



**Derek Griffith:** Prototype Engineer

**Hailey Hein:** Project Manager, CAD Engineer, Financial Manager

**Haoran Li:** Test Engineer

**Yanbo Wang:** Manufacturing Engineer, Website Manager

**October 14th, 2025**

Engineering 218

# Client Requirements

60% Met

Table 1: Client Requirements Overview

	Part	Status	Notes	Presentation Shown	Built/Achieved
Required	Toolbox with tools	Acquired	Assembled and tested 5 Drawer toolbox with 238 tools	33%, 67%, 100%	Yes
	Storage for driver equipment	Upcoming Build	Manufactured-integrated cabinet space	33%, 100%	No
	Storage for 4 SAE car tires	Acquired	Top-mounted tire carrier tub made from aluminum sheet	33%, 67%, 100%	Yes
	Brake System	Acquired	Bicycle brake rotors and calipers mounted to the rear axle	67%	Yes
	Steering System	Acquired	Front wheel hub/tie rod system with base frame	33%, 100%	No
	Mounted vice	Acquired	Purchase vice, hard mounted to the top workspace	100%	Yes
	Built in shade	Upcoming Purchase	Rollout shade OR mounted umbrella	100%	No
	Power supply	Acquired	2500 W Inverter with power strip and extension cord	33%, 67%, 100%	Yes
	> 6in OD casters	Acquired	10 in casters provided with the sponsored base frame	100%	No
	Minimal trailer footprint	Upcoming Build	Dimensions 30"x60", to test by loading and unloading	100%	No
	Mounted fire extinguisher	Acquired	Hard mounted to the exterior of the cart for easy access	33%, 100%	Yes
	Drawer locking system	Acquired	Incorporated 3D printed locks in the purchased toolbox	67%, 100%	Yes
	Tie-down rings	Upcoming Purchase	To purchase or make from existing materials, undecided	100%	No
	NAU/Sponsor logos	Sponsored	Being coordinated with Northern Arizona Signs	67%, 100%	Yes
Bonus	Jacking push rod	Acquired	Assembled and tested on Formula SAE car, to mount next	33%, 67%, 100%	Yes
	Grinding wheel/Arbor press	Backburner	Budget allocation	Undecided	No
	Wheel stands for SAE cars	Backburner	^	Undecided	No
	Additional trailer tailgate	Backburner	^ Budget & product was backordered	Undecided	No
	Sound System	Backburner	^ Budget, waiting until all cart components are purchase	Undecided	No

