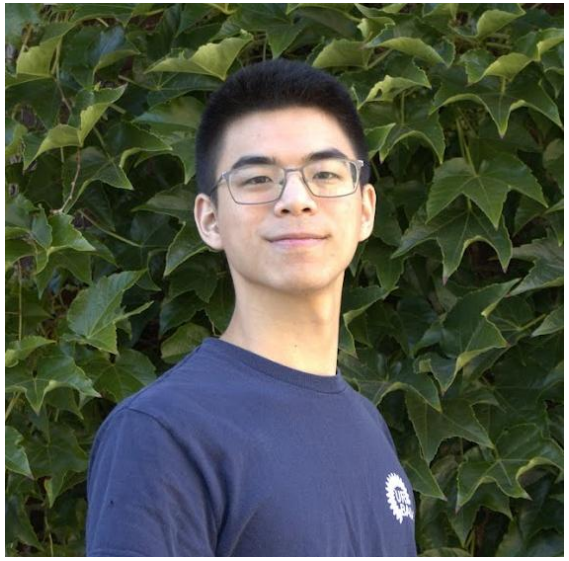


Tyler Liao

BS Mechanical Engineering (Anticipated May 2026)

I want to make things and solve problems. My passions include machining, mechanical design, and fabrication. Currently, I am pursuing a BS in Mechanical Engineering at the University of Rochester. The best parts of my day are when I get the chance to put engineering theory into practice, such as with my time leading the Baja SAE car team. During my time at the University of Rochester, I was awarded membership in the Tau Beta Pi Engineering Honors Society, and Dean's List Scholarship. I also enjoy learning and teaching and have worked as a teaching assistant for a wide range of engineering and fabrication courses. In my spare time, I enjoy playing the trombone with the University of Rochester Symphony Orchestra, playing Ultimate Frisbee, and machining pens and small toys on my Taig micro lathe.

201-893-8305 | tylerliao22@gmail.com | Linkedin

Table of Contents

Baja SAE Chief Mechanic

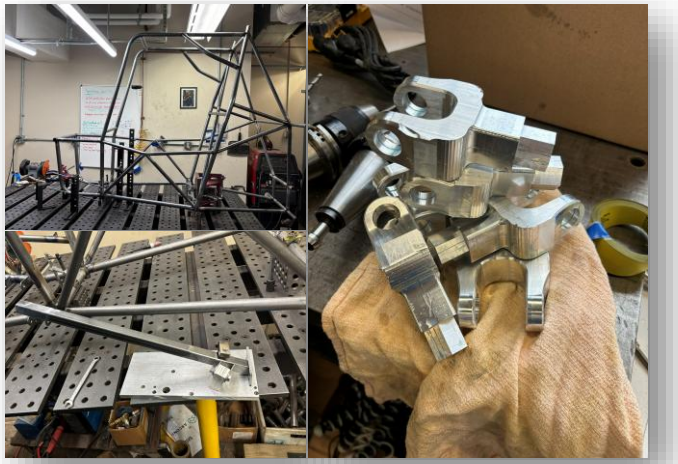
Role Description:
As Chief Mechanic of the Yellowjacket Racing team I was responsible for all aspects of manufacturing and shop operation.

New Member Training/Onboarding:

- Devised new member training program
- Organized safety sessions for machining and welding

Manufacturing:

- Maintained documentation and knowledge on advanced manufacturing capabilities
- Coordinated manufacturing and test schedule
- Managed car build budget of $10,000



Weld fixturing and machining

YJR25 Model Unveiling

Baja team at competition

YJR-25 Baja Vehicle

Vehicle Goals

- Vehicle shall complete 38.5 miles on the RIT Track, 22 of which uninterrupted, to ensure good performance in the endurance event.
- Vehicle shall weigh less than previous model (<485 lb).
- CoG within ± 1.5 ft of driver to fit wide range of drivers, and less than ¼ times the frame height from the LFS.
- Ground Clearance range of 11-13" will allow for suspension tuning to dynamic events
- Minimum slow turning radius of 11' w/ parallel steering
- 100ft acceleration time of 4.3 seconds on pavement

Project Description:

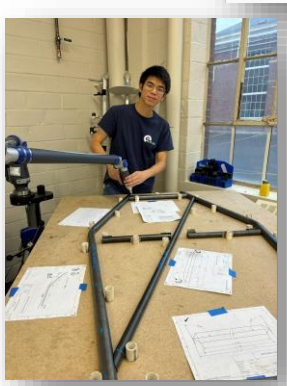
- Lead design, fabrication, and testing cycle of new Baja car
- Improve vehicle robustness and manufacturing accuracy

