

NG Super Sonic Rocket 100% Build Update

Presenters: Austin Paothatat, Avery Charley, Koi Quiver,
Lindsey Dineyazhe



Figure 1: Two stage rocket
University of Sheffield [1]

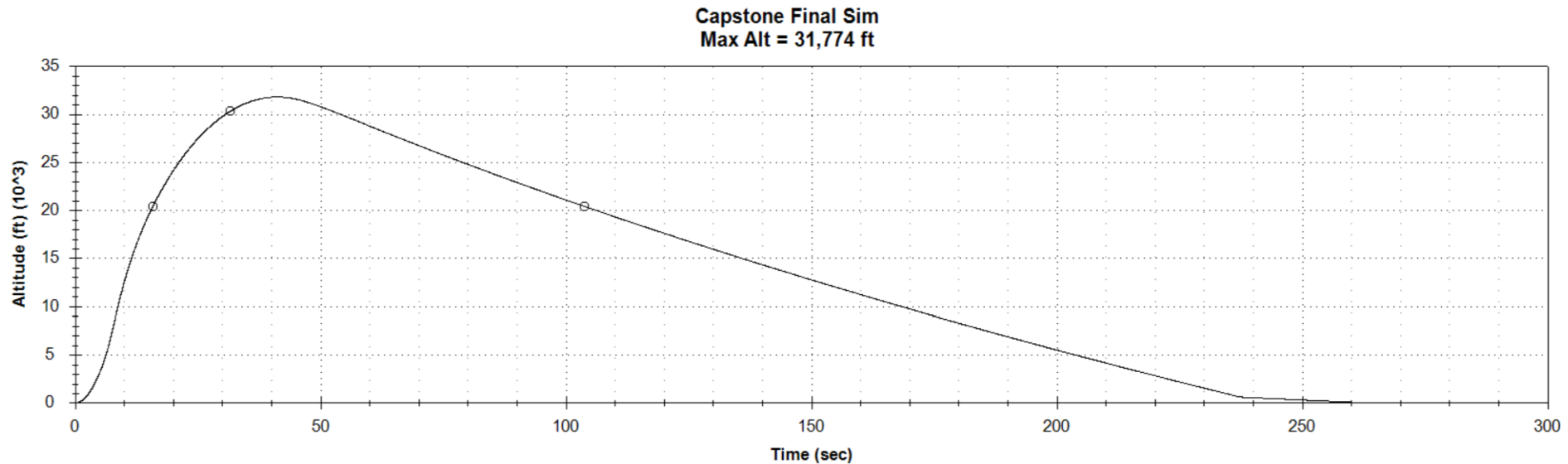
Design Effort

- Fin Dimension
 - Increased Surface Area to Increase Stability Margin for Supersonic Flight
 - Fin Span was Increased to 7"
- Separation System Design
 - 100% Manufactured in NAU Machine Shop
- Full Vehicle Design is 100% Completed
 - Continue Updating Simulation Files with Full Vehicle Weight

Design Effort

- Simulations

- Predicted altitude- 31,774' AGL
- Predicted Velocity- 2,267 ft/s, Mach 2.015
- Predicted Acceleration- 13.55 G Maximum



Bill of Materials (BOM) (1/2)