# Design Description

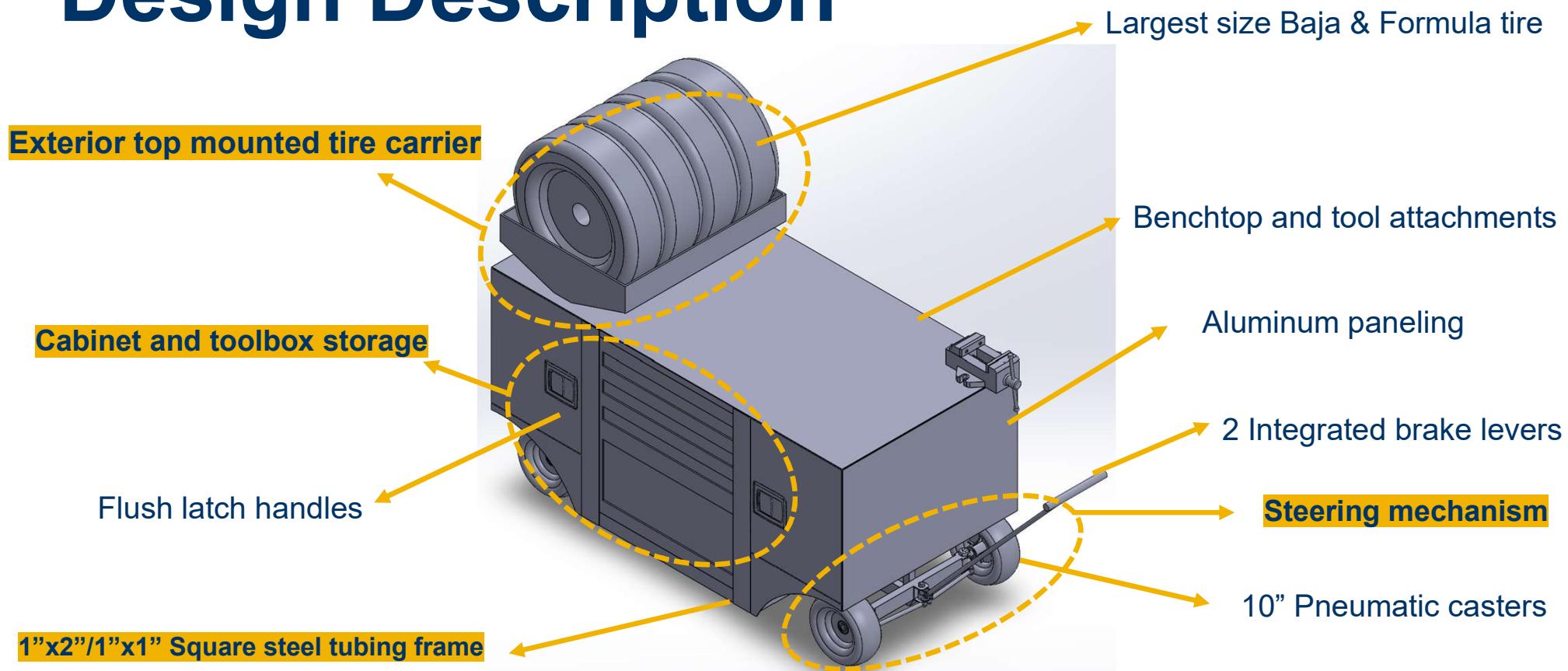


Figure 1: Top Model View

# Progress Chart

\*Complete\*



Figure 2: Raw Frame CAD

\*In Transit\*



Figure 3: Miller Custom Fab Sponsored Frame

\*Projected\*



Figure 4: Benchmarked Frame Construction

\*Projected\*



Figure 5: Benchmarked Completed Pit-cart

**Initial:**  
Completed CAD  
Completed calculations  
Completed BOM

**33% Build:**  
Parts 70% Ordered  
**Base frame constructed**  
Attached wheels  
Attached handle

**67% Build:**  
Parts 85% Ordered  
Working brakes  
Integrated toolbox  
**4x1" Framing around toolbox**

**100% Build:**  
Full aluminum siding  
Tools/equipment in place  
Completed assembly manual  
Tests in progress  
Full vinyl wrap installed

# Sponsored Frame Update

Chase Miller

to me ▾

Hailey,

Hope you are having a good week so far. I have one in stock that is close to your dimensions. I need to finish a few things on it. Give me a week or so and I will get it done and shipped out to you.

Jul 22, 2025 1:05 PM



Chase Miller

to me ▾

It should ship by next Tuesday. The boys got the frame in the jig and the back axle tacked. Had to put a paying job in front of it but should have it welded Friday. Spindle kit and wheels are ready to go. We normally ship these assembled but I want you all to learn and put it together. More info to come end of this week.

Sep 30, 2025 8:07 PM (6 days ago)