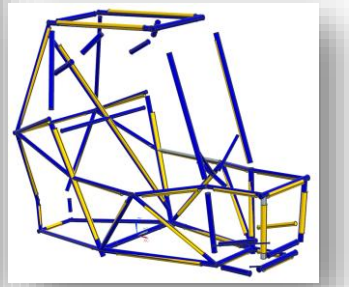
	Created: 6/8/24	Edited: 10/2/24	Summer + Fall Semester																										
	Current Date:	12/13	6/7	6/14	6/21	6/28	7/5	7/12	7/19	7/26	8/2	8/9	8/16	8/23	8/30	9/6	9/13	9/20	9/27	10/4	10/11	10/18	10/25	11/1	11/8	11/15	11/22	11/29	12/6	12/13
	Due Date:		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
First Projects + NX Learning	7/19/24	-147	X	X	X	X	X	X	X																					
Iteration 0	8/26/24	-109		X	X	X	X	X	X	X	X	X	X	X	X															
Activities Fair	8/30/24	-105												X	X															
OktoBajaFest	9/27/24	-77												X	X	X	X	X	X											
Iteration 1/w. Full Assembly and Analysis	10/25/24	-49												X	X	X	X	X	X	X	X	X	X							
Pumpkin launch	10/25/24	-49																	X	X	X	X	X							
Spooky Science Day	10/26/24	-48																				X	X							
Frame Manufacturing Start	10/25/24	-49														X	X	X	X	X	X	X	X	X						
PDR General Email	10/28/24	-46																				X	X							
PDR Subsystem Emails	11/1/24	-42																		X	X	X	X	X						
Arc and Flame Weld Training	11/3/24	-40																				X	X	X						
Makers Faire	11/15/24	-28																						X	X	X				
Design Hard Deadline	11/27/24	-16																	X	X	X	X	X	X	X	X	X	X		
Virtual Buisness RFP	12/13/24	0																						X	X	X	X	X	X	X
Cockpit Manufacturing	12/15/24	2																						X	X	X	X	X	X	X
Manufacturing	3/14/25	91																										X	X	X
Crowd Funding	2/15/25	64																					X	X	X	X	X	X	X	X
Team Bonding																		X					X					X		
Shop Cleaning														X						X					X					X
Newsletter																				X										

Gantt Chart Master Schedule

Solution Methods:

- Organize design and fabrication Gantt Chart schedule
- Collaborate with design leads on manufacturability
- Verify manufactured components with Faro Arm CMM





Faro Arm CMM measuring as built vehicle

CNC Prototyping

Results:

- YJR-25 vehicle completed on schedule even after numerous design delays and manufacturing difficulties
- Vehicle placement improved from 70th to 24th

Official Competition Placing

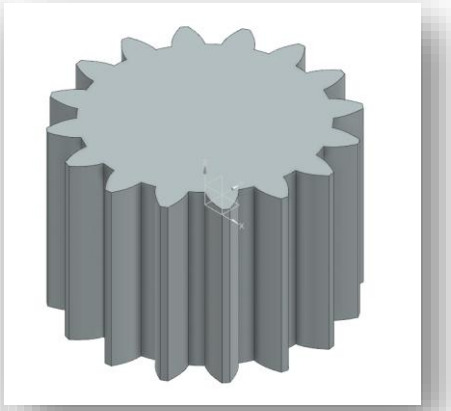
24	109	Univ of Rochester	Yellowjacket Racing

Independent Study: Gears

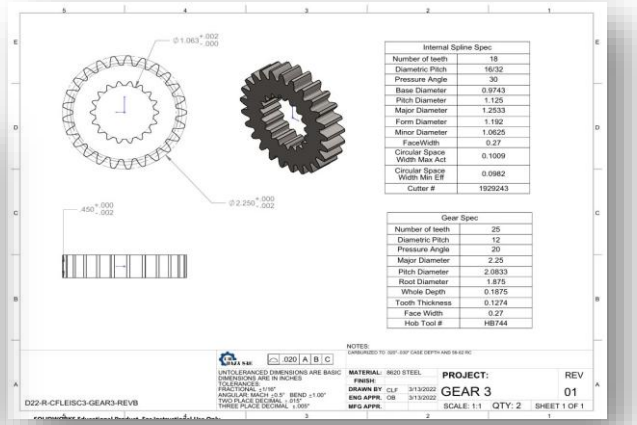
Project Description:

