Active Rocket Controls (ARC)

Engineering Calculations

Henry Benedictus (Team Lead)

Chyler Bitsoi (CAD lead)

Emilio Huggins (Manufacturing Lead)

AislinnJoy Gacayan (Budget/Fundraising Lead)

Eric Reyes (Communications Lead)

Fall 2025-Spring 2026

Assignment Overview

Now that you've completed an entire semester of capstone, you should have a pretty good understanding of your project and how your team functions. With an eye for success, answer the following questions (do not speak in generalities, be very specific):

Reflection:

Project Management - Successes: In a bulleted list with a sentence or two introducing the list, what were the most successful things that your team did last semester with-respect-to project management and team communication?

Successes:

- **Teamwork:** The team works well together, is great with communication, and often comes together well to complete tasks and goals.
- **Eye For Improvement/Accountability:** The team recognizes areas that need to be improved on through different experiences. Whether that be from loss of points on assignments, to observing work done by other teams, and seeing where we can improve to do better. Each team member also has great accountability when it comes to individual mistakes.
- **Creating Complete Prototypes:** Prototype 1 included an initial sled test bed, 3d printing a housing capsule for a 2.66 in diameter rocket, and painting the already existing test bed. Prototype 2 consisted of 3d printing a sizable fuselage to get a physical product

to hold, using foam to make the motor rings. Also, a control mechanism was printed, which was valuable to learn what improvements need to be made for manufacturing it.

- **Successful First Test Launch:** A few team members went to the test launch in December 2025. Members learned the process of launching the rocket at the launch site with a successful launch.
- **Finishing Assignments and Project Tasks on Time:** A majority of the assignments, whether individual or team assignments, and tasks were completed in a timely manner. As well as completed to the team's best ability.
- **3D Printing Improvements:** Print iterations for prototyping revealed new CAD modeling methods and print settings, along with potential for new design ideas, leading to successful prototyping and future refined printing. GD & T research gives new insight to designing for manufacturability.
- **Fundraising:** Monetary donations through GoFundMe, material donations from other teams.
- **Reaching Out for Help:** Collaboration, sponsorships, external help and resources.
- **Report Revisions:** Dedicate time for all members to revise their respective sections in group deliverables, and peer review each other's sections

Project Management - Room for Improvements: In a bulleted list with a sentence or two introducing the list, what areas with respect to project management and team communication could your team improve upon?

<u>Future Improvements</u>

- **Design for Manufacturability:** The team recognizes that since a large quantity of the parts need to be custom made, we need to have a mind set to think of what dimensions are reasonable for production. Whether it be the cost of feasibility.

    - Some team members have taken the initiative to review GD&T guidelines.
    - We are planning to try to meet with a machinist from the NAU Machine shop to get a better understanding of design for manufacturability.
- **Better Time Management:** Even though the team did well in completing tasks on time, we have recognized that
    - Many team members completed their part on assignments, such as Report 1, last minute, and that has resulted in a lower score than desired because we did not have enough time to revise.
    - Members attend meetings regularly, but timing is inconsistent.
    - Members in conversation could stay on topic more, rather than venting on other classes, obligations, or life.
- **Improved Cohesion with Electrical Engineering Team:** Communication with EE Division has been spotty throughout Fall whether it be our mistake or their lack of transparency. Below are initiatives to make this capstone project a more cohesive collaborative effort:
    - Proposal to merge the Microsoft Teams channels for easier access to each other's deliverables.
    - Consistently share weekly agendas/minutes to, again, promote better communication between the two divisions.
    - Create a team shirt design for presentations that both ME and EE divisions wear to externalize uniformity.
- **File Management:** File organization has either been in someone's personal folder, Google Drive, or Teams. Standardizing this process will take the guesswork out of figuring out who has what file, and save time accessing files, as shown below:
    - In addition to a unified Teams channel, relay files through this platform rather than both Teams and Google Drive.
    - Any Google Drive file will be uploaded to Teams as a link to make Teams the main platform for organizing file location.
- **Full Requirements for Assignments:** Assignments in the past have been marked down for missing requirements. Below are initiatives to improve adherence to requirements that are in the interest of helping our capstone development:
    - The rubric should be incorporated into the assignment in the drafting phase to make hitting the requirements easier to reference.

- The rubric and assignment description should be more closely referenced rather than loosely referenced to ensure the start of the assignment is already in the direction of the requirements.
- Make it standard protocol to revise the assignment before submission, at least the day before. Sometimes, in past assignments, it would be a suggestion to do this more than a regular habit.