# Design Efforts

100% Complete

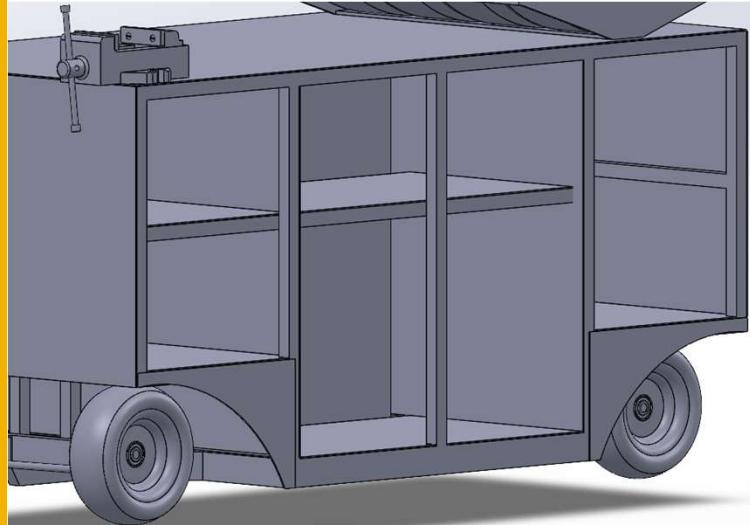


Figure 6: Modeled Cabinet Storage



Figure 7: Modeled Steering Mechanism

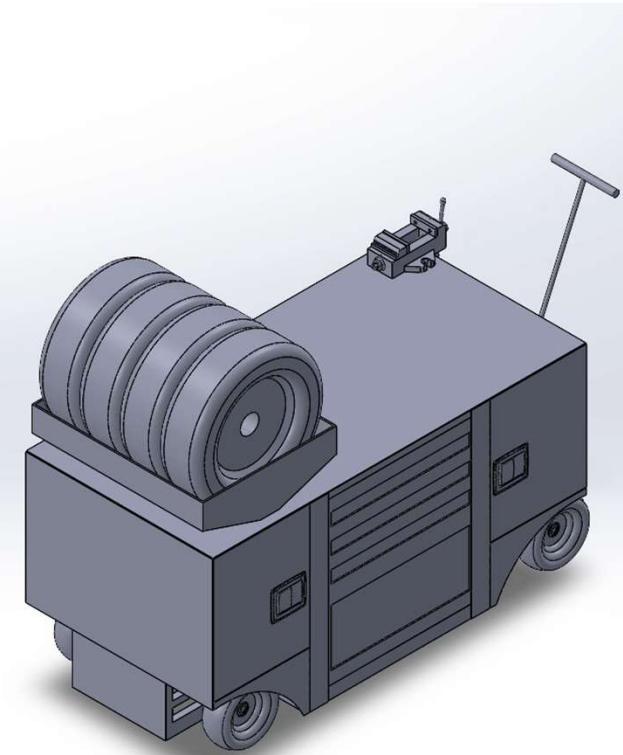


Figure 8: Tire Holder Schematic

# Design Changes



Figure 9: Original Sponsor Designed Front Brakes

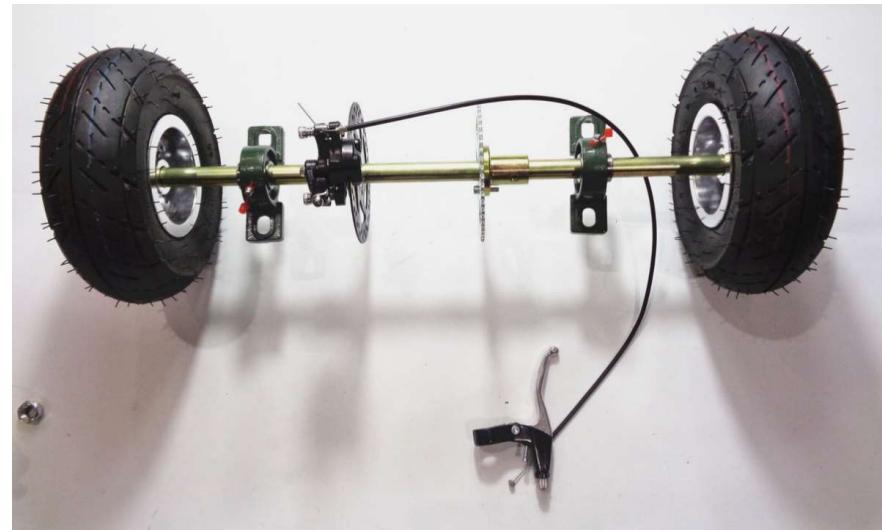


Figure 10: Example of New Rear Axle Brakes