- Develop procedures to cut, simulate, and heat treat custom gears in-house for the Baja Team
- 4 Credit Independent study project under Dr. Christopher Muir

Torque testing rig



NX involute gear model from first principles



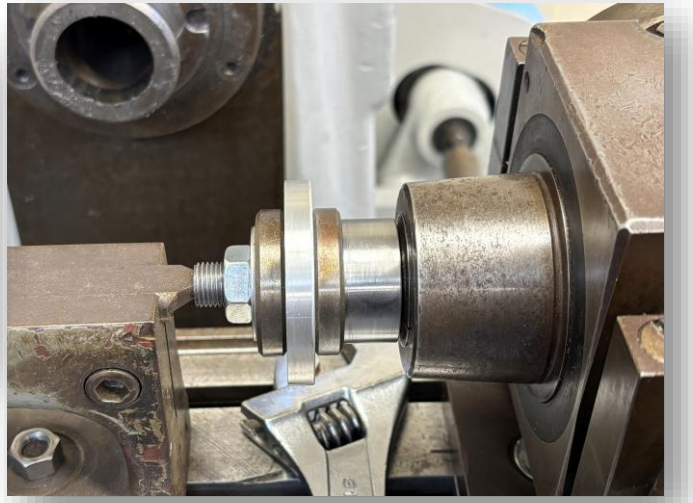
Example gears from Baja car

Solution Methods:

- Generate involute profile from first principles in NX
- Machine gear cutting mandrel and arbor

	Imperial		Metric
# Teeth	25		25
Diametral Pitch	12.000		12.250
Pitch Diameter (in)	2.083		2.0408163265306100000
Pitch Radius (in)	1.042		1.020
Module (mm)	2.042		2.000
Circular Pitch (mm)	6.414		6.283
Base Radius (in)	0.979		0.959
Base Diameter (in)	1.958		1.918
Pressure Angle (°)	20		20
Addendum (in)	0.083		0.082
Dedendum (in)	0.104		0.102

Excel Calculations of gear parameters from AGMA standards. Comparison of imperial and metric gear geometries



Gear Mandrel

Future Work:

- Build testing fixture to measure gear loading
- Correlate Faro Scanner data to model geometry
- Simulate and measure dynamic and fatigue lifetime of in-house gears

Tritium Science Research

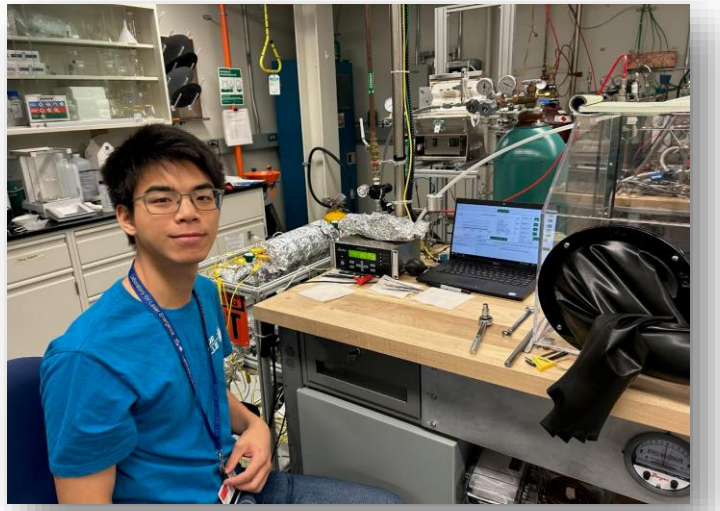
Role Description:
Perform work as research assistant under Dr. Zachary Robinson in Tritium Science group. Work performed at the University of Rochester's Laboratory for Laser Energetics.

Atomic Layer Deposition (ALD):

- Specialized Chemical Vapor Deposition technique
- Self limiting chemical reaction
- Deposit conformal, pinhole free nanometer thin films