SUBSYSTEM	ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY.	PRICE (\$)	TOTAL PRICE (\$)	ACQUISITION METHOD	PRIMARY VENDOR
NOSECONE	1	1	Nose Cone Shell	Carbon Fiber	1	N/A	N/A	Manufacture	NovaKinetics
	2		Nose Cone Coupler	Carbon Fiber	1	N/A	N/A	Manufacture	NovaKinetics
	3		Nose Cone Bulkhead	6061 Aluminum	1	N/A	N/A	Manufacture	IMS
	4		eyebolt-type2_ai	Steel	1	N/A	N/A	Donated	NAU Rocket Club
	5		Metal Nose Cone Tip	Steel	1	N/A	N/A	Donated	NAU Rocket Club
	6	92949A347	Button Head Hex Drive Screw	18-8 SS	2	\$3.79	\$3.79	Order	McMaster Carr
BODY	7		2nd Stage Body Tube (50in. X 6.17in.)	Carbon Fiber	1	N/A	N/A	Manufacture	NovaKinetics
	8		Payload Body Tube	Carbon Fiber	1	N/A	N/A	Manufacture	NovaKinetics
	9		Lower Body Tube	Carbon Fiber	1	N/A	N/A	Manufacture	NovaKinetics
FIN CANISTERS	10		Aft End Centering Ring with Sep Brace	6061 Aluminum	2	N/A	N/A	Manufacture	IMS
	11		Centering Ring	6061 Aluminum	4	N/A	\$88.65	Manufacture	IMS
	12		Fin Bracket	6062 Aluminum	6	N/A	N/A	Manufacture	IMS
	13		Corner Bracket	6063 Aluminum	24	N/A	N/A	Manufacture	IMS
	14	92095A196	M4 Button Head Hex Drive Screw	Passivated 18-8 Stainless Steel	36	\$8.69	\$17.38	Order	McMaster Carr
	15	91263A516	Hex Drive Flat Head Screw	Zinc-Plated Alloy Steel	26	\$8.82	\$17.64	Order	McMaster Carr
	16	94645A101	M4 Nylon Lock Nut	Zinc-Plated Steel	60	\$14.05	\$28.10	Order	McMaster Carr
	17	94645A210	M8 Nylon Lock Nut	Zinc-Plated Steel	6	\$11.16	\$11.16	Order	McMaster Carr
	18	91292A213	18-8 Stainless Steel	Stainless Steel	12	\$7.94	\$23.82	Order	McMaster Carr
	19	1556A65	Stainless Steel Bracket	Stainless Steel	18	\$2.59	\$2.59	Order	McMaster Carr
	20	97483A095	Aluminum Flush Mount Rivets	6061 Aluminum	32	\$15.35	\$15.35	Order	McMaster Carr
	21		Fin	Carbon Fiber	6	\$340.21	\$340.21	Order	Composite Envisions
	22		2nd Stage End Cap	6061 Aluminum	1	N/A	N/A	Manufacture	IMS

Bill of Materials (BOM)

AVIONICS	23		Avionics Coupler 2nd Stage	Steel	1	N/A	N/A	Manufacture	NAU Rocket Club
	24		Avionics Bulkhead	6061 Aluminum	2	N/A	N/A	Manufacture	NAU Rocket Club
	25		flat washer type a narrow_ai	6062 Aluminum	12	N/A	N/A	Donated	NAU Rocket Club
	26		eyebolt-type2_ai	Steel	2	N/A	N/A	Donated	NAU Rocket Club
	27		Avionics Sled (3D Printed)	3D Polymer	2	N/A	N/A	Manufacture	
	28		Raven 4 v9		4	N/A	N/A	Donated	NAU Rocket Club
	29		GPS Tracker v15		2	N/A	N/A	Donated	NAU Rocket Club
	30	92001A321	18-8 Stainless Steel Wing Nut	18-8 SS	8	N/A	N/A	Donated	NAU Rocket Club
	31	90322A657	High-Strength Steel Threaded Rod	Steel	4	N/A	N/A	Donated	NAU Rocket Club
	32		Switch Band	Carbon Fiber	1	N/A	N/A	Donated	NAU Rocket Club
	33		hex thick nut_ai	Steel	2	N/A	N/A	Donated	NAU Rocket Club
RECOVERY	34		Main Parachute	Nylon	1	N/A	N/A	Donated	NAU Rocket Club
	35		Drogue, Booster	Nylon	1	N/A	N/A	Donated	NAU Rocket Club
	36		Drogue, SS	Nylon	1	N/A	N/A	Donated	NAU Rocket Club
	37		Main parachute, Booster	Nylon	1	N/A	N/A	Donated	NAU Rocket Club
	38		Aerotech 98/15360 Motor casing	6061 Aluminum	2	N/A	N/A	Donated	NAU Rocket Club
	39		Aerotech N1000W	Propellant	1	\$1,257.99	\$1,257.99	Order	Aerotech
	40		Aerotech N3300R	Propellant	1	\$1,153.99	\$1,302.69	Order	Aerotech
	41		Shock Cord 8800lbs	Kevlar	2	N/A	N/A	Donated	NAU Rocket Club
	42		Tender Decender	6061 Aluminum	2	N/A	N/A	Donated	NAU Rocket Club
				Total Parts Needed	352			Total Parts Received	349
SEPERATION SYSTEM OMITTED DUE TO NDA BUT INCLUDED IN FINAL CALCULATIONS				Total Cost (\$):	\$3,314.18		Parts On Hand (%)		99.15%
				Total Spent	\$3,503.30		Assembled (%)		95.00%