Remaining Design Efforts

- **Control Mechanism Finalization (Chyler):** Finalizing the design of the control mechanism to control the fins. Some of the parts that are needed have been ordered, which will help with the final dimension of the mechanism.
- **Fin Math Finalization (Henry):** The initial calculations have been documented and found. Needs to talk to the professor or an outside source to verify the calculations. Once a majority of the rocket parts have been ordered, the team needs to weigh all the parts, find the velocity within RockSim, and find the moment of inertia.
- **Parachute Mechanism Finalization (Aislinn Joy):** Needs to find the black powder charge within Solar Shack and work with EEs on how the black powder will ignite. Finalize the amount of black powder needed to deploy the parachute. Make charge in SolidWorks.
- **Heat Insert Finalization (Emilio):** Finding heat inserts that will go into the motor rings and will connect the ¼ in screws to them.
- **Control Theory (Eric):** Continue working with EEs to look into control theory to control the rocket.

Gantt Chart:

The ARC Gantt chart shown in Figure 1 is separated by two distinct colors. Blue represents tasks that need to be completed throughout the semester, outlined by the ME 486C calendar. Red represents the individual tasks that have been identified to be completed by the 33% completion deadline, and before the team starts building. Along with the literature review, which needs to be completed by the customer handoff. The red line that is shown within the calendar indicates which week the team is currently on.

Project Start Date:		Mechancial Team Gnatt Chart					Week Starting:
9/1/2025							

#	Task	Assigned To	Start	End	Status	Days	%Done
1	ME 486C	Team	16-Jan	8-May	In Progress	112	0.00%
2	Project Managment	Team	5-Jan	16-Jan	In Progress	11	0.00%
3	Engineering Calculation Summary	Team	17-Jan	23-Jan	Not Started	6	0.00%
4	Self Learning 1	Individual	16-Jan	30-Jan	Not Started	14	0.00%
5	50% Update	Team	16-Jan	13-Feb	Not Started	28	0.00%
6	Eval 1	Individual	2-Feb	6-Feb	Not Started	4	0.00%
7	Website Check 1	Eric	12-Feb	27-Feb	Not Started	15	0.00%
8	100% Update	Team	13-Feb	26-Feb	Not Started	13	0.00%
9	Eval 2	Individual	23-Feb	27-Feb	Not Started	4	0.00%
10	Ugrad Registration	Team	6-Mar	7-Mar	Not Started	1	0.00%
11	Draft of Poster	Eric/AJ	20-Mar	27-Mar	Not Started	7	0.00%
12	Initial Testing Presentation	Team	26-Feb	13-Mar	Not Started	15	0.00%
13	Eval 3	Individual	24-Mar	28-Mar	Not Started	4	0.00%
14	Test Planner	Henry/Emilio/Chyler	6-Mar	27-Mar	Not Started	21	0.00%
26	Final Poster	Eric/AJ	27-Mar	10-Apr	Not Started	14	0.00%
15	Final Launch	Team	14-Mar	15-Mar	Not Started	1	0.00%
16	Initial Testing	Team	15-Mar	9-Apr	Not Started	1	0.00%
17	Full CAD Packet	Henry	16-Jan	3-Apr	Not Started	77	0.00%
18	Intial Testing Results	Team	21-Mar	10-Apr	Not Started	20	0.00%
19	Final Testing Results	Team	10-Apr	16-Apr	Not Started	6	0.00%
20	Final Report	Team	21-Mar	17-Apr	Not Started	27	0.00%
21	Final Website Check	Eric	7-Apr	21-Apr	Not Started	14	0.00%
22	Expo PPT and Poster Delivery Results	Team	20-Apr	24-Apr	Not Started	4	0.00%
23	Final Product Demo	Team	10-Apr	16-Apr	Not Started	6	0.00%
24	Symposium and Symposium Practice	Team	26-Apr	1-May	Not Started	5	0.00%
25	Client Handoff	Team	26-Apr	1-May	Not Started	5	0.00%
26	Operation/Assembly Manual	Henry/Emilio/Chyler	16-Apr	30-Apr	Not Started	14	0.00%
27	Final Peer Eval (#4)	Individual	27-Apr	1-May	Not Started	4	0.00%
28	Capstone Exit Survey	Team	1-May	2-May	Not Started	1	0.00%
30	Client Handoff	Team	26-Apr	3-May	Not Started	7	0.00%
31	Control Mech Finalization	Chyler	12-Jan	22-Jan	Not Started	10	0.00%
32	Fin Math Finalization	Henry	12-Jan	21-Jan	Not Started	9	0.00%
33	Parachute Mech Finalization	AJ	12-Jan	25-Jan	Not Started	13	0.00%
34	Heat Insert Finalization	Emilio	12-Jan	25-Jan	Not Started	13	0.00%
36	Control Theory for Fins	Eric	12-Jan	25-Jan	Not Started	13	0.00%
37	50% Update Presentation Set Up	AJ	12-Jan	6-Feb	Not Started	25	0.00%
38	Lit Review	Team	30-Sep	30-Apr	In Progress	212	66.00%
39	Build Week	Team	15-Feb	22-Feb	Not Started	7	0.00%