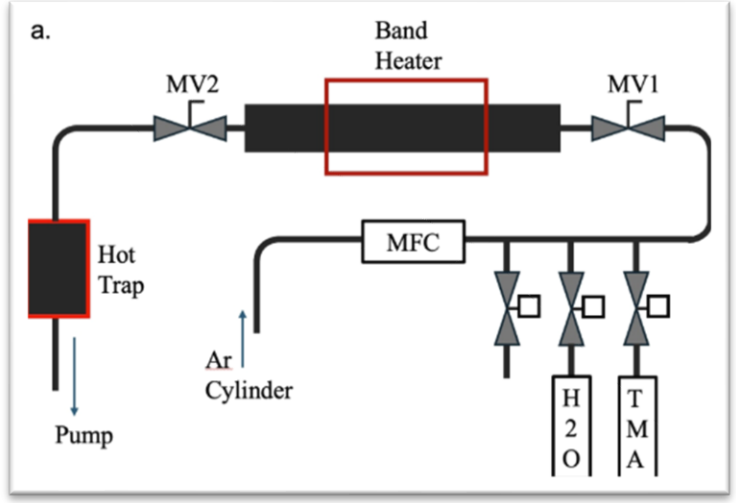
ALD Research Goals:

- Study Tritium permeation behavior for nuclear fuel containment applications
- Develop new ALD process conditions for uniform coating of large internal surfaces

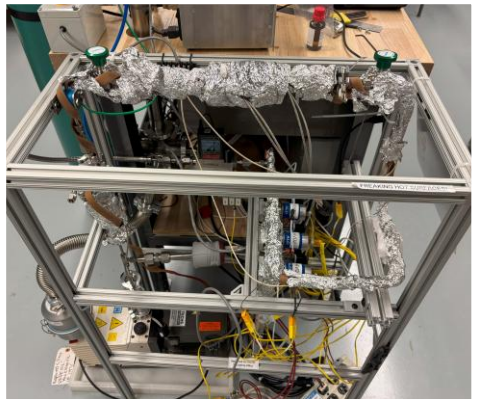


Lab Workstation

Supervisor: Dr. Zachary Robinson
LLE Tritium Science Group



ALD Reactor Diagram

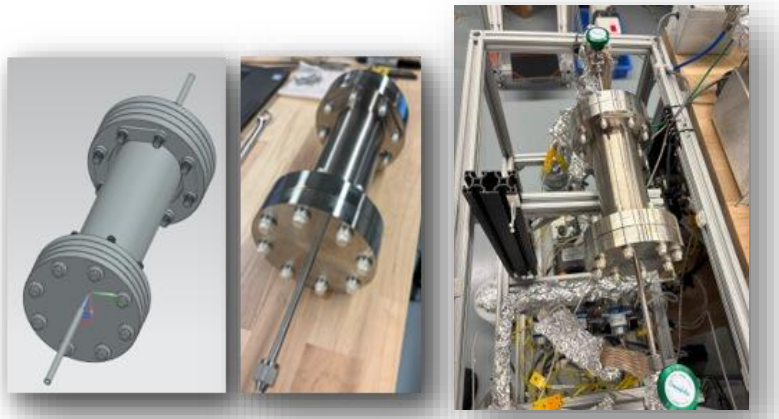


ALD Reactor

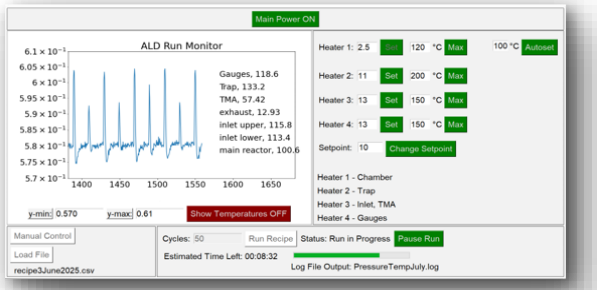
Process Development

Project Description:

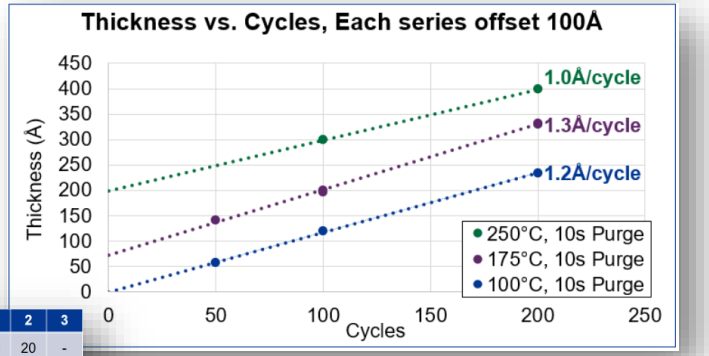
- Perform process development on atomic layer deposition for different reactor geometries
- New control software GUI



Horizontal Chamber Configuration



Python GUI



Level	1	2	3
Purge Time (s)	10	20	-
Temp (°C)	100	175	250

Exploring Parameter Space

Solution Methods:

