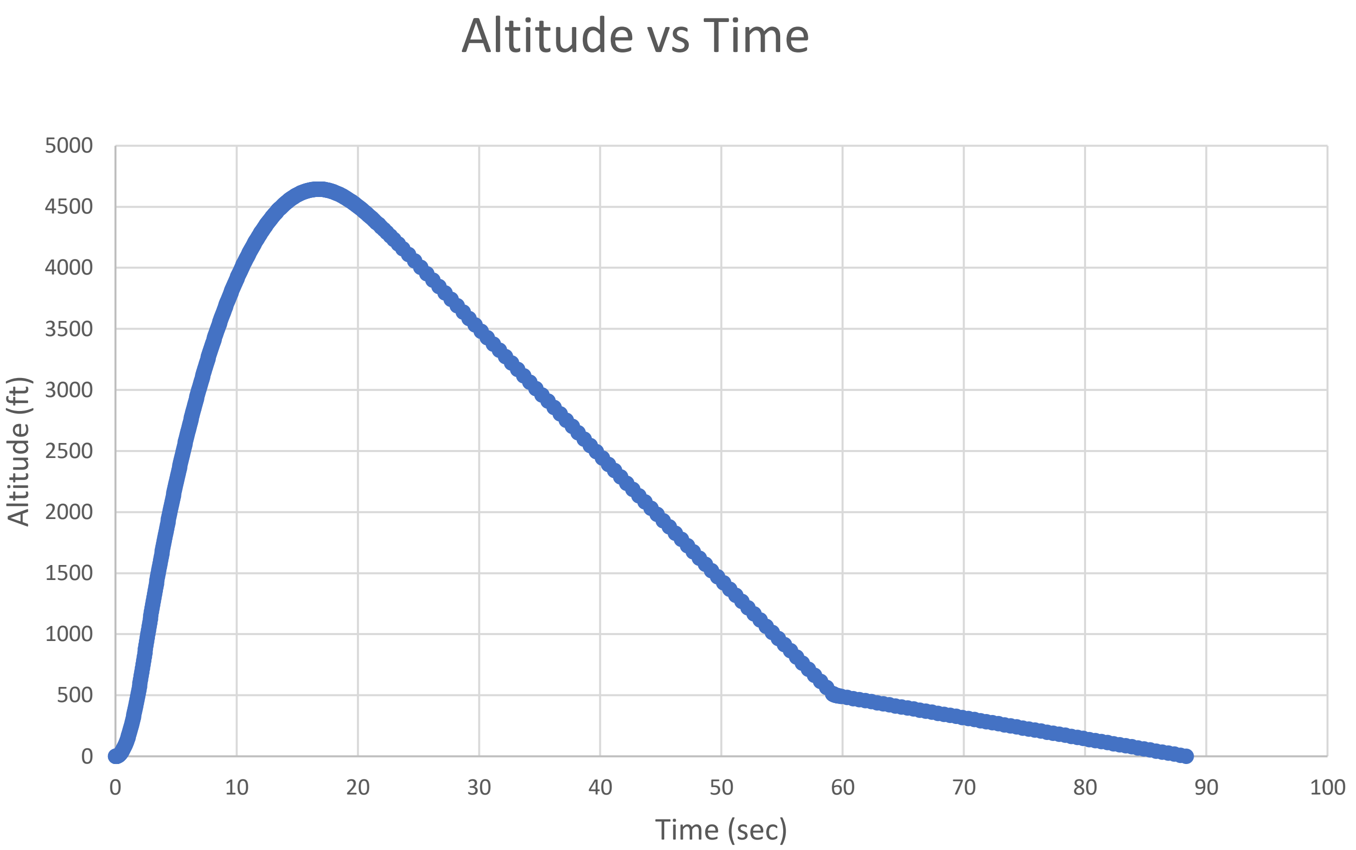


Avionics Bay



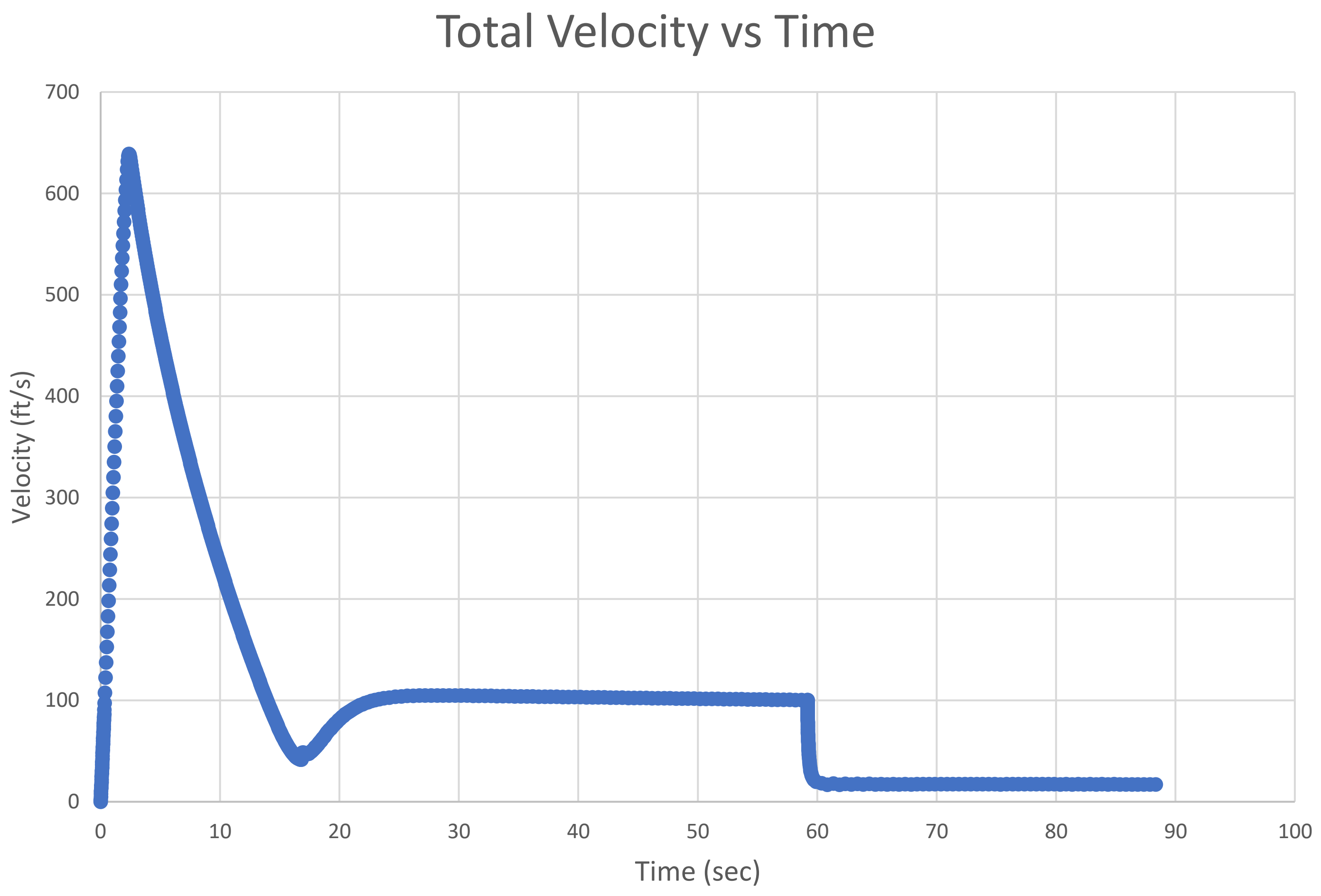
Mission Performance Predictions

- Official Target Apogee- 4600 ft
- Simulated Altitude based on 5 mph simulation: 4644 ft