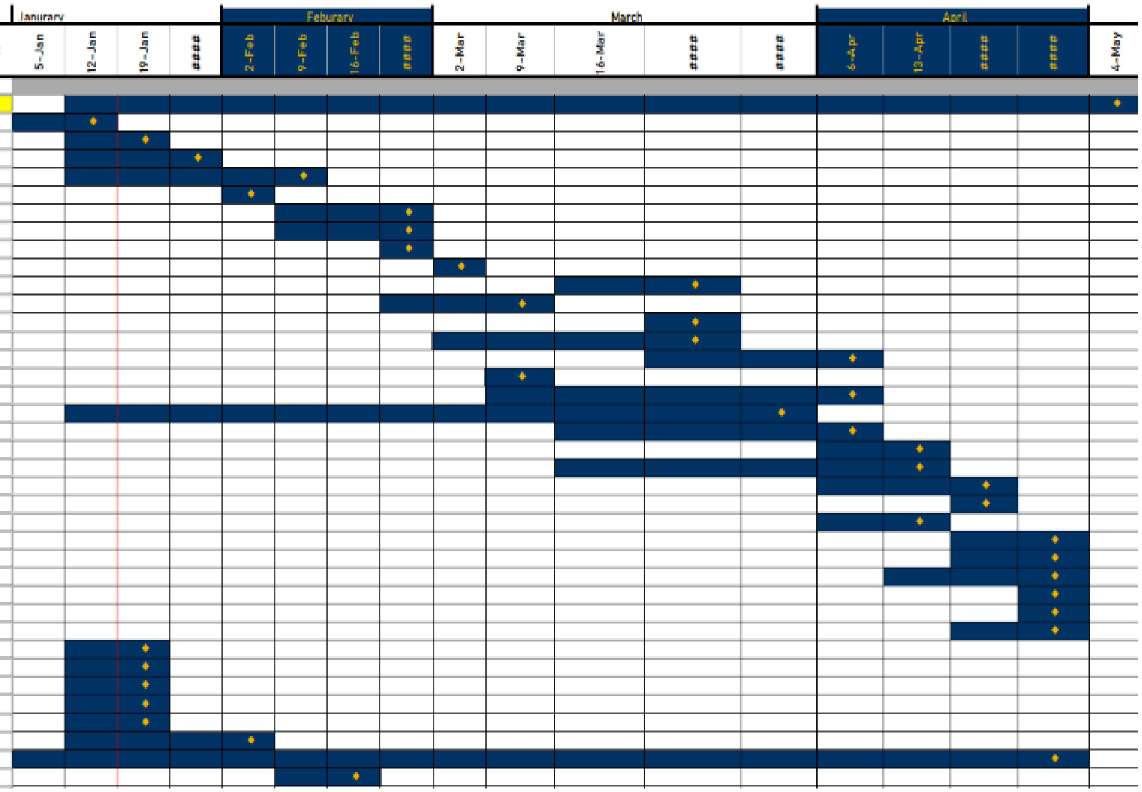


Figure 1: ARC Gantt Chart

Top Level Finances: AJ

	Income	Expenses	Anticipated	Source	Notes
Income		Total Used			
Starting Funds	$ 500.00	$ 354.49			NAU/Client
GoFundMe Fundraising	$ 978.61	$ 819.71			GoFundme
SICCS Fest	$ 200.00	-			EE Award Money
Donation	$ 19.08	$ 19.08			
TOTAL	$ 1,697.69				
Expenses					
Motors		$ 343.56		NAU	4 Motors (Two H-100W, Two I500T) , plus Hazmat Fee
Atmospheric Pressure Sensor		$ 10.93		NAU	
Food		$ 20.00		GoFundme	Lunch for ME & EE team during prototype assembly
PLA Filament		$ 43.74		GoFundme	2 kg
Tripoli Fee		$ 30.00		GoFundme	
Prototype BoM 1 Expenses					
1/4 in.-20 x 2 in. Zinc Eye Bolt		$ 1.47		Donation	
3/8 in. Zinc Flat Washer		$ 3.97		Donation	
Foam Panel		$ 9.99		Donation	FOAMULAR NGX 1 in. x 2 ft. x 2 ft. R-5 Project Panel
0.85 fl. oz. Epoxy		$ 1.96		Donation	
Prototype BoM 2 Expenses					
1/4 in. - 20 x 1-1/4 in. Zink Bolts		$ 1.69		Donation	
Final BOM Expenses					
3" G12 Airframe		$ 193.69		GoFundme	
1.6" /38 mm G12 Airframe Motor Tube		See Notes		GoFundme	Unit Price: $24.59; Ordered in group
3" G12 Coupler 9"		See Notes		GoFundme	Unit Price: $30.00; Ordered in group
Plastic 3" Ogive		See Notes		GoFundme	Unit Price: $24.60; Ordered in group
		$ 92.37			
Servo (Qty:4)		$ 431.95		GoFundme	X15-755X Coreless Mini Digital Metal Gear Tail Servo
Screws for Heat Inserts		$ 7.96		GoFundme	MonsterBolts - 1/4"-28 x 3/4" Button Head Socket Cap Screws, ASME B18.3, Alloy Steel, Black Oxide
Rod Ends			$ 12.89	GoFundme	M3xL19mm Lever Steering Linkage Tie Rod Ball Head Link Joint End
TOTAL EXPENSES		$ 1,193.28	$ 12.89		
Current Balance		$504.41			
Projected Balance			$491.52		

Purchasing Plan: Emilio