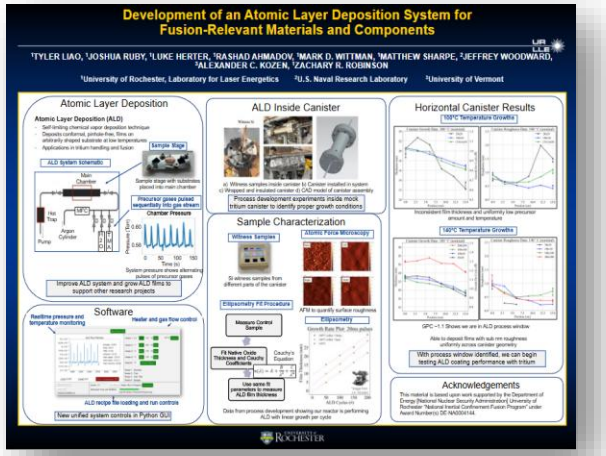
- Developed new control software in Python
- Process development on silicon wafers in 1” Tube Reactor
  - Full factorial design of experiments
- Designed new large horizontal chamber reactor
- Worked with Ebara to source custom heater jacket

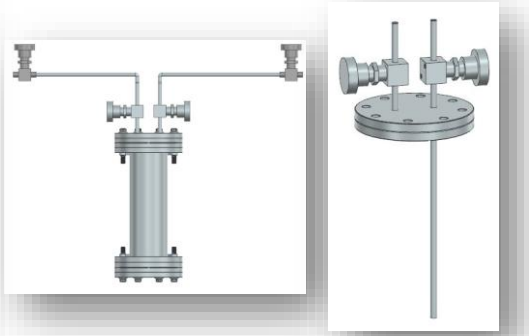
Results:

- Poster presentation award winner at New York State Section American Physical Society conference

Future Work:

- Working with Mechanical Engineering department to manufacture new vertical reactor configuration





New Vertical Chamber Assembly

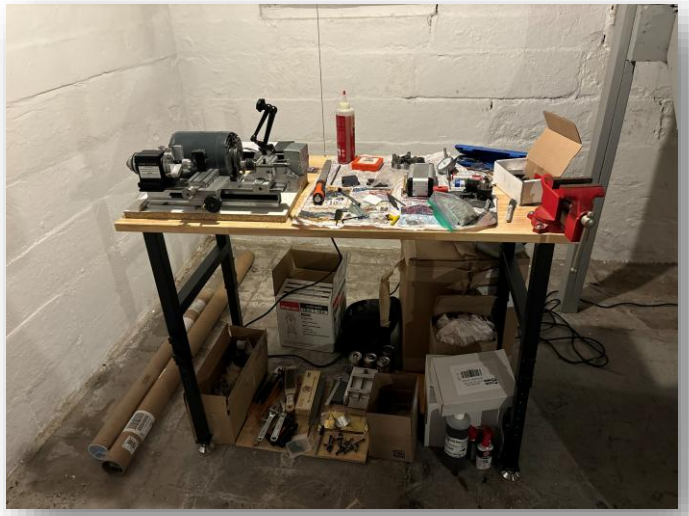
Mini Projects

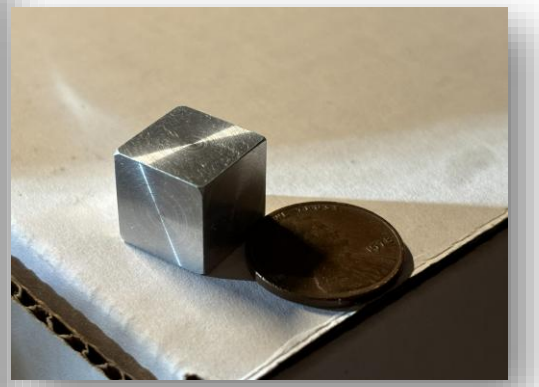
Mini Projects:

The following are a selection of smaller engineering projects done over the course of my engineering education at the University of Rochester, as well as in my free time

Creative Manufacturing:

- With these small projects I get to experiment and exercise my creativity in machining
- I own a Taig Micro lathe that I machine on in my spare time