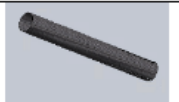




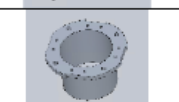
Purchasing Plan

ITEM NO.	PART	DESCRIPTION	QUANTITY	PRICE	TOTAL UNIT PRICE	VENDOR	STATUS	RESOURCE
1	92949A347	Button Head Hex Drive Screw	2	\$ 3.79	\$ 3.79	McMaster Carr		https://www.mcmaster.com
2	92095A196	M4 Button Head Hex Drive Screw	36	\$ 8.69	\$ 17.38	McMaster Carr		https://www.mcmaster.com
3	91294A193	Hex Drive Flat Head Screw	26	\$ 8.82	\$ 17.64	McMaster Carr		https://www.mcmaster.com
4	94645A101	M4 Nylon Lock Nut	60	\$ 14.05	\$ 28.10	McMaster Carr		https://www.mcmaster.com
5	94645A210	M8 Nylon Lock Nut	6	\$ 11.16	\$ 11.16	McMaster Carr		https://www.mcmaster.com
6	91292A213	18-8 Stainless Steel	12	\$ 7.94	\$ 23.82	McMaster Carr		https://www.mcmaster.com
7	1556A65	Stainless Steel Bracket	18	\$ 2.59	\$ 2.59	McMaster Carr		https://www.mcmaster.com
8	97483A095	Aluminum Flush Mount Rivets	32	\$ 15.35	\$ 15.35	McMaster Carr		https://www.mcmaster.com
9	flat washer type a narrow_a	flat washer type a narrow_ai	12	N/A	N/A	Donated		NAU Rocket Club
10	eyebolt-type2_ai	eyebolt-type2_ai	3	N/A	N/A	Donated		NAU Rocket Club
11	Raven 4 v9	Flight altimeter	4	N/A	N/A	Donated		NAU Rocket Club
12	GPS Tracker v15	GPS Tracker v15	2	N/A	N/A	Donated		NAU Rocket Club
13	92001A321	18-8 Stainless Steel Wing Nut	8	N/A	N/A	Donated		NAU Rocket Club
14	90322A657	High-Strength Steel Threaded Rod	4	N/A	N/A	Donated		NAU Rocket Club
15	Switch Band	Switch Band	1	N/A	N/A	Donated		NAU Rocket Club
16	Hex thick nut_ai	Hex thick nut_ai	2	N/A	N/A	Donated		NAU Rocket Club
17	rocket_cone_tip	Metal nose cone tip	1	N/A	N/A	Donated		NAU Rocket Club
18		Main Parachute	1	N/A	N/A	Donated		NAU Rocket Club
19		Drogue, Booster	1	N/A	N/A	Donated		NAU Rocket Club
20		Drogue, SS	1	N/A	N/A	Donated		NAU Rocket Club
21		Main parachute, Booster	1	N/A	N/A	Donated		NAU Rocket Club
22		Aerotech 98/15360 Motor casing	2	N/A	N/A	Donated		NAU Rocket Club
23		Shock Cord 8800lbs	2	N/A	N/A	Donated		NAU Rocket Club
24		Tender Decender	2	N/A	N/A	Donated		NAU Rocket Club
25	Carbon Fiber	2 x 2 Twill (24" x 36" x 0.122")	1	N/A	N/A	Donated		Novakinetics
26		Carbon fiber fins	6	\$ 340.21	\$ 340.21	Composite Envisions		
27	Motor_1	Aerotech N1000W (Propellant)	1	\$ 1,257.99	\$ 1,257.99	Aerotech		https://wildmanrocketry.com
28	Motor_2	Aerotech N3300R (Propellant)	1	\$ 1,153.99	\$ 1,302.69	Aerotech		https://wildmanrocketry.com
		Total Items:	302	Total Required:	\$ 3,314.18	Cost Percent Purchased:		22.74%
		Total Aquired:	299	Total Purchased:	\$ 3,503.30	Percent Donated:		15.89%
						Total Percent Aquired:		99.01%