Using the fundraised budget, several main parts of our prototype were purchased in preparation for our final design, mostly parts forming the fuselage/main body of our rocket along with parts for assembly. The parts included four X15-755X Coreless Mini Digital Metal Gear Tail Servos, a 3" G12 Airframe for our fuselage, a 1.6" / 38mm G12 Airframe acting as our motor tube, 3" G12 Coupler, Plastic 3" Ogive for the nose cone, and 1/4"-28 x 3/4" Button Head Socket Cap Screws for component assembly. All parts have been ordered with proper anticipated lead time, with half of our final components having arrived as of now. Below are two BOMs describing the status of our materials, with the first bill being strictly semester one content and the second bill having a running total of all of the team's materials.

PROTOTYPE BOM (SEM 1)

Assembly Name	Active Rocket Control
Assembly Number	ARC-3
Assembly Revision	Nov-25
Date of Approval	Nov-25
Total Piece	32
Total Cost	$ 17.08

BOM Level	Raw Materials, Parts or Components	Part Number	Unit Cost	Quantity	Total Cost	Actual Cost	Bought or Made	Vendor	Product Number
1	1/4 in. - 20 x 1-1/4 in. Zink Bolts	1	$ 0.13	13	$ 1.69	$ 1.69	Bought	Home Depot	1002626439
1	3D Printed Fusaloge	2	$ 2.03	4	$ 8.12	$ 8.12	Made	N/A	N/A
1	Motor Capsule	3	$ 1.62	1	$ 1.62	$ 1.62	Made	N/A	N/A
1	Motor Capsule Ring	4	$ 0.91	3	$ 2.73	$ 2.73	Made	N/A	N/A
1	Upper Servo Holder	8	$ 0.33	1	$ 0.33	$ 0.33	Made	N/A	N/A
1	Servo Gear	4	$ 0.01	2	$ 0.02	$ 0.02	Made	N/A	N/A
1	Servo Linkage	4	$ 0.10	2	$ 0.20	$ 0.20	Made	N/A	N/A
1	Lower Servo Holder	4	$ 0.55	1	$ 0.55	$ 0.55	Made	N/A	N/A
1	Lower Link Arm	4	$ 0.01	2	$ 0.02	$ 0.02	Made	N/A	N/A
1	Rear Fins	13	$ 0.60	3	$ 1.80	$ 1.80	Made	N/A	N/A
1	FOAMULAR NGX 1 in. x 2 ft. x 2 ft. R-5 Project Panel	14	$ 9.99	1	$ 9.99	$ 9.99	Bought	Home Depot	1006237521
			Total	32	$ 17.08	$ 17.08			

FINAL PROTOTYPE BOM (SEM 2)