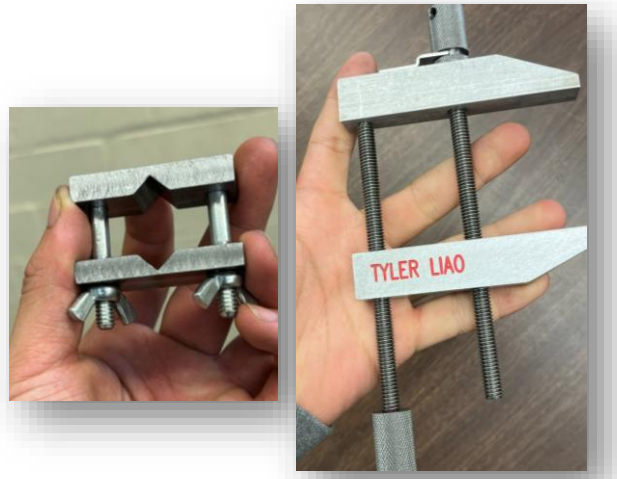




Lathe cube!

Taig Micro Lathe machining small parts

Bolt action pen

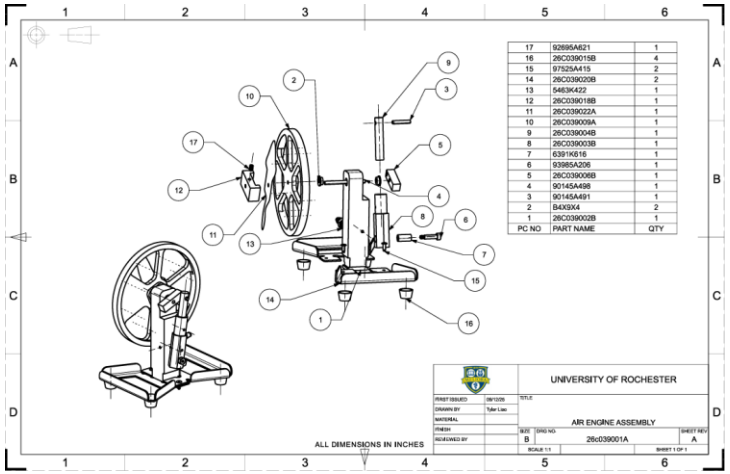


Small clamps and other shop tools

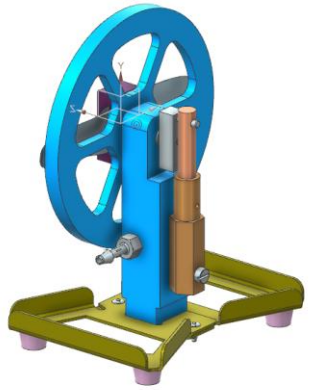
Air Engine

Project Description:

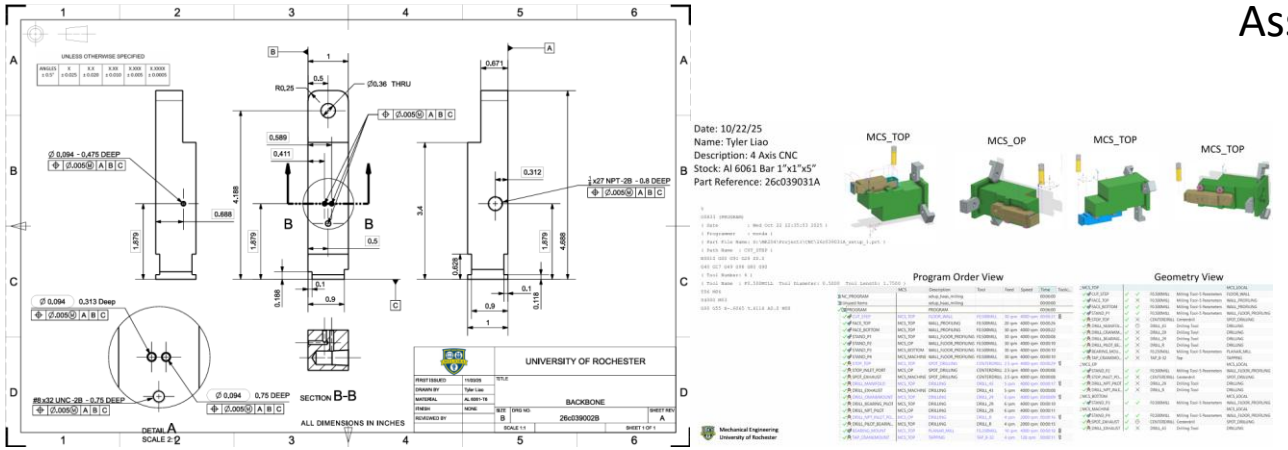
- Create CAD, drawings of air engine with accompanying simulation
- Fabricate and assemble using a variety of processes