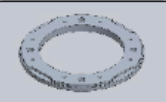


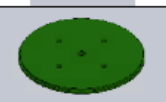
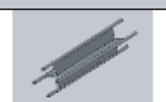
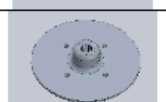
Budget

Funding/Expense	Description	Amount
Client Funding	Northrop Grumman	+\$7,000
Fundraising	Donations, GoFundMe	+\$938.78
First Semester Expenses	Prototype	-\$191.05
Second Semester Expenses	Hardware, material, PPE, tools, motors	-\$3,312.25
Future Expenses	Travel, +reimbursements	~\$1,500
Total Remaining:		\$1,864.52

Manufacturing Plan (1/2)

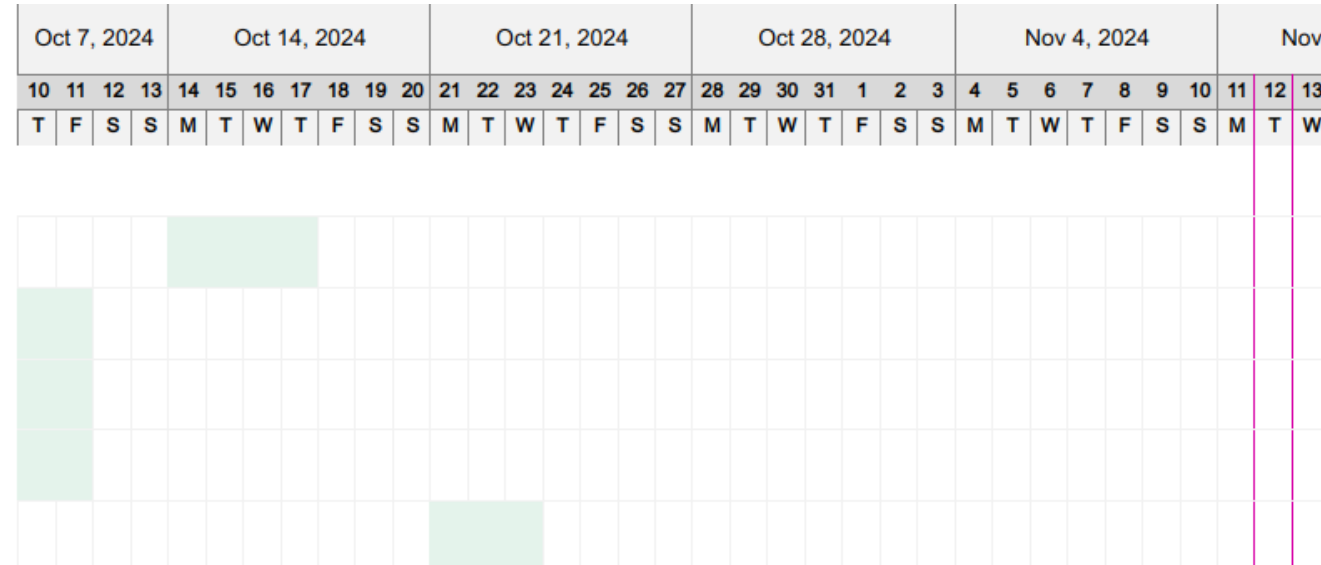
SUB-SYSTEM	ITEM NO.	DESCRIPTION	MATERIAL	MANUFACTURING LOCATION	MANUFACTURER	TIME (hr.)	IMAGE	QTY.	TOTAL TIME	QTY COMPLETED	COMPLETED TIME
Nose Cone	1	Nose Cone (26 in. x 6.17 in.)	Carbon Fiber	Novakinetics	Avery / Lindsey	48		1	48	1	48
Internal	2	Couplers	Carbon Fiber	Novakinetics	Avery / Lindsey	16		3	48	3	48
Body	3	2nd Stage Body Tube (50 in. x 6.17 in.)	Carbon Fiber	Novakinetics	Avery / Lindsey	48		1	48	1	48
	4	Payload Body Tube (40 in. x 6.17 in.)	Carbon Fiber	Novakinetics	Avery / Lindsey	48		1	48	1	48
	5	Lower Body Tube (50 in. x 6.17 in.)	Carbon Fiber	Novakinetics	Avery / Lindsey	48		1	48	1	48
Fin Canister (2nd & Booster)	6	Fins	Carbon Fiber	Composite Envisions	Avery / Lindsey	1		6	6	6	6
	7	Fin Brackets	Al (6061)	Engineering Workshop	Koi Quiver / Austin	3		8	24	8	24
	8	Aft End Centering Rings	Al (6061)	Engineering Workshop	Koi Quiver / Austin	2		1	2	1	2