# Brake Layout CAD

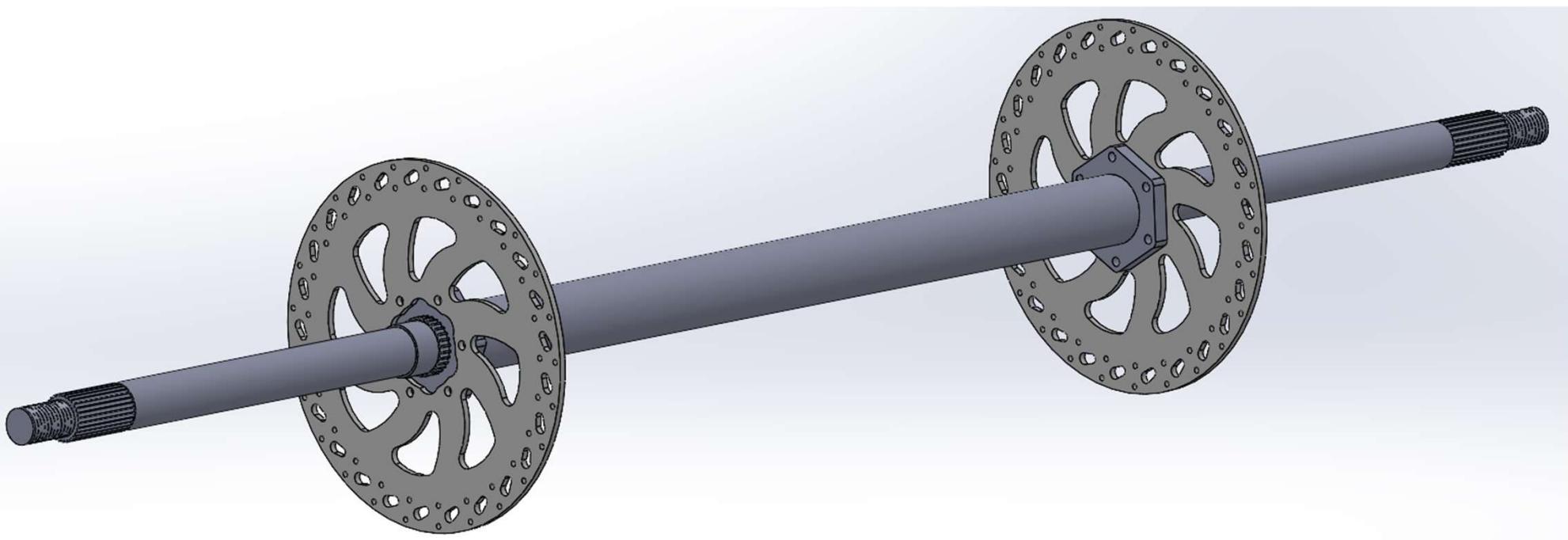


Figure 11: Two Rotor Brake Layout

# Brake Layout CAD

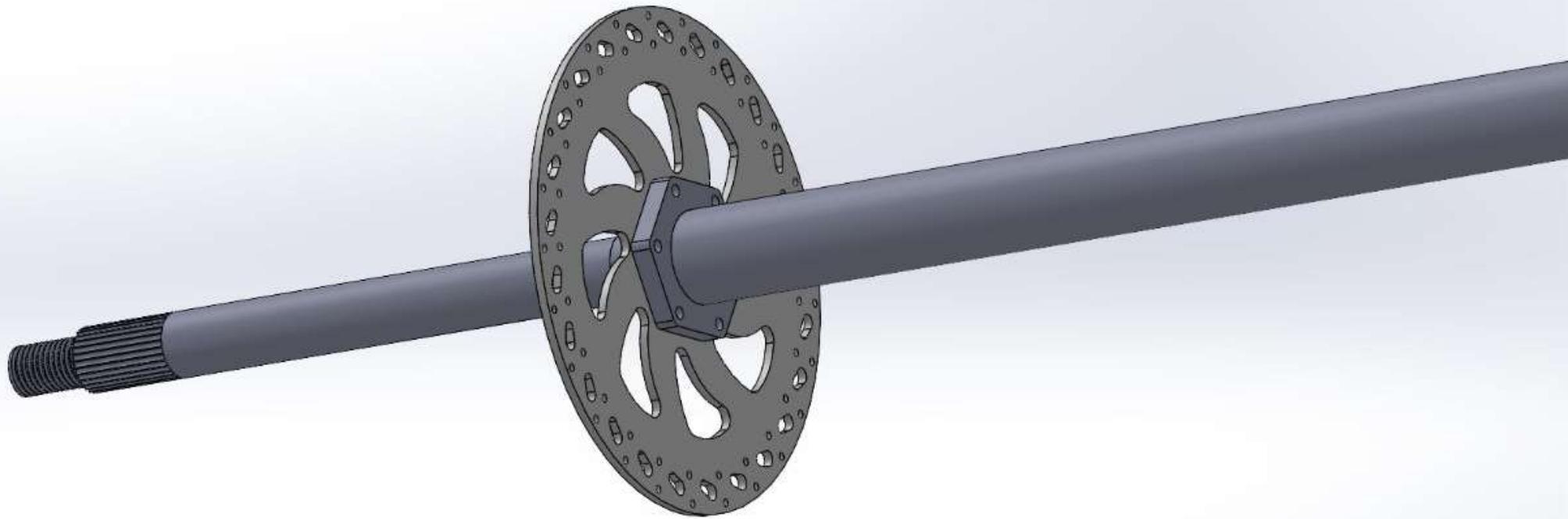


Figure 12: Closeup Brake Layout

# Purchasing Plan

- 86% Purchased
- 90% On Hand
- Staying under budget
- Adding new sponsors to reduce cost
- Waiting on major frame component
- All other components are ready to be installed