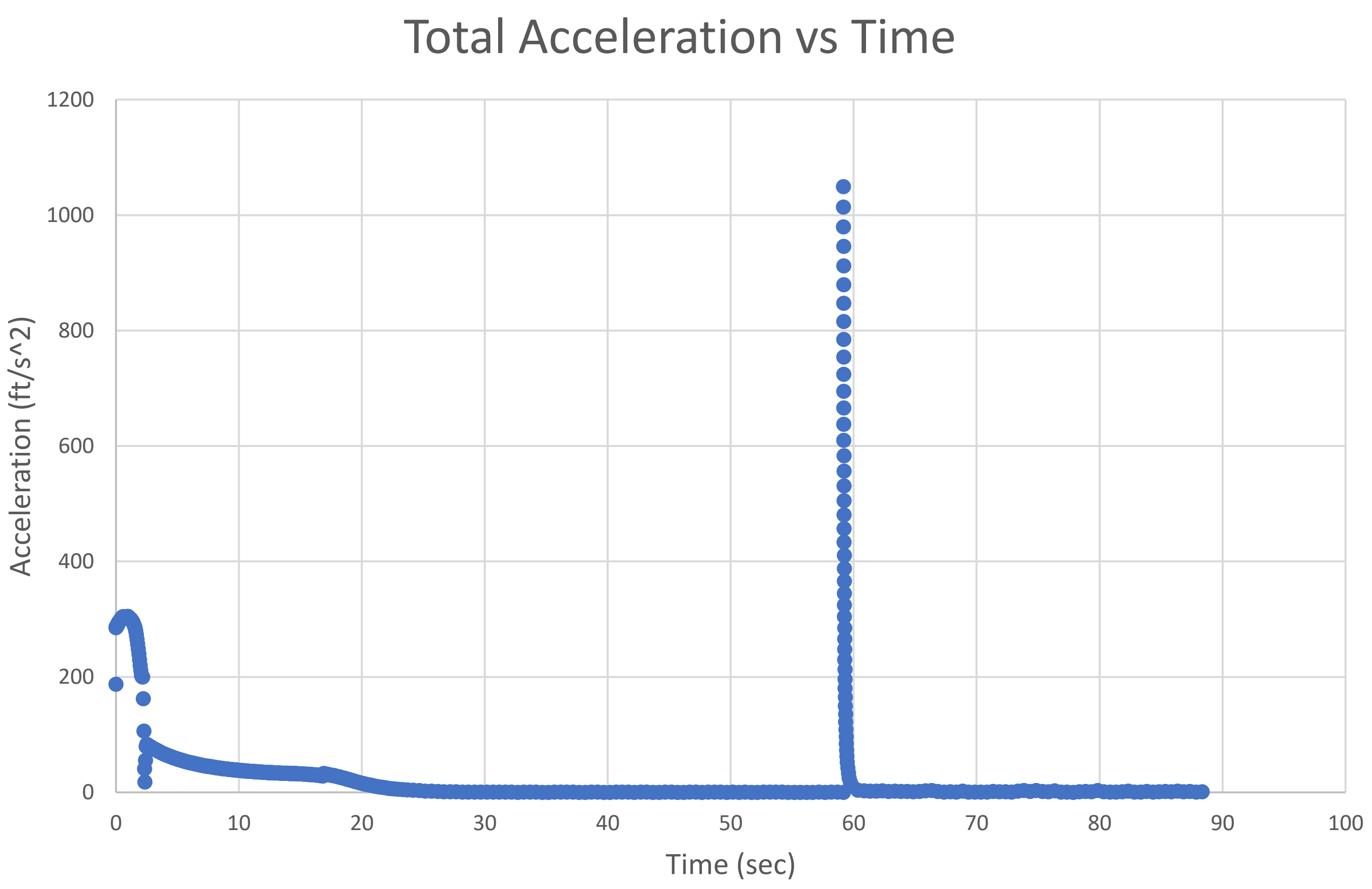
Mission Performance Predictions

- Velocity Off-the-Rail: 86.3 ft/s
- Maximum Velocity: 636 ft/s
- Maximum Mach #: 0.58
- Ground-Hit Velocity: 17.1 ft/s



Mission Performance Predictions

- Maximum Acceleration: 305 ft/s^2



Mission Performance Predictions

Descent Times from Equation	
Drogue Descent Time (s)	49.9
Main Descent Time (s)	34.9
Total Descent Time (s)	84.8

Descent Times from OpenRocket Simulations	
Total Flight Time (s)	99.5
Time to Apogee (s)	16.8
Total Descent Time (s)	82.7