Manufacturing Plan (2/2)

	9	Centering Ring	Al (6061)	Engineering Workshop	Koi Quiver / Austin	2		4	8	4	8	
	10	2nd Stage End Cap	Al (6061)	Engineering Workshop	Koi Quiver / Austin	2		1	2	1	2	
	11	Corner Bracket (1)	Al (6061)	Engineering Workshop	Koi Quiver / Austin	0.5		24	12	24	12	
	12	Corner Bracket (2)	Al (6061)	Engineering Workshop	Koi Quiver / Austin	0.5		36	18	36	18	
Avionics	13	Avionics Bulkhead	Al (6061)	Engineering Workshop	Austin	0.5		4	2	4	2	
	14	Avionics Sled	3D Print	Engineering Workshop	Austin	6		2	12	2	12	
	15	Avionics 2nd Stage Aft Bulkhead	Al (6061)	Engineering Workshop	Austin	1		1	1	1	1	
								Total	94	327	94	327
								Completed Manufacturing (%)	100.00%			
								Manufacturing Time (%)	100.00%			

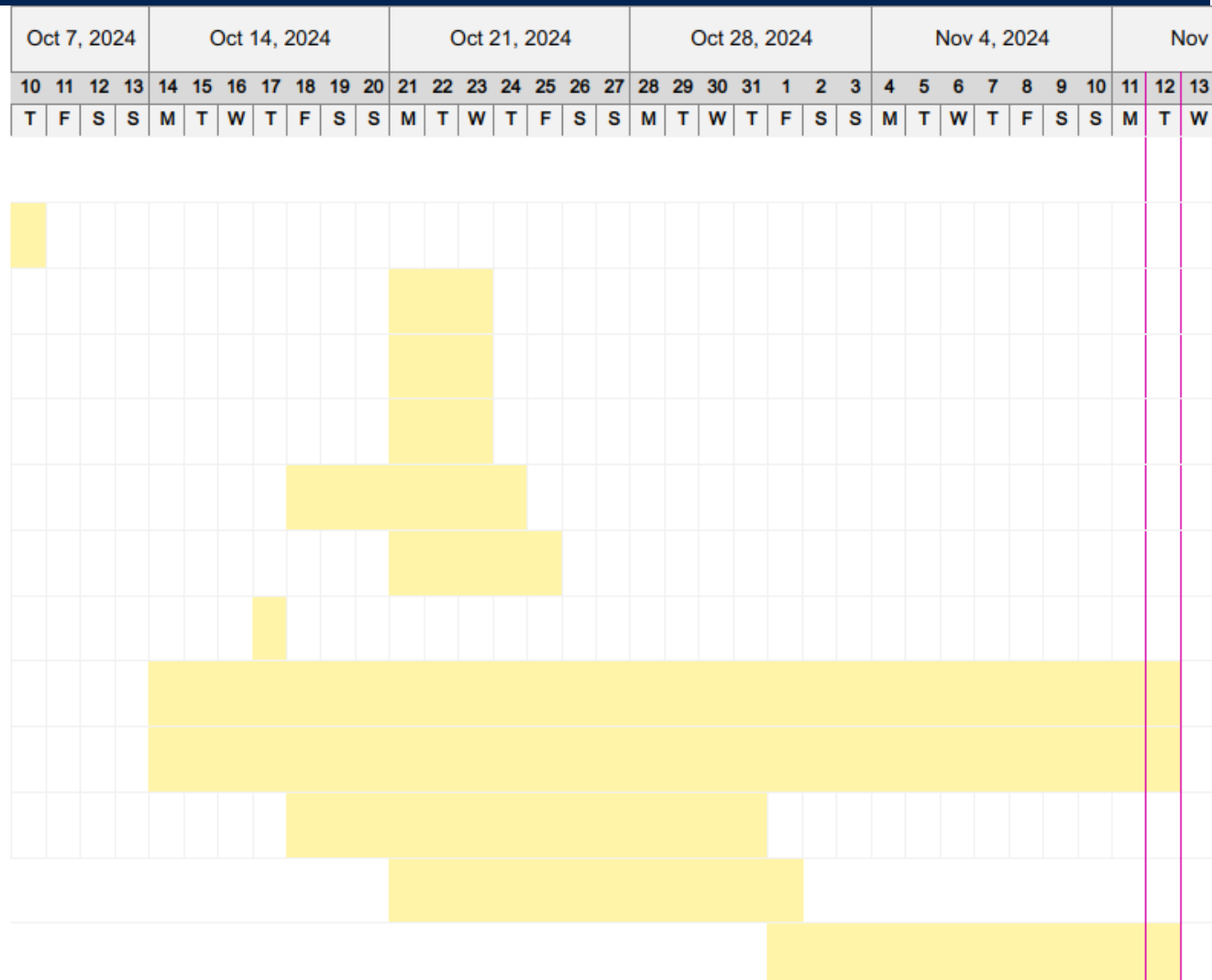
Gantt Chart Updates

TASK	ASSIGNED TO	PROGRESS	START	END
Stage 2				
Hardware Status Update - 67% Build	Team	100%	10/14/24	10/17/24
Assembly hardware Procurement	Lindsey, Avery	100%	10/9/24	10/11/24
Parachute 1 Initial Procurement	Linsdey, Avery	100%	10/9/24	10/11/24
Parachute 2 Initial Procurement	Lindsey, Avery	100%	10/9/24	10/11/24
Launch Testing Plan	Team	100%	10/21/24	10/23/24

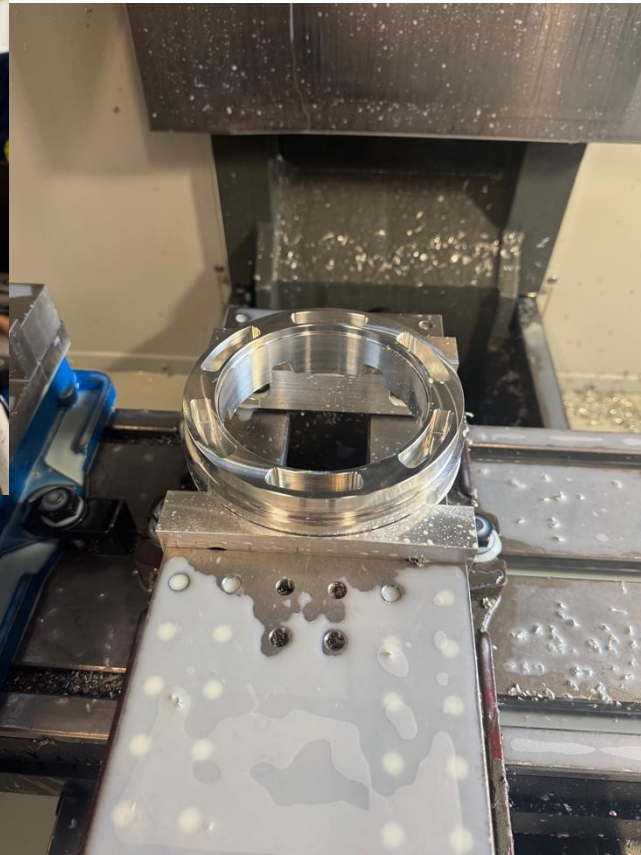
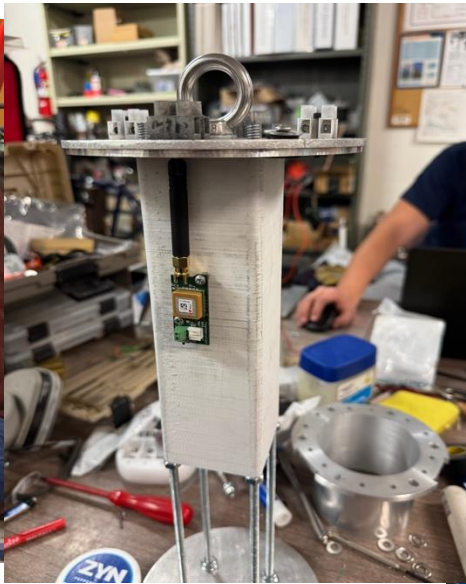