Table 2: In Progress Purchase Plan

Part	Price	Status
<b>Order Form 1:</b>		
13"Dx24.25"Wx29.33"H Box with 238 tools	\$ 284.39	Delivered
Fire extinguisher mount for 2.5lb extinguisher	\$ 8.85	Delivered
9" Safety wire plier kit	\$ 26.62	Delivered
Brake bleed kit	\$ 23.38	Delivered
2500W Inverter Generator	\$ 294.90	Delivered
120 V Power strip	\$ 31.87	Delivered
25 ft Extension cord	\$ 12.75	Delivered
Hinged aluminum trailer ramp extension		Canceled/Backordered
Formula rear swivel lift jack	\$ 290.84	Delivered
	\$ 973.60	
<b>Order Form 2:</b>		
0.065" 1x1 Square Tubing 6' Qty 18	\$ 306.90	Delivered
0.020" 36x96" Aluminum Paneling Qty 4	\$ 520.84	Delivered
Tax+Shipping	\$ 228.55	
	\$ 1,056.29	
<b>Order Form 3:</b>		
Door hinges/handles/latches, brakes	\$ 117.56	Delivered
<b>In Person (Harbor Freight):</b>		
6" Vice, Super glue, tie-wire, bungee cords	\$ 77.59	Delivered
<b>Upcoming:</b>		
Rivets		
Tie-down Anchors		
Umbrella	\$ 39.99	Undecided
<b>Donated/Sponsored:</b>		
Formula Tire Holder	\$ 100.00	Delivered
Miller Fab Base Frame	\$ 1,150.00	In Transit
Monetary	\$ 501.00	Deposited
	\$ 1,751.00	
<b>Total Spent:</b>	\$ 2,225.04	\$2000 NAU SAE Starting Budget
<b>Total Left:</b>	\$ 275.96	

# Manufacturing Plan

Table 3: In Progress Manufacturing Plan

Part	Manufacture Status	Location	Comment	Projected Time to Build	Percentage Complete
Base Frame	Built?	Sponsor Shop	In Transit?	Apparently 4 months?	100%?
Frame shell	Upcoming Build	98C Machine Shop	Requires Base Frame	18 hours	0%
Aluminum Panels	Upcoming Build	98C Machine Shop	Requires Base Frame	8 hours	0%
Aluminum Tire Holder	Built	Sponsor Shop	Tested with tires	3.5 hours	100%
Brake System	Upcoming Build	98C Machine Shop	Designed in CAD	4 hours	30%
Formula Push-Rod	Built	98C Machine Shop	Testing stage	2 hours	100%
Toolbox Latches	3D Printed	Engineering	Installed	3 hours	100%
Steering Handle	Built	Sponsor Shop	In Transit?	1 hour	100%?
Extinguisher mounting	Upcoming Install	98C Machine Shop	Requires Base Frame	0.5 hours	75%