Mission Performance Predictions

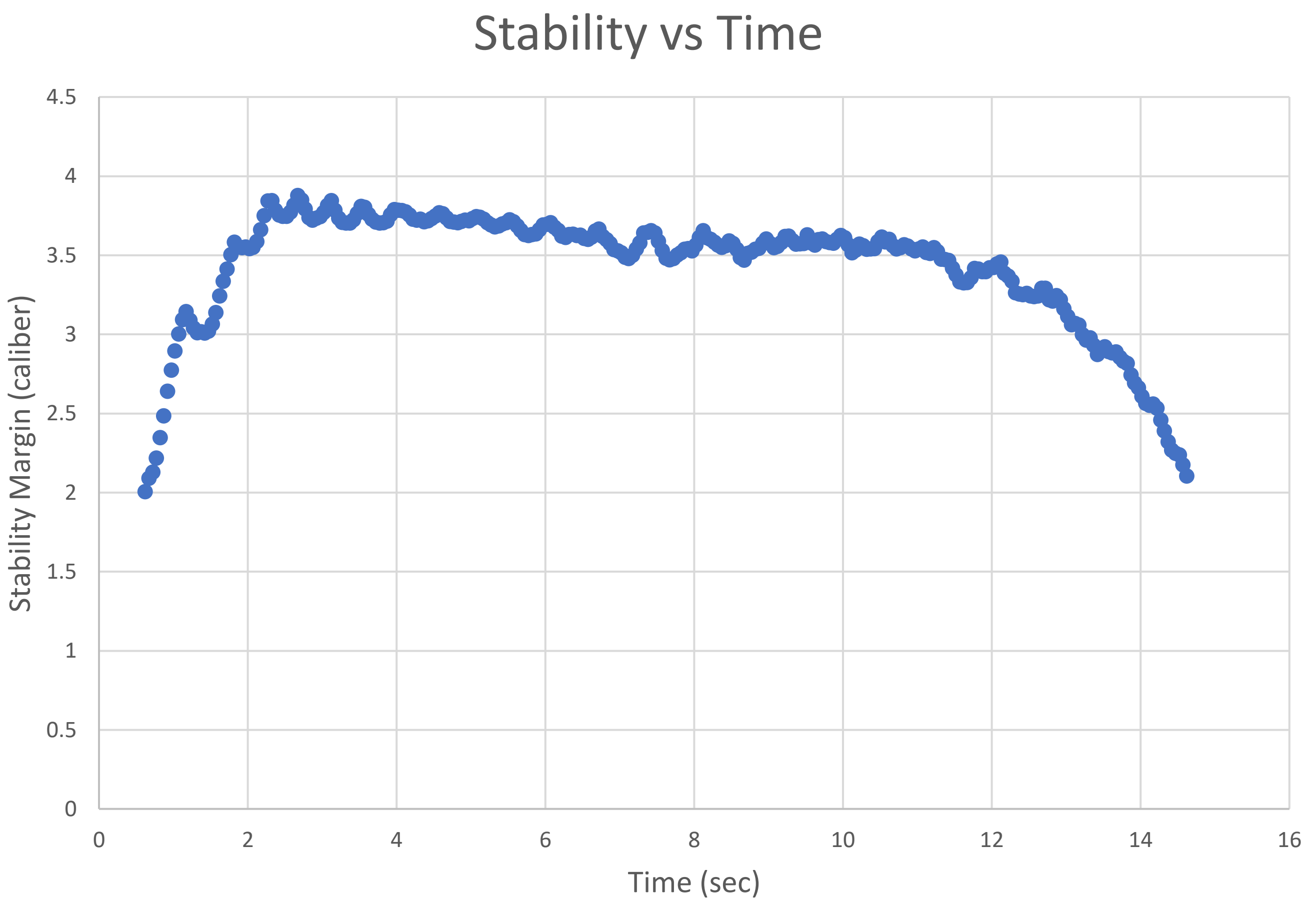
Drift from Equation			
Wind Speed (mph)	Total Drift (ft)	Drogue Drift (ft)	Main Drift (ft)
5	622.02	366.21	255.81
10	1244.05	732.42	511.63
15	1866.07	1098.63	767.44
20	2488.10	1464.84	1023.26

Drift from OpenRocket Simulations	
Wind Speed (mph)	Total Drift (ft)
5	596.1
10	1163.7
15	1696.3
20	2270.4

Kinetic Energy at Ground Hit from Equation	
Forward Section (ft-lb)	25.35
Central Section (ft-lb)	21.27
Aft Section (ft-lb)	58.08

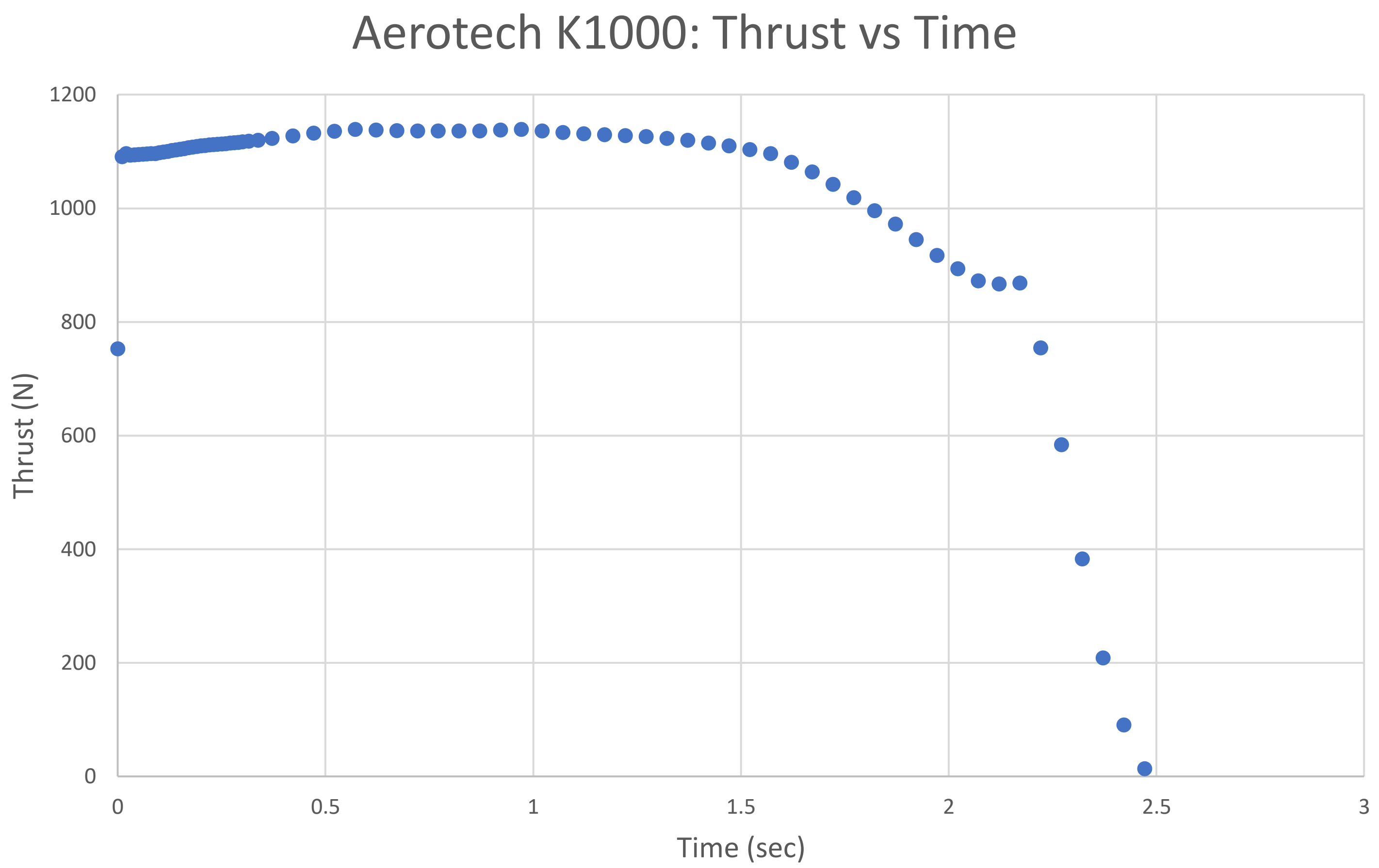
Static Stability

- Static Stability at the Launch Pad- 2.62
- Static Stability at Rail Exit- 2.73
- Maximum Static Stability- 3.75