Raw Materials, Parts or Components	Part Num	Unit Cost	Quantit	Total Cost	Actual Cost	Bought or Made	Vendor	Product Number	On-hand	On-hand	Lead Time
X15-755X Coreless Mini Digital Metal Gear Tail Servo	1	$89.99	4	$359.96	$431.95	Bought	KST	N/A	☑	In House	N/A
3" G12 Airframe	2	$180.51	1	$193.69	$193.69	Bought	Madcow Rocketry	FT30	☑	In House	N/A
1.6" / 38mm G12 Airframe	3	$24.59	1	$24.59	$28.98	Bought	Madcow Rocketry	FT16	☐	Ordered	3 Weeks
3" G12 Coupler	4	$30.00	1	$30.00	$34.40	Bought	Madcow Rocketry	FC30-900	☐	Ordered	3 Weeks
Plastic 3" Ogive	5	$24.60	1	$24.60	$28.99	Bought	Madcow Rocketry	PNC30Y	☐	Ordered	3 Weeks
MonsterBolts - 1/4"-28 x 3/4" Button Head Socket Cap	6	$0.73	10	$7.28	$7.96	Bought	MonsterBolts	N/A	☑	In-House	N/A
H-100W	7	$ 49.49	2	$ 98.98	$ 98.98	Bought	Apogee Rockets	82195	☑	In-House	N/A
I-500	8	$ 87.29	2	$ 174.58	$ 174.58	Bought	Apogee Rockets	81292	☑	In-House	N/A
1/4 in. - 20 x 1-1/4 in. Black Oxide Coated	9	$ 6.79	2	$ 13.58	$ 13.58	Bought	Home Depot	9178581	☑	In-House	N/A
3" G12 Airframe	10	$ 117.98	1	$ 117.98	$ 117.98	Bought	Madcow Rockets	FT30	☑	In-House	N/A
1.6" / 38mm G12 Motor Tube	11	$ 32.00	1	$ 32.00	$ 32.00	Bought	Madcow Rockets	FT16-STD-160-NAT	☑	In-House	N/A
3" O Ring	12	$ 0.25	2	$ 0.50	$ -	Bought	Home Depot	1006915751	☑	In-House	N/A
1/4 in.-20 x 2 in. Zinc Eye Bolt	13	$ 1.47	1	$ 1.47	$ -	Bought	Home Depot	1005795870	☑	In-House	N/A
3/8 in. x 10 ft. Strut Fitting Galvanized Threaded	14	$ 13.00	1	$ 13.00	$ -	Bought	Home Depot	236714	☑	In-House	N/A
3/8 in.-16 Stainless Steel Hex Nut	15	$ 0.64	8	$ 5.12	$ -	Bought	Home Depot	436999	☑	In-House	N/A
3/8 in. Zinc Flat Washer	16	$ 3.97	1	$ 3.97	$ -	Bought	Home Depot	1000242015	☑	In-House	N/A
Ejection Charge	17	$ 9.95	1	$ 9.95	$ 9.95	Bought	Madcow Rockets	CCW001	☑	In-House	N/A
Rear Fins	18	$ 0.60	1	$ 0.60	$ -	Bought	Ali Express	N/A	☑	In-House	N/A
24" Printed Nylon Parachute	19	$ 10.28	1	$ 10.28	$ -	Bought	Apogee Rockets	29093	☑	In-House	N/A
Plastic 3" Ogive	20	$ 24.60	1	$ 24.60	$ 24.60	Bought	Madcow Rockets	PNC30Y	☑	In-House	N/A
1/2" Nylon Tube Webbing (10ft)	21	$ 8.80	1	$ 8.80	$ -	Bought	Apogee Rockets	29504	☑	In-House	N/A
Audrino Mega	22	$ 22.99	1	$ 22.99	$ 22.99	Bought	Elagoo	N/A	☑	In-House	N/A
Atmospheric Pressure Sensor	23	$ 8.90	1	$ 8.90	$ 8.90	Bought	Smart Prototyping	102074	☑	In-House	N/A
IMU Sensor	24	$ 12.50	1	$ 19.47	$ 19.47	Bought		4692	☑	In-House	N/A
Printed Circuit Board	25	$ 20.00	1	$ 20.00	$ 20.00	Bought	JLCPCB	N/A	☑	In-House	N/A
Audrino Battery	26	$ 9.99	1	$ 9.99	$ 9.99	Bought	Duracell	N/A	☑	In-House	N/A
0.85 fl. oz. Epoxy	27	$ 0.98	2	$ 1.96	$ 1.96	Bought	Home Depot	1002244228	☑	In-House	N/A
									89%		

Budget Left	
GoFundMe	$884.87
Costs	$725.97
Remaining	$158.90

From the Final Prototype BOM, most of our materials to be used have either been made or already arrived. Anticipating success and the use of spare components on hand, additional purchases of critical components should not be necessary. In the event of worst case, plans should be put in place to replace parts that could hinder testing should they fail, such as airframe and other structural components.