# Hardware Demonstration



Figure 13: Toolbox and Tools Hardware



Figure 14, 15: Additional Parts Hardware



10/14/2025

Yanbo Wang, SAE Toolbox



Figure 16: Material Hardware

12

# Toolbox Latch Testing Demonstration



Figure 17: Tilted Toolbox Without the Latching System  
10/14/2025



Figure 18: 3D Printed Latch Design  
Derek Griffith, SAE Toolbox



Figure 19: Tilted Toolbox With 3D Printed Latching System and Magnet Catch

# Tire Carrier Construction

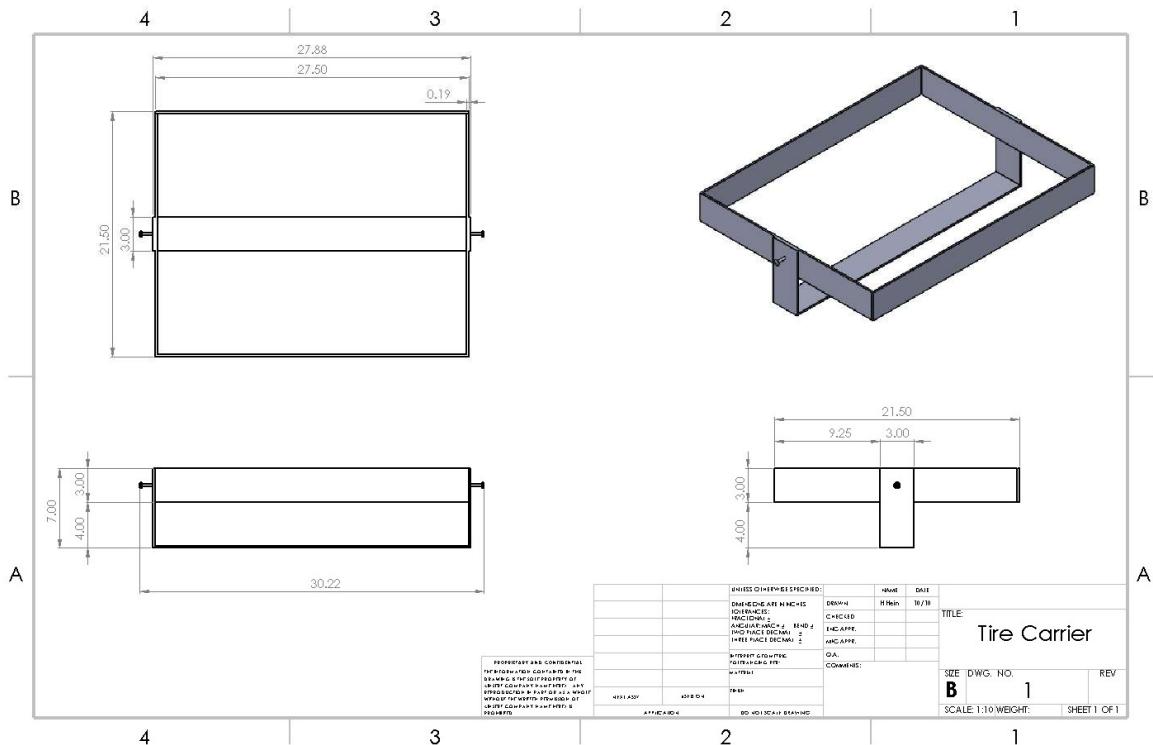


Figure 20: Redesigned 3/16" Steel Flat-Strap Tire Holder



Figure 21: Physical Tire Carrier With Formula Tire

# Formula Jack Test Demonstration

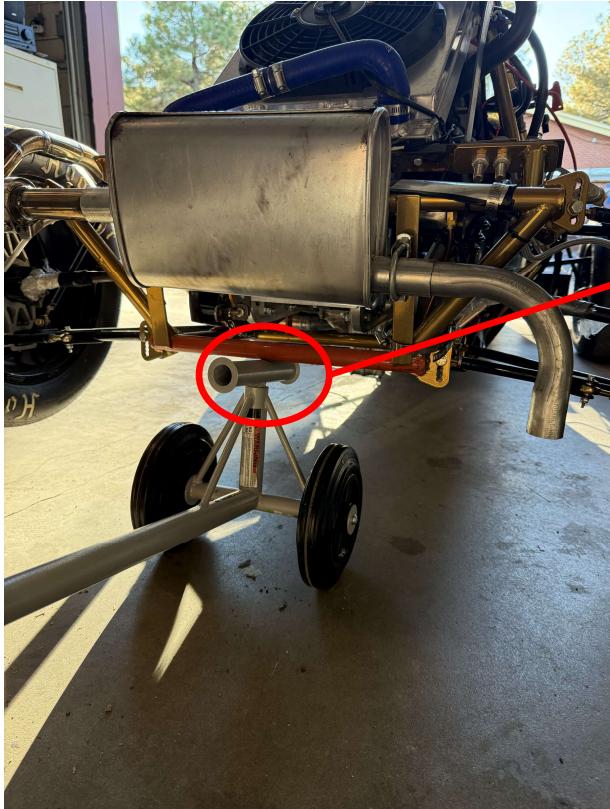


Figure 22: Push-jack Under the Formula SAE



Figure 23: Need for Design Change



Figure 24: Completed Design Change Test

# Inverter Load Test Demonstration



Figure 25: 10W-30 Oil Fill

Prepped the inverter by filling with:

- 10W-30 Oil
- E87 Pump gas

Took the inverter outside and plugged in different devices to check all systems

- Noticeably quiet noise level (69dB)
- 11 hour run time @ 25% load
- 5.5 hour run time @ 50% load
- 39.7 lbs total weight