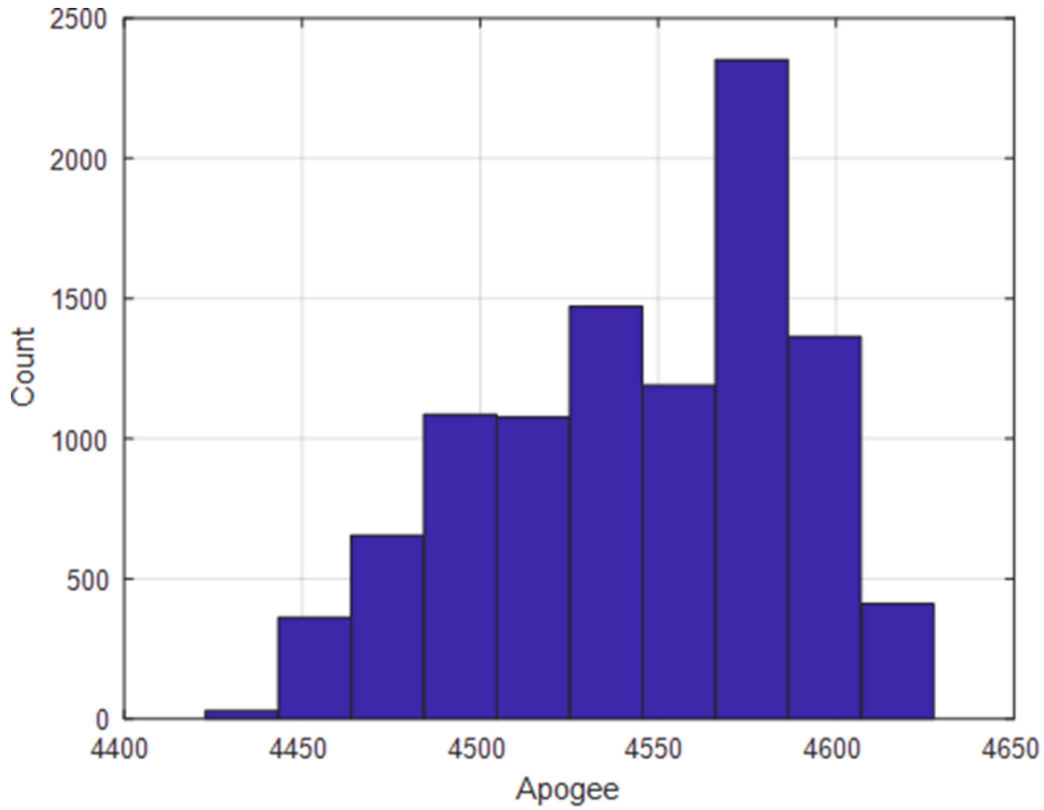


Preliminary Motor Selection

- Motor: Aerotech K1000
- Propellant Mass: 1234 g
- Impulse: 2512 Ns
- Maximum Thrust: 1674 N
- Thrust to Weight Ratio: 9.04:1



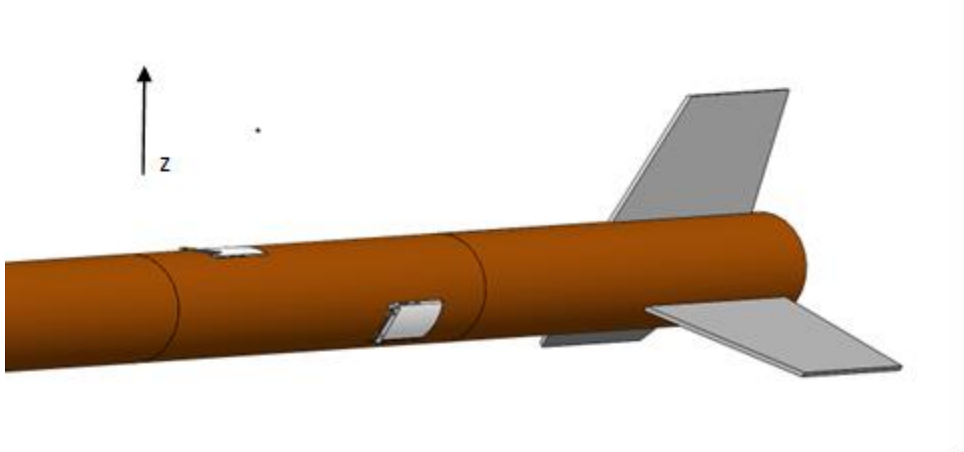
Monte Carlo Simulations: Altitude

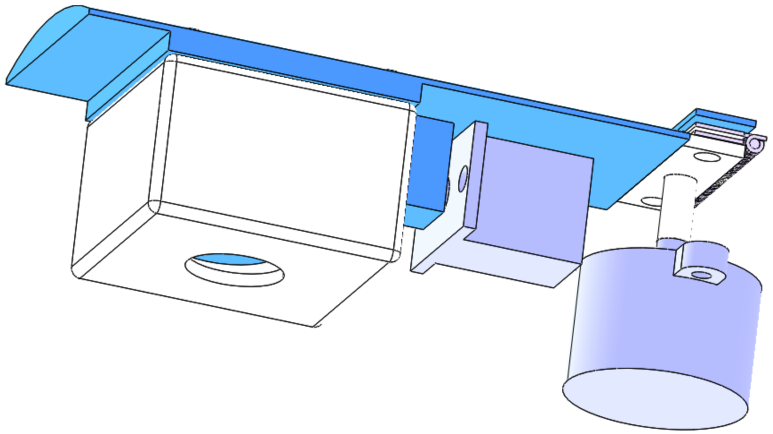


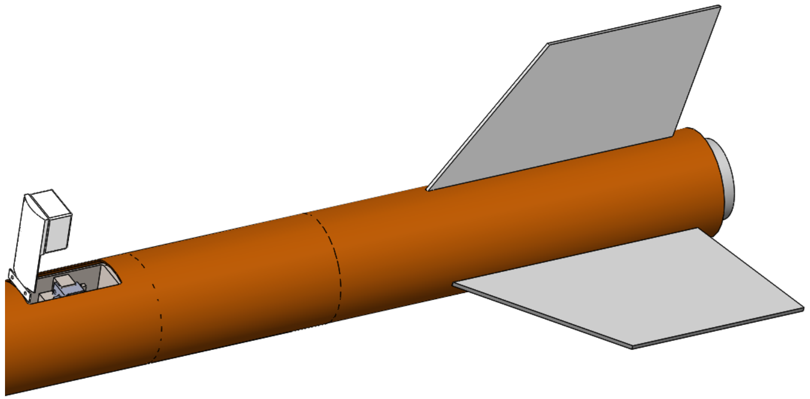
Monte Carlo Simulation: Altitude			
Launch Angle	Wind Condition	Probability Weight	Predicted Average Altitude (ft)
0	0 mph	5%	4670
5 deg	5 mph	10%	4646
5 deg	10 mph	70%	4620
10 deg	15 mph	10%	4459
10 deg	20 mph	5%	4444
Most Probable Altitude			**4600 ft**