Manufacturing Plan Overview: Chyler

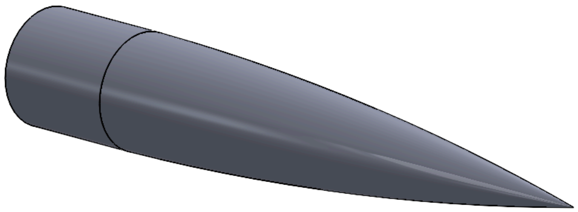
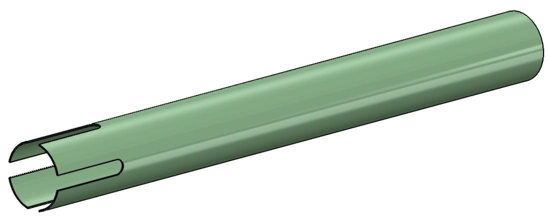
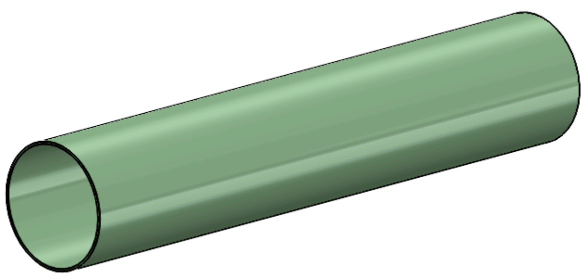
The mechanical and electrical engineering team at Northern Arizona University will complete the manufacturing for the Active Rocket Control system. Fabrication and assembly will take place through January and into March in preparation for the test launch flight and further testing events. The Sustainable Energy Laboratory (Solar Shack) will be used along with supplied hand tools, power tools, and other required industrial manufacturing tools. Those industrial manufacturing tools, such as CNC water jet, CNC mills, and 3D printers, will be contracted and utilized off campus as needed. Therefore, limited external fabrication support may be required for the precision cutting of important high-tolerance components.

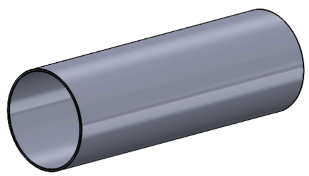
As shown in the Gantt chart in the project documentation, manufacturing will start up in earnest in late January, once designs have been finalized and components have been obtained. The primary window for manufacturing will take place between mid february and early March, which is consistent with our corresponding Gantt chart above. Such timing has been planned to ensure that builds are completed in time for dry fitting inspections, epoxy curing, subsystem integrations, and any testing/flights. Team assignments will be assigned these manufacturing tasks according to their subsystem, to maintain individual investment in the project's progress.

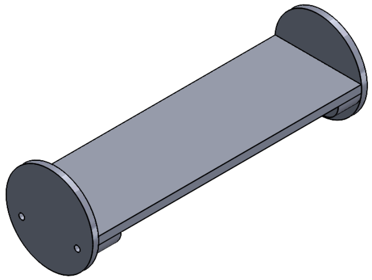
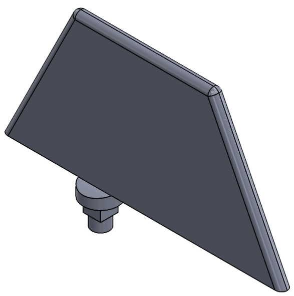
The primary materials used throughout the manufacturing process include composite airframe components like G10 composite hardware, G12 airframe, and polymer components (PLA), aluminum stock for mechanical linkages, and standard steel fasteners.

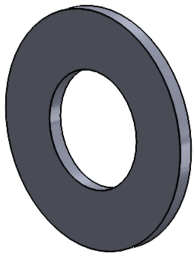
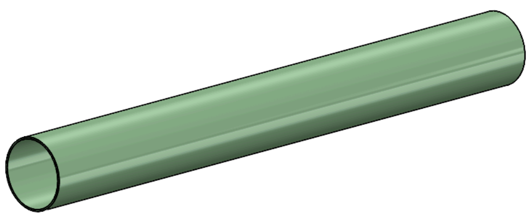
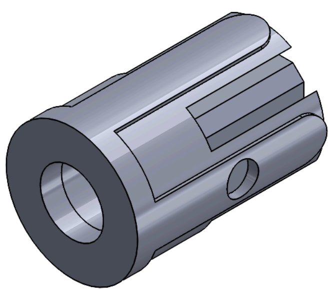
Below is the table, which consists of the fabrication plan listing all steps needed to complete, resulting in a full build, along with the person responsible for oversight and construction.