Figure 26: All-Systems Inverter Check



# Vinyl Wrap Projection

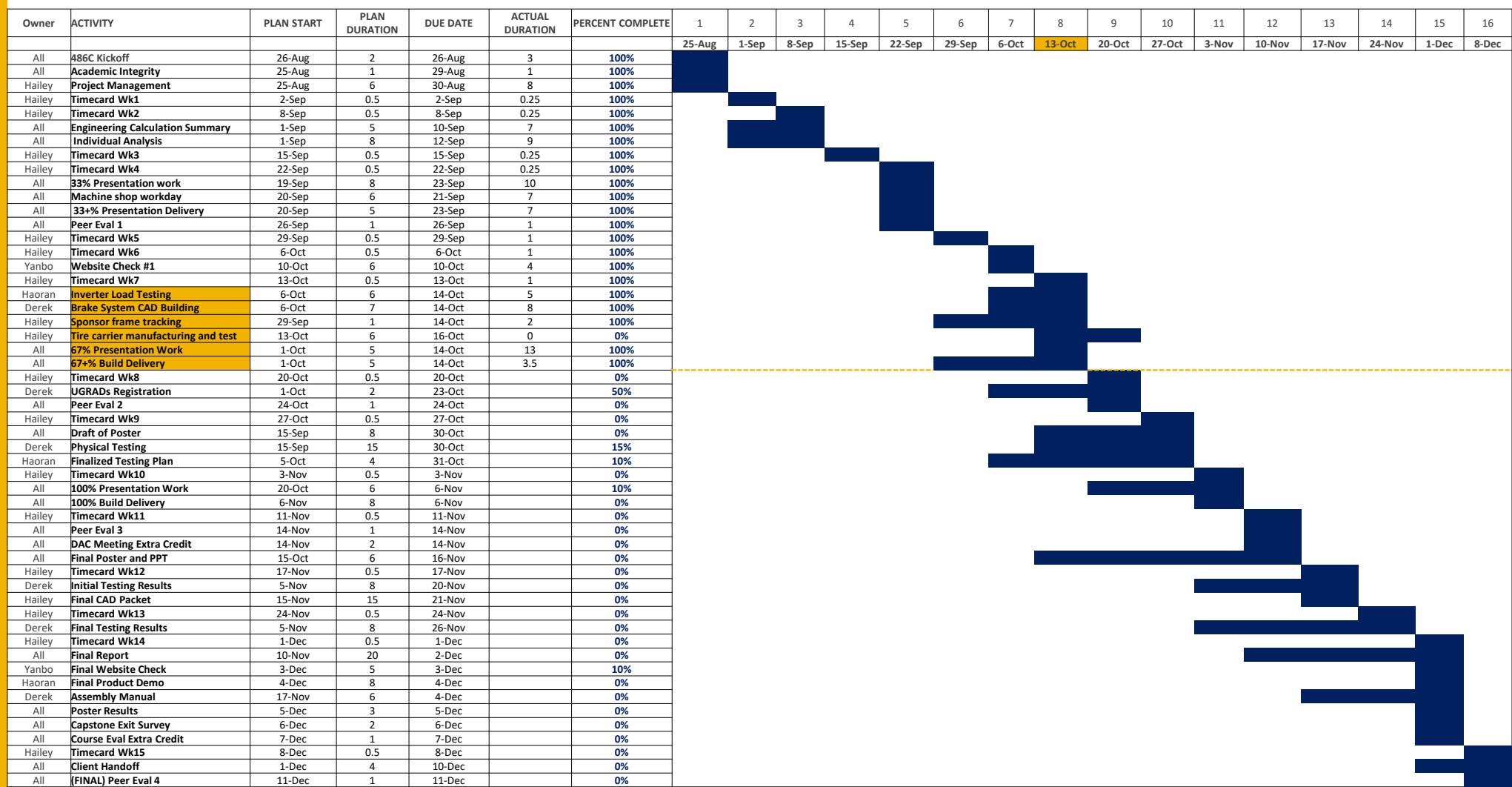
## Northern Arizona Signs

- Partnership for a **fully sponsored** vinyl wrap; design and install
- Display of sponsor' and NAU logos
- Removes the need for spray paint purchasing
- Achieves client requirements