Payload Design Overview

- Detect launch & landing by IMU and Barometer
- Unlock camera facing up by IMU data (one will always face up)
- Receive commands from SDR dongle
- Rotate camera by using stepper motor

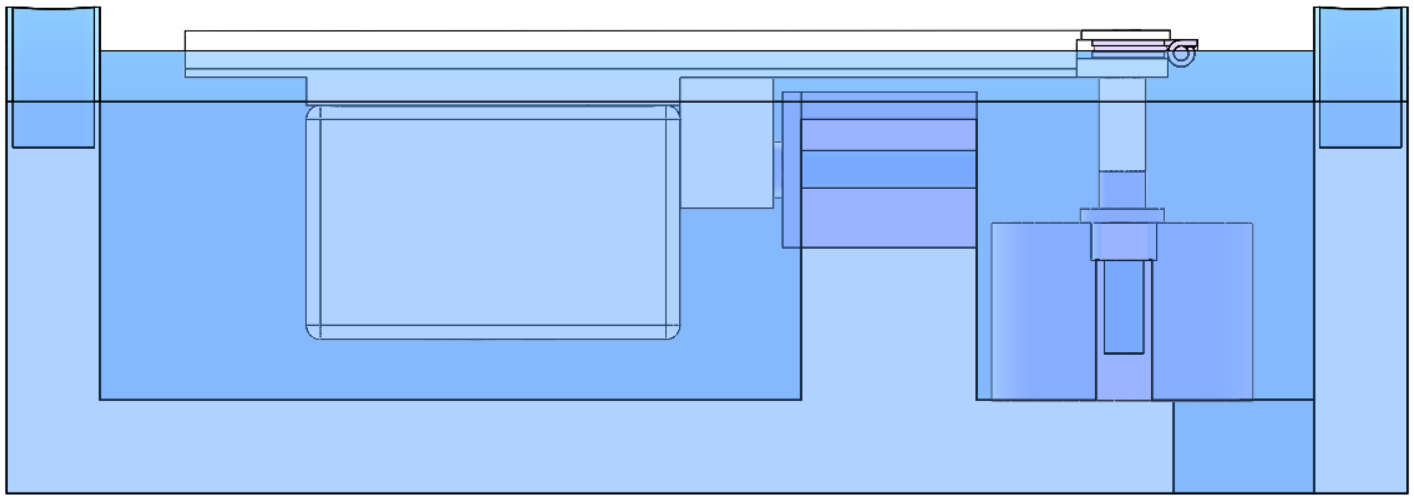


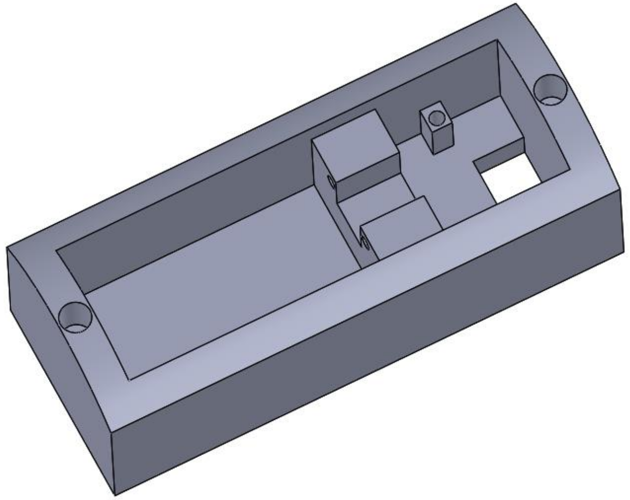




Payload Retention System

The payload is enclosed by housing that is screwed on to the airframe with threaded inserts.