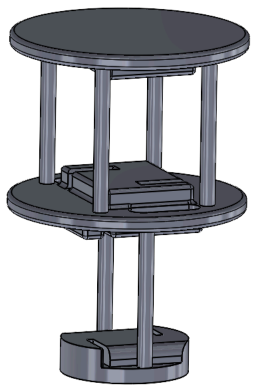
Manufacturing/Fabrication Plan	The manufacturing/Fabrication listed below will be conducted on the Northern Arizona Campus solar shack.
Vehicle Components	

Nose Cone 	1. Inspect nose cone for defects or damage. 2. Test fit the nose cone to the forward payload airframe 3. Sand the nose cone to achieve proper tolerance. 4. Verify fitment to the payload section. 5. Modify nose cone top as required for sensor or mechanical interface. 6. Final fitment verification before integration. -Eric Reyes
Airframe 	1. Inspect the material section for damage or warping. 2. Mark the orientation and mating ends of each airframe section. 3. Sand internal surfaces near coupler and nose cone interfaces. 4. Measure and mark the rear aft mechanism component. 5. Clean surfaces in preparation for epoxy bonding. -Chyler
Payload Bay 	1. Inspect the payload airframe section for damage or manufacturing defects. 2. Sand internal surfaces to ensure proper fitment of avionics components. 3. Mark and drill holes for all-thread rods. 4. Test fit bulkheads, avionics sled, and threaded rods. 5. Verify internal clearances for wiring, sensors, and connectors. 6. Ensure accessibility for arming switches and avionics servicing. 7. Final fitment verification prior to integration. – Chyler

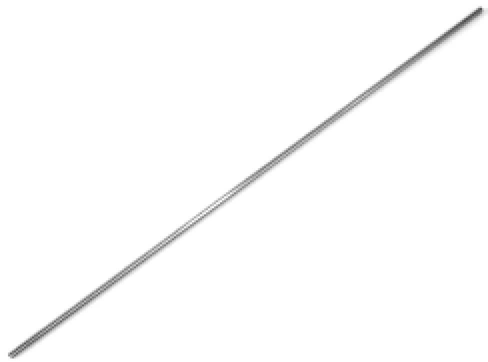
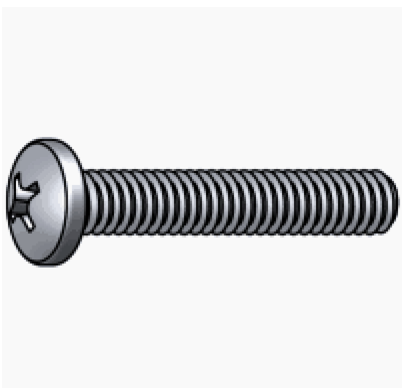
Coupler 	1. Inspect coupler for surface defects. 2. Sand outer diameter to ensure a smooth intersection into the airframe. 3. Sand inner diameter as needed to fit avionics. 4. Test fit into mating airframe sections. 5. Mark orientation for final assembly. - Aislin Joy
Switch Band 	1. Cut switch band from airframe stock material. 2. Sand edges to remove sharp corners. 3. Drill access holes for arming switches. 4. Test fit the switch band between airframe sections. 5. Verify switch alignment and clearance. 6. Prepare the surface for bonding. -Chyler
Avionics Sled	1. Manufacture an avionics sled by 3D printing. 2. Remove support material and sand contact surfaces. 3. Drill mountain holes for all threads. 4. Test fit the sled into the avionics bay.

	5. Verify component spacing and wire routing clearance. 6. Final inspection before electric integration. -Emilio
Fins 	1. Inspect fin material for defects. 2. Cut fins to the final profile. 3. Sand fins edges and root surfaces. 4. 3D print the fins control shaft. 5. Sand the fin and control shaft to prepare for bonding. -Chyler
Centering Ring	1. Inspect centering rings for dimensional accuracy. 2. Sand inner and outer diameters for proper fit. 3. Test fit onto motor tube. 4. Verify clearance and alignment. -Henry

	
Motor Tube 	1. Inspect motor tube for damage. 2. Sand the outer diameter of the motor tube. 3. Test fit centering rings. 4. Prepare the surface for centering rings bonding. 5. Verify motor fitment. 6. Prepare for final assembly. -Henry
Rear Aft Control Mechanism 	1. 3D print components. 2. Remove supports and sand mating surfaces. 3. Assemble mechanism components. 4. Test fit with servo mounts and fins. 5. Verify range of motion and clearance. -Emilio