Assembly Drawing and BOM



CAD Model



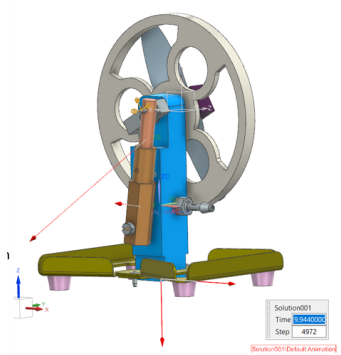
Engine Backbone Drawing and CNC Process Sheet

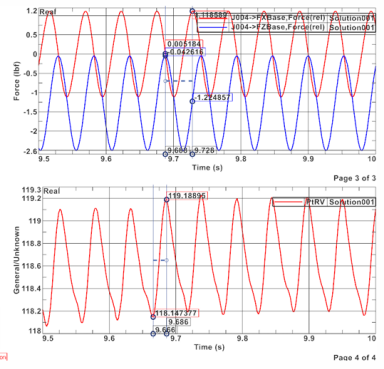
Solution Methods:

- Drawings and CNC programming done in NX
- Involved casting and mold design, CNC machining, manual lathing and milling, injection molding, and composite layup
- Simulated air engine performance using NX

Results:

- Fabricated and assembled parts for testing
- Held tight tolerances for smooth operation with as low as 0.5psi air pressure





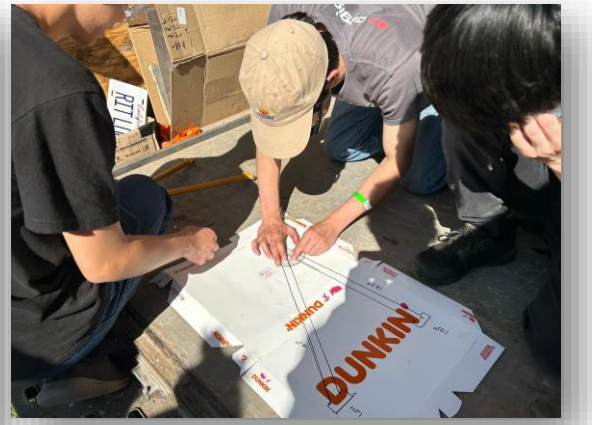
Coefficient of Speed Fluctuation Simulation

Tube Welding Fixture

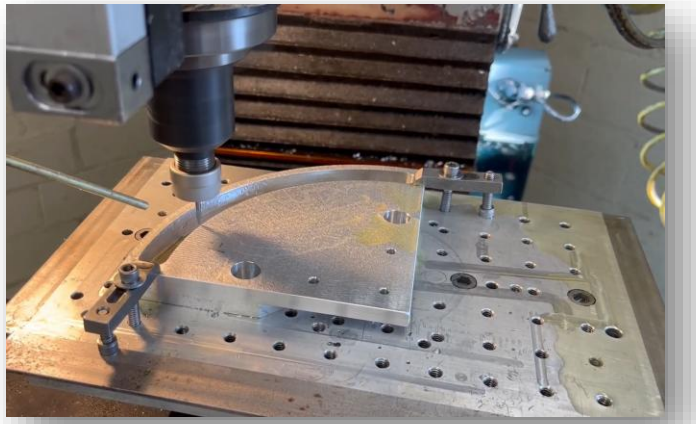
Project Description:

- Tube coping and welding for the Baja team is slow and has accuracy limitations, especially when travelling to competition site
- Design fixture to speed up and increase accuracy of tube coping and welding process

Routed Fixture



DIY fixturing at competition

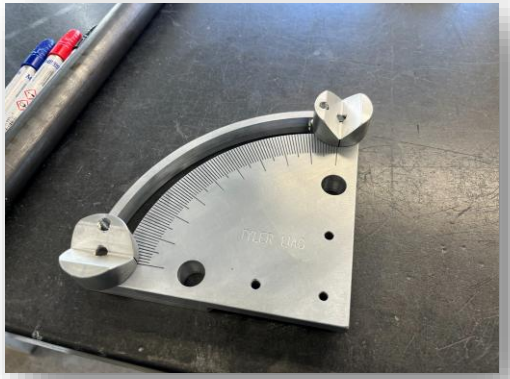


Main baseplate milling with Prototrak 3 Axis

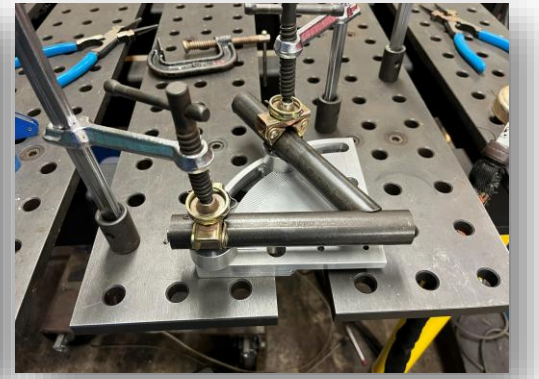
Pucks machined on lathe then processed in milling machine