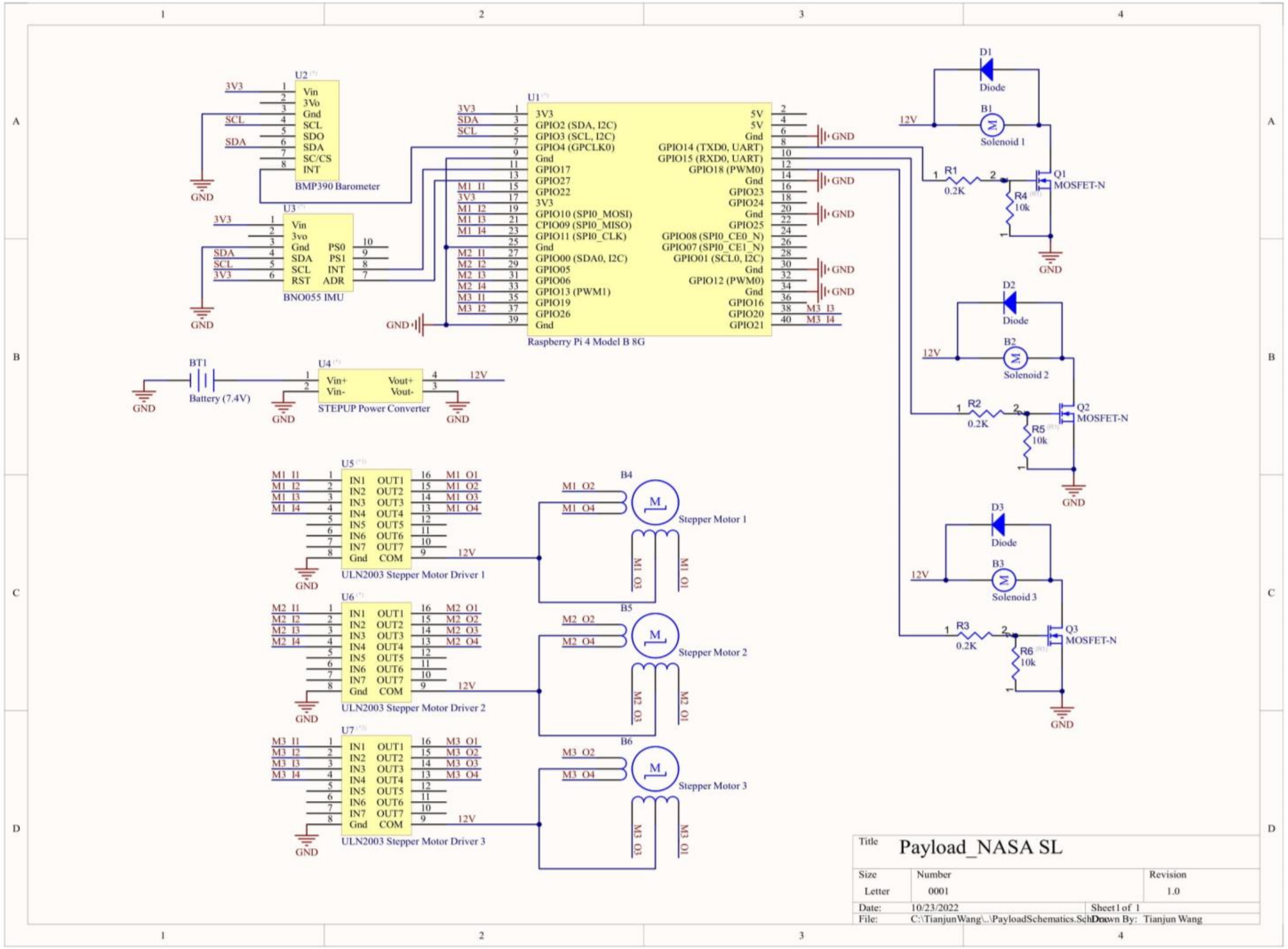


Preliminary Payload Electronic Design

Microprocessor
- Raspberry Pi 4 8GB RAM

Sensors
- BNO055 IMU (launch & orientation)
- BMP390 Barometer (redundancy)
- 8MP USB2.0 FOV150 Cameras
- SDR Dongle

Actuators
- 4.5mm Stroke Solenoids
- 28BYJ-48 Stepper Motors
- Separate Power Supply



Preliminary Payload Software Design

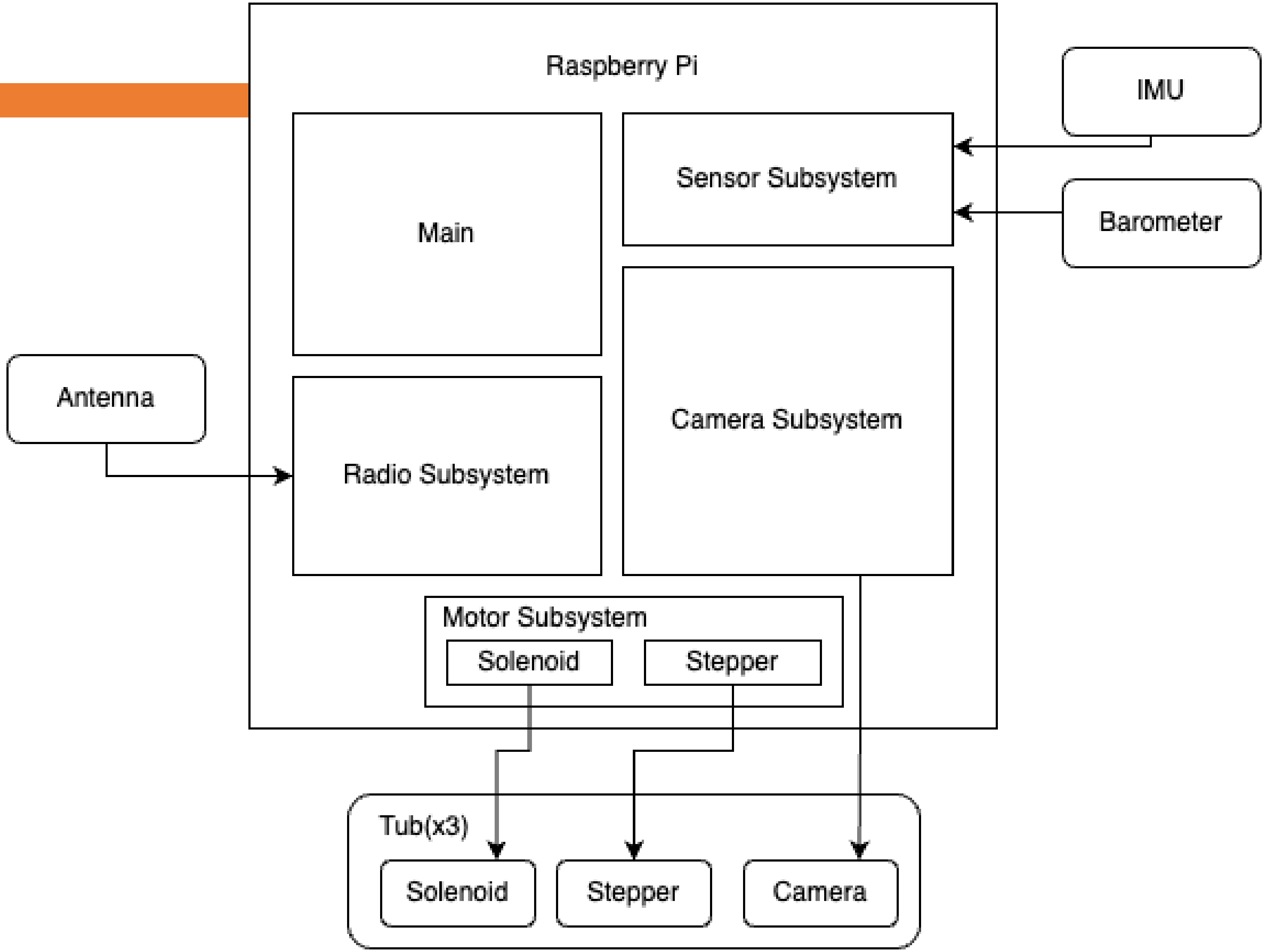
All payload operations will be controlled by the primary payload computer.

Flight Computer: Raspberry PI

Software System Inputs: Radio (Antenna), IMU, Barometer

Software System Outputs: Solenoid, Stepper Motor, Camera

Four Software Subsystems: Sensor, Radio, Camera, Motor



Personnel Hazards Analysis

	Severity (S)	Likelihood (L)
1, 2	Little to no equipment damage/very minor or no injury	1-20% occurrence, very unlikely
3, 4	Minor equipment damage/minor injury	21-40% occurrence, unlikely
5, 6	Moderate equipment damage/mild injury	41-60% occurrence, uncertain likelihood
7, 8	Major equipment damage/mild to major injury	61-80% occurrence, likely
9, 10	Irreparable equipment damage/major injury or death of personnel	81-100% occurrence, very likely

		Likelihood									
		1	2	3	4	5	6	7	8	9	10
Severity	1	1	2	3	4	5	6	7	8	9	10
	2	2	4	6	8	10	12	14	16	18	20
	3	3	6	9	12	15	18	21	24	27	30
	4	4	8	12	16	20	24	28	32	36	40
	5	5	10	15	20	25	30	35	40	45	50
	6	6	12	18	24	30	36	42	48	54	60
	7	7	14	21	28	35	42	49	56	63	70
	8	8	16	24	32	40	48	56	64	72	80
	9	9	18	27	36	45	54	63	72	81	90
	10	10	20	30	40	50	60	70	80	90	100