Upper Servo Mounts 	1. 3D print servo mounts. 2. Remove supports and sand surfaces. 3. Drill mounting holes. 4. Test fit servos into the mount. 5. Verify alignment. 6. Final inspection before installation. -Emilio
Eye hooks 	1. Inspect eye hooks for damage or manufacturing defects. 2. Verify thread size and compatibility with mating hardware. 3. Test fit eye hooks into bulkheads or mounting locations. 4. Verify alignment with the shock cord or linkage attachment. 5. Secure with an appropriate nut and washer during final assembly. -Aslinn Joy
Threaded Nuts	1. Inspect nuts for thread damage or deformation. 2. Verify thread compatibility with all-thread and eye hooks. 3. Test thread engagement to ensure smooth operation. 4. Set aside appropriate quantities for each subsystem.

	5. Final torque applied during assembly. -Aislinn Joy
Threaded Rods 	1. Measure the required all-thread length per design specifications. 2. Mark cut locations. 3. Cut all-thread to length using hand tools. 4. Deburr cut ends to prevent thread damage. 5. Test fit nuts and eye hooks onto cut threads. 6. Verify overall fit within the avionics bay or structure. -Chyler
Aluminum round stock (push rods)	1. Measure required pushrod lengths from the CAD model. 2. Mark cut locations on aluminum stock. 3. Cut aluminum rods to length. 4. Deburr cut ends to remove sharp edges. 5. Drill or tap ends if required for linkage attachment. 6. Test fit pushrods with servo horns and control mechanism.

	7. Verify free movement and alignment. -Chyler
Screws 	1. Inspect screws for damage or manufacturing defects. 2. Verify screw size, length, and thread type per design requirements. 3. Test fit screws through the airframe into the rear aft control mechanism. 4. Drill pilot holes in the airframe if required. 5. Verify proper alignment and engagement without binding. 6. Secure using appropriate torque during final assembly. -Henry
Wing Nut	1. Inspect wing nuts for thread damage or deformation. 2. Verify thread compatibility with all-thread rods. 3. Test fit wing nuts on avionics bay threaded rods. 4. Verify clearance for hand-tightening and removal. 5. Final installation during avionics bay assembly.

	-Eric
Shockcord 	1. Inspect shock cord for fraying, cuts, or manufacturing defects. 2. Verify sewn loops and attachment points. 3. Measure and confirm the correct length per design requirements. 4. Test fit the shock cord with eye hooks and quick links. 5. Final installation during recovery system assembly. – Emilio
Parachute	1. Inspect parachute canopy for tears or defects. 2. Inspect shroud lines for damage or tangling.

	3. Verify attachment points and hardware compatibility. 4. Perform test packing to ensure proper fit within the airframe. 5. Final packing completed before flight readiness review. – Henry
Quicklinks/Carabiners 	1. Inspect quick links/carabiners for damage or deformation. 2. Verify size and load rating per design requirements. 3. Test fit with shock cord, eye hooks, and parachute loops. 4. Verify full thread engagement or gate closure. 5. Final installation during recovery system assembly. – Henry

Rail Buttons 	1. Inspect rail buttons for defects. 2. Measure and mark rail button locations on the airframe. 3. Drill mounting holes in the airframe. 4. Install rail buttons and verify alignment with the launch rail. 5. Inspect for secure attachment and clearance. – Emilio
Black Powder charge head 	1. Inspect charge cap for defects or damage. 2. Verify fitment with avionics bulkhead. 3. Test fit retention hardware and wiring pass-throughs. 4. Ensure secure containment and accessibility. 5. Final installation completed prior to flight testing. – Aislinn

Paint 	1. Lightly sand exterior surfaces to promote adhesion. 2. Clean surfaces to remove dust and debris. 3. Apply primer and paint as required. 4. Allow sufficient cure time before handling. -Aislinn Joy

Special Project Section: Henry

Since the only launch date the team is able to launch is right before week 9, the team is proposing to change the completion percentages for the 33% and 66% completion dates.

50%:

- Design Effort: 100%
- Purchase Plan: 75% parts on hand. 50% on order.
- Manufacture Plan: Show 50%+ project built and completed.
- Demonstration: Show 50%+ of working hardware.

100%:

- Design Effort: 100%
- Purchase Plan: 100% parts on hand.
- Manufacture Plan: Show 100%+ project built and completed.
- Demonstration: Show 100%+ of working hardware.

Initial Testing:

- Instead of showcasing the 3rd Hardware presentation, we are looking at presenting the testing results from the tests conducted weeks prior since they will have already been completed.