Figure 27: Rough AI Generated Wrap Concept

Table 4: SAE Toolbox Fall 2025 Gantt Chart Update



# Live Website

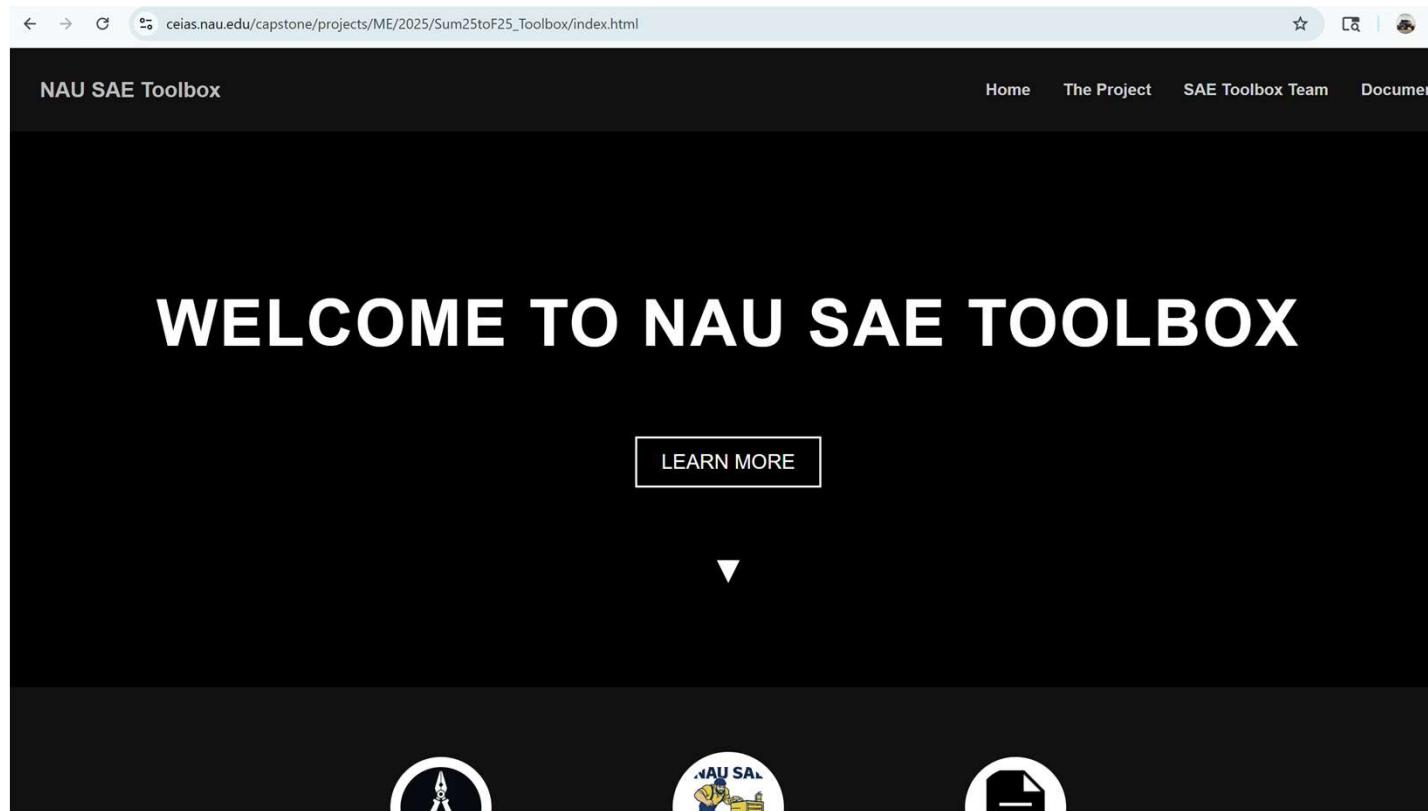


Figure 28: Website Walkthrough

Yanbo Wang, SAE Toolbox

# Moving Forward

## **100% Demo**

- Base frame construction!!
- Possible plan B design
- Full aluminum siding
- Tools/equipment in place
- Tests in progress
- Full vinyl wrap
- Working brakes

## **Next testing**

- Drawer latch operation
- Brake Operation
- Tipping/Stability
- Turning radius
- Trailer footprint
- Weight capacity
- Correct tooling

## **Timeframe**

- Poster draft (16 days)
- 100% Build (22 days)
- Final Testing Results (43 days)
- Client handoff (56 days)

**Thank You  
Questions?**