Gantt Chart Updates

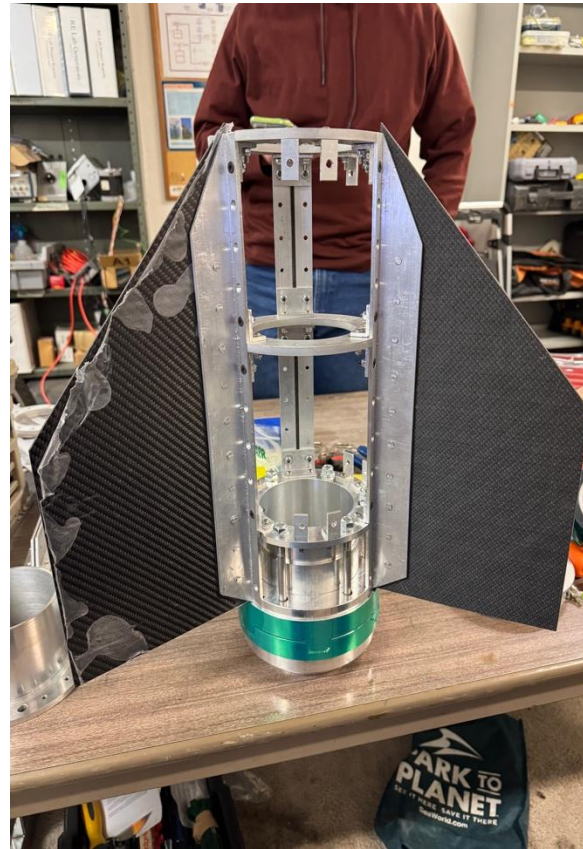
TASK	ASSIGNED TO	PROGRESS	START	END
Stage 3				
Team Staff Meeting 7	Team	100%	10/10/24	10/10/24
Assembly hardware Procurement Checkup	Lindsey, Avery	100%	10/21/24	10/23/24
Parachute 1 Procurement Checkup	Lindsey, Avery	100%	10/21/24	10/23/24
Parachute 2 Procurement Checkup	Lindsey, Avery	100%	10/21/24	10/23/24
UGRADS Registration	Team	100%	10/18/24	10/24/24
Peer Eval 2	Individual	100%	10/21/24	10/25/24
Team Staff Meeting 8	Team	100%	10/17/24	10/17/24
Booster Assembly	Team	100%	10/14/24	11/12/24
Main Rocket Assembly	Team	100%	10/14/24	11/12/24
Draft of Poster	Team	100%	10/18/24	10/31/24
Finalized Testing Plan	Team	100%	10/21/24	11/1/24
Hardware Status Update - 100% Build	Team	100%	11/1/24	11/12/24



Demonstration



Demonstration



Next Steps

- Final Poster and PPT
- Flight Hardware
 - Motors
 - Railing
- Ground Testing
 - Ejection Charge
 - Flight Computer Simulation
- Aesthetics
 - Filler
 - Paint
- Primary Launch Day – 11/17 (or Emergency Date 12/14)
- Testing Results
- Finalizing CAD

Full Launch Vehicle Assembly



- Wouldn't fit the screen, Koi for scale

Conclusion

Thank you!

Questions?