Hazard	Cause	Effect	S	L	Score	Mitigation Strategy
All-purpose cement contact	Exposure to fumes	Dizziness	5	1	5	Use of PPE per MSDS in well-ventilated areas
All-purpose cement ignites	Liquid form exposed to heat source	Burns, inhalation of smoke	8	2	16	Keep in well-ventilated, cool storage. Keep away from heat sources/oxidizers
Cleaning agent contact	Use of cleaning agents	Irritation, possible blindness if sprayed in eyes	4	4	16	Use of PPE per MSDS
Epoxy contacts skin	Exposure of skin to epoxy	Skin irritation	5	6	30	Use of PPE per MSDS when handling epoxy
Gelcoat compound ignites	Liquid form exposed to heat source	Burns ranging from 1st to 3rd degree, smoke inhalation	9	2	18	Keep in well-ventilated, cool storage. Keep away from heat sources/oxidizers
Gelcoat fume inhalation	Prolonged toxic fume exposure	Dizziness	4	1	4	Use of PPE per MSDS in well-ventilated areas
Paint thinner contact	Spills, accidental touch with bare skin	Irritation, possible blindness if sprayed in eyes	7	1	7	Use of PPE per MSDS. Keep lid closed when not in use
Paint thinner ignites	Liquid form exposed to heat source	Burns ranging from 1st to 3rd degree, smoke inhalation	9	2	18	Keep in well-ventilated, cool storage. Keep away from heat sources/oxidizers
Spray paint can explodes	Compressed gas in paint can exposed to heat	Hearing damage and lacerations or organ damage from debris	9	1	9	Use of PPE per MSDS, keep spray paint can away from heat sources

Failure Modes and Effects Analysis

	Severity (S)	Likelihood (L)	Detection (D)
1, 2	Little to no effect on flight/little to no equipment damage	1-20% occurrence, very unlikely	81-100% detection chance, very likely detection
3, 4	Slight effect on flight/minor equipment damage	21-40% occurrence, unlikely	61-80% detection chance, likely detection
5, 6	Moderate effect on flight/moderate equipment damage	41-60% occurrence, uncertain likelihood	41-60% detection chance, uncertain detection
7, 8	Major effect on flight/major equipment damage	61-80% occurrence, likely	21-40% detection chance, unlikely detection
9, 10	Complete vehicle loss/irreparable equipment damage	81-100% occurrence, very likely	1-20% detection chance, very unlikely detection

RPN Score

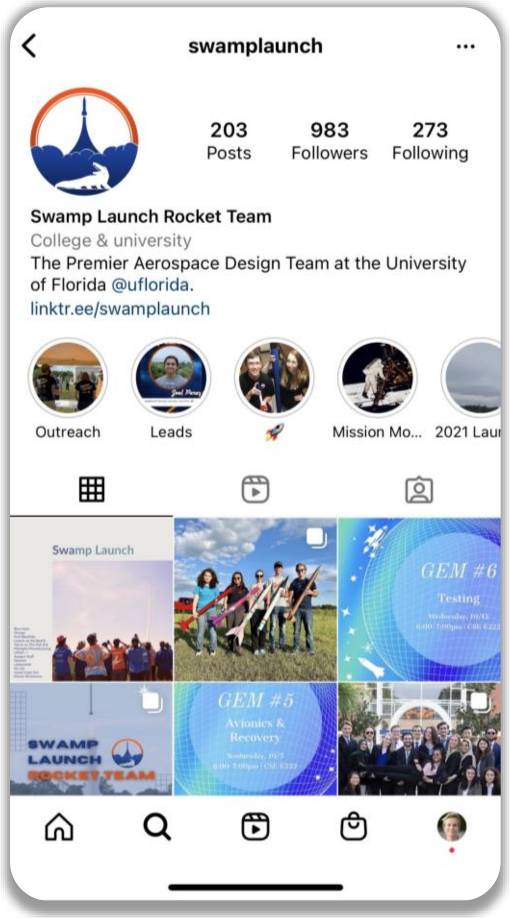
1-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901+

Component	Function	Failure Mode	Failure Cause	Failure Effects		
				Local Effects	Next Higher Level	System Effects
Propellant	Generates thrust to propel the rocket.	Propellant Failure	Grain Defects, Improper storage, Water Damage.	Improper propellant burn.	Abrupt changes in thrust.	The launch vehicle has unpredictable trajectory/flight, or the rocket doesn't take off. Additional risks of over pressuring.
Nozzle	Controls the mass flow rate of the propellant burn.	Nozzle Deformation	Structural failure of the nozzle.	The nozzle exit area, nozzle exhaust pressure, and the mass flow rate change.	Abrupt changes in the thrust vector, and impulse.	The launch vehicle has an altered trajectory creating potential danger to bystanders
Motor Case (including the forward and aft closures)	Encloses the propellant grain and maintains pressure.	Case Deformation	Structural failure of the motor case including the forward or aft enclosures.	Internal pressure is not maintained, and propellant interacts with other components.	Motor assembly is damaged, and integrity of the motor and launch vehicle are compromised.	The launch vehicle is prone to having an unpredictable flight.
Motor Tube	Encloses the motor assembly in the correct position.	Motor Tube is dislodged.	Structural failure of the motor tube.	The motor case is not held in the correct position.	Risk of motor case forced through the launch vehicle, and misaligned thrust vector.	The launch vehicle is damaged, and the flight trajectory is altered.
Motor Retainer	Retains the motor inside the rocket.	Motor Retainer cracks or breaks.	Structural failure of the motor retainer or unfastened screws.	The motor case assembly is not held in place.	Risk of motor case assembly forced through the launch vehicle.	The launch vehicle is damaged, and the motor's function is lost.
Thrust Plate	Transfers the thrust from through the centering rings and to the airframe.	Thrust Plate cracks or breaks.	Structural failure of the thrust plate.	The integrity of the centering rings and the airframe are compromised.	Centering rings are damaged, and risk of damage to airframe.	The launch vehicle is damaged, and the flight trajectory is altered.

Component	S[1]	L[2]	D[3]	RPN[4]	Corrective Actions
Propellant	9	3	4	108	Ensure the integrity of the propellant grains by visually checking for defects. Store motors in a Climate Regulated room, and handle with care.
Nozzle	9	3	5	135	Ensure defects are not present on the nozzle by visually checking for them. Always handle the nozzle with care.
Motor Case (including the forward and aft closures)	7	2	8	112	Ensure the integrity of the case by visually inspecting for defects. Always handle the motor case with care, and always have a protective cover over the casing until launch.
Motor Tube	6	3	6	108	Ensure the alignment of the tube by visually inspecting for defects. Always handle the motor tube with care.
Motor Retainer	7	4	7	196	Ensure the motor is retained by tightening the screws.
Thrust Plate	5	4	7	140	Ensure the thrust plate is properly fastened by visually inspecting for defects. Always handle the thrust plate with care.