Solution Methods:

- Custom angle fixture plate with angle graduations
- Worked with experienced toolmaker to design and fabricate parts using Prototrak 3 Axis milling machine



Assembled Part



Set up for welding

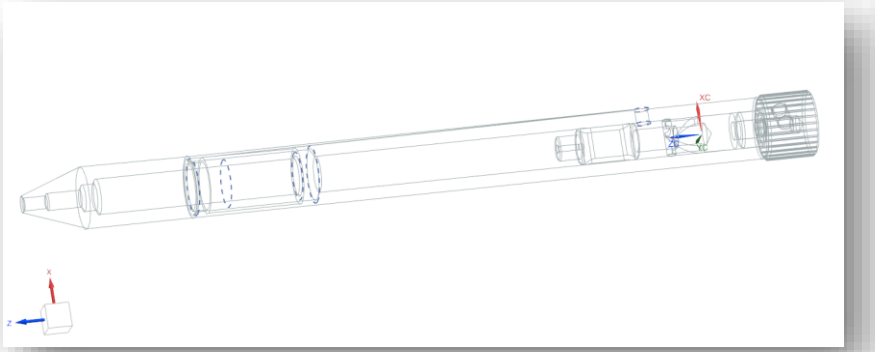
Results:

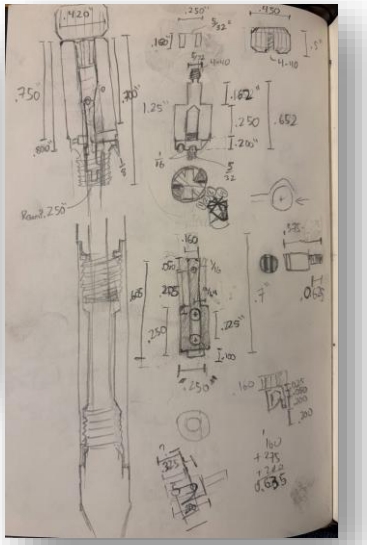
- Fabricated and assembled parts for use in tube welding
- Removed need for dedicated fixtures in certain cases

Machining Pens

Project Description:

- Personal project to make interesting metal pens
- Experiment with small part machining and custom fixture design





Planning racheting pen mechanism

45° Indexing fixture

Rachet Mechanism

Solution Methods:

- Experiment creatively with fun machining techniques
- Machine custom pens out of brass, aluminum
- Prototype and design mechanisms

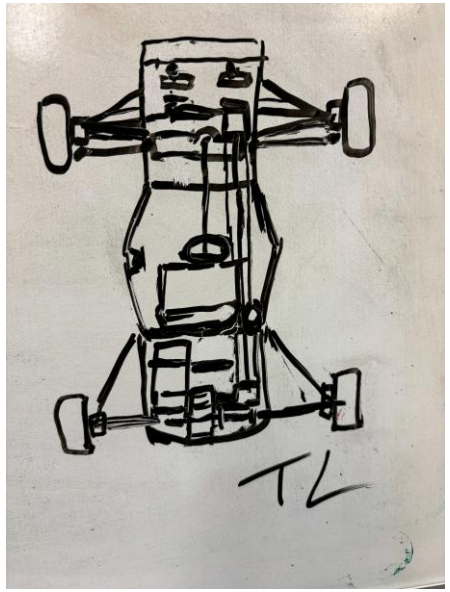
Results:

- Assortment of bolt action mechanism pens
- Custom ratcheting twist pen with pressed bronze bearing machined entirely on micro lathe machine

Bolt Action Pens

Ratcheting Mechanism Pen

Baja Bonus Page



Drawing from memory, proud of my “mind CAD”

Pretty sure it’s not supposed to look like that

(YJR-23’s first competition) live and learn…

Doesn’t work quite the same in real life

(YJR-23’s second competition) Or maybe not