Requirements Compliance Plan – General & Safety

- General
  - Educational Engagement Sub-team
  - Social Media
- Safety
  - Safety Plan



Requirements Compliance Plan - Vehicle

6.2.1 Vehicle Testing Plan

Test ID	Title	Overview of Procedure	Rationale	Required Materials
LV-MS-1	Airframe Material Compression Test	Use Instron UTM to experimentally determine maximum compressive strength of a section of airframe.	Ensure that airframe material is capable of withstanding compressive forces during flight and landing.	Instron UTM, airframe material sample
LV-MS-2	Fin Material Bend Test	Use Instron UTM to experimentally determine maximum flexural strength of a sample of fin material through a four-point flexural test.	Ensure fin material is capable of withstanding forces from ground impact upon landing.	Instron UTM, fin material sample
LV-MS-3	Bulkhead Material Strength Test	Use Instron UTM to experimentally determine maximum tensile strength of bulkhead and eyebolt assembly.	Ensure bulkhead assembly is capable of withstanding force of parachute ejection	Instron UTM, bulkhead material, eyebolt
LV-MS-4	Epoxy Strength Test	Use Instron UTM to experimentally determine maximum shear strength of epoxy through a lap shear test.	Ensure epoxy is capable of withstanding forces of vehicle operation.	Instron UTM, epoxy, material sample
LV-MS-5	Recovery Harness Knot Efficiency Test	Use Instron UTM to experimentally determine the efficiency of several knots used to secure recovery harness to eyebolts.	Ensure recovery harness attachments are capable of withstanding force of parachute ejection.	Instron UTM, recovery harness material sample
LV-MS-6	Recovery Harness Material Strength Test	Use Instron UTM to experimentally determine maximum yield strength of recovery harness material.	Ensure recovery harness material is capable of withstanding force of parachute ejection.	Instron UTM, recovery harness material sample
LV-MS-7	Airframe Material Impact Resistance Test	Drop section of airframe from a height that simulates flight recovery conditions.	Ensure airframe is capable of withstanding forces during vehicle recovery.	Airframe material sample
LV-MS-8	Bulkhead Impact Resistance Test	Drop a bulkhead attached to a weighted airframe from a height that simulates flight recovery conditions.	Ensure bulkheads are capable of withstanding forces during vehicle recovery.	Airframe material sample, bulkhead

NASA

- Design
  - Motor choice
  - Vehicle prohibitions
- Simulations
  - Apogee
  - Stability
- Testing
  - Idle time
  - Launch preparation

Team

- Testing
  - Payload compressive strength

Requirements Compliance Plan - Recovery

6.2.1 Vehicle Testing Plan

Test ID	Title	Overview of Procedure	Rationale	Required Materials
LV-MS-1	Airframe Material Compression Test	Use Instron UTM to experimentally determine maximum compressive strength of a section of airframe.	Ensure that airframe material is capable of withstanding compressive forces during flight and landing.	Instron UTM, airframe material sample
LV-MS-2	Fin Material Bend Test	Use Instron UTM to experimentally determine maximum flexural strength of a sample of fin material through a four-point flexural test.	Ensure fin material is capable of withstanding forces from ground impact upon landing.	Instron UTM, fin material sample
LV-MS-3	Bulkhead Material Strength Test	Use Instron UTM to experimentally determine maximum tensile strength of bulkhead and eyebolt assembly.	Ensure bulkhead assembly is capable of withstanding force of parachute ejection	Instron UTM, bulkhead material, eyebolt
LV-MS-4	Epoxy Strength Test	Use Instron UTM to experimentally determine maximum shear strength of epoxy through a lap shear test.	Ensure epoxy is capable of withstanding forces of vehicle operation.	Instron UTM, epoxy, material sample
LV-MS-5	Recovery Harness Knot Efficiency Test	Use Instron UTM to experimentally determine the efficiency of several knots used to secure recovery harness to eyebolts.	Ensure recovery harness attachments are capable of withstanding force of parachute ejection.	Instron UTM, recovery harness material sample
LV-MS-6	Recovery Harness Material Strength Test	Use Instron UTM to experimentally determine maximum yield strength of recovery harness material.	Ensure recovery harness material is capable of withstanding force of parachute ejection.	Instron UTM, recovery harness material sample
LV-MS-7	Airframe Material Impact Resistance Test	Drop section of airframe from a height that simulates flight recovery conditions.	Ensure airframe is capable of withstanding forces during vehicle recovery.	Airframe material sample
LV-MS-8	Bulkhead Impact Resistance Test	Drop a bulkhead attached to a weighted airframe from a height that simulates flight recovery conditions.	Ensure bulkheads are capable of withstanding forces during vehicle recovery.	Airframe material sample, bulkhead

NASA

- Design
  - Separate avionics bay
  - Electronics selection
- Testing
  - Parachute drag
  - Altimeter accuracy
  - Ejections
  - Interference

Team

- Simulations
  - Descent rate
- Design
  - Recovery harness
- Testing
  - Parachute packing

Requirements Compliance Plan - Payload

NASA

- Design
  - Camera selection
- Testing
  - Radio testing
  - Software unit testing

Team

- Testing
  - Acceleration
  - Landing detection
  - Camera arm
  - Battery life

6.2.2 Payload Testing Plan

Test ID	Title	Overview of Procedure	Rationale	Required Materials
P-CF-1	Raspberry Pi Functionality Demonstration	Connect keyboard, mouse, and monitor to Raspberry Pi and confirm that it is fully functional.	Ensure Raspberry Pi can run necessary commands.	Raspberry Pi, laptop
P-CF-2	Camera Functionality Demonstration	Instruct camera to take a photo.	Ensure camera is responsive to commands.	Camera, Raspberry Pi, software
P-CF-3	Radio Reception Test	Transmit radio instructions to payload receiver and determine if instructions were received.	Ensure payload can successfully receive transmissions.	Radio, Raspberry Pi
P-CF-4	Image Manipulation Software Unit Test	Manipulate images in required ways (rotate, apply filters) using software.	Ensure payload software can execute required image manipulation commands.	Payload software
P-CF-5	Latch Release Test	Instruct solenoid to release the latch securing the camera assembly inside the payload.	Ensure solenoid is responsive to software commands and has sufficient power to release latch.	Latch assembly, Raspberry Pi, software
P-CF-6	Camera Rotation Test	Instruct motor to rotate camera around z-axis through software.	Ensure that camera can be rotated through software commands.	Camera assembly, Raspberry Pi, software
P-CF-7	Camera Deployment Test	Initiate camera deployment through software commands.	Ensure that camera can be successfully deployed from the payload housing.	Payload assembly
P-CF-8	IMU Accuracy Test	Record IMU readings for several acceleration scenarios and compare to correct values.	Ensure IMU yields accurate readings for use by payload systems.	IMU
P-SI-1	Raspberry Pi Camera Integration Test	Perform multiple commands on Raspberry Pi to take photos using cameras.	Ensure that Raspberry Pi can interface with the cameras.	Cameras, Raspberry Pi

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Thank you!