

<https://github.com/RobertAtwood/Portfolio/tree/Project-deep-dives>

1. Aerospace Engineering Senior Capstone

**6' Wingspan flying business jet
'FOD Vacuum'**

This project was designed and built, from an idea to a finished flying product, in 9 weeks. Completed by a team of 3, led by me.

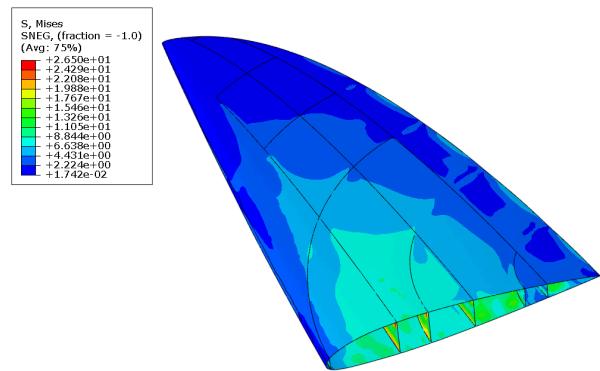
Project parameters: Design and build a business jet. Construction out of wood materials (balsa/bass/plywood), 3d prints allowed, carbon fiber/fiberglass disallowed. Given 3 weeks to design, with a critical design review presentation every week, design freeze at the 4th week, once design approved, start the build.

An interesting constraint of note to this project was that every assembly (fuselage, tail sections, wings) needed to be built inside a jig. From the start, we designed our assemblies for manufacturing (DFM), understanding they had to be manufactured in a jig. Having done this multiple times as a hobby with and without a jig, it takes a significantly larger investment and more time, but the result is far superior in alignment, consistency, and ease of assembly to build with one.

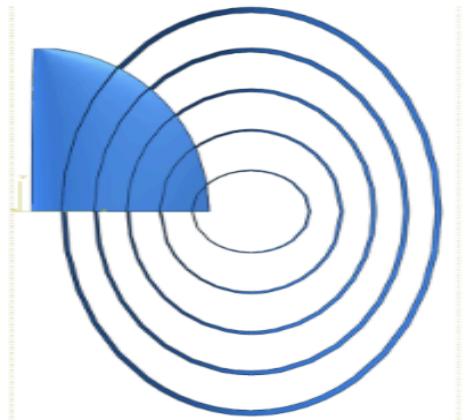
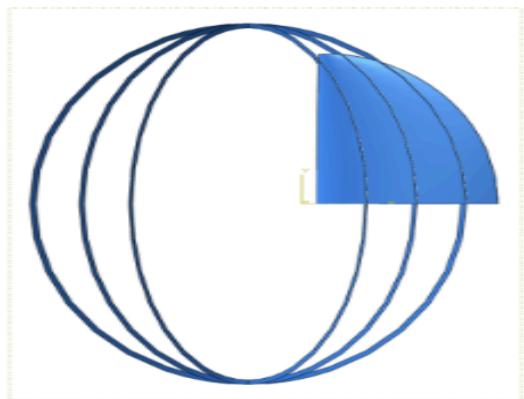


2. ABAQUS Spitfire Wing - Senior Elective Project Design of Experiments (DOE)

Design an experiment with multiple design variables, output variables and constraints. Use an optimization algorithm (genetic algorithm was chosen) that will automatically change the design parameters, then automatically run a new simulation in ABAQUS, then output variables of interest to inform the algorithm how to tweak the design and create the next generation for the genetic algorithm to run. The optimization was given by the objective cost function incorporating mass, and two cases for deflection high G turn and hard landing.



z
y
x
Step: AnalysisStep
Increment: 1: Step Time = 1.000
Primary Var: S, Mises
Deformed Var: U Deformation Scale Factor: +1.000e+00

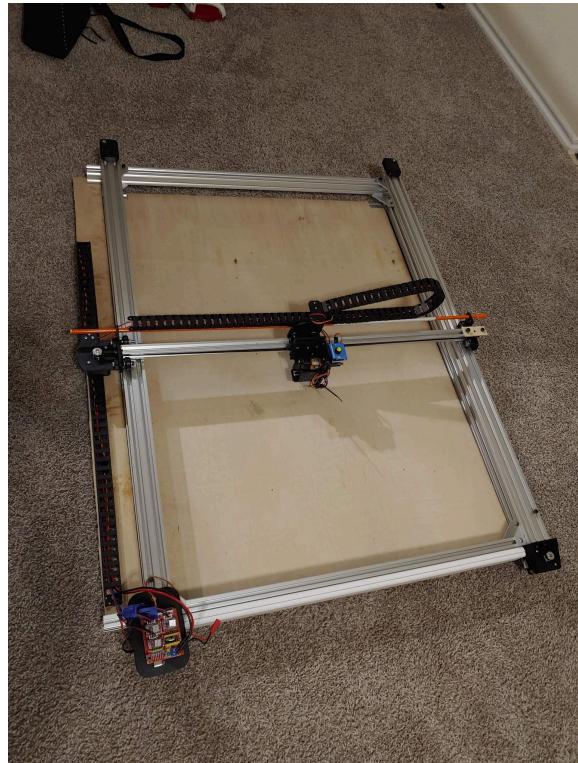
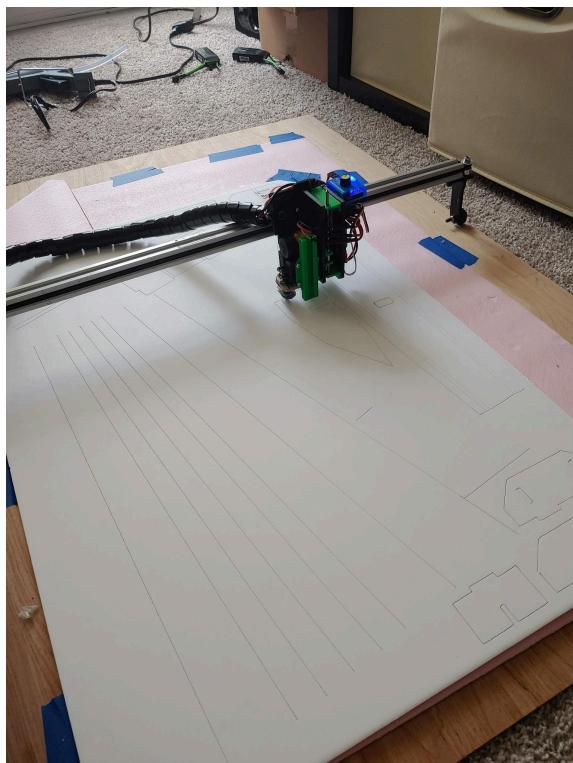


3. DIY CNC

Self-Driven project

Problem: The hobby of building RC planes out of foam board requires a lot of time ahead of time spent cutting out parts by hand. The result is only as accurate as your process for transferring plans and your hand's steadiness. Additionally, cutting the parts is not rewarding like the building or flying portion of the hobby is.

Goal: increase accuracy in parts and decrease time required to cut parts. Also, attain skills and knowledge for building a CNC for building a significantly more advanced CNC in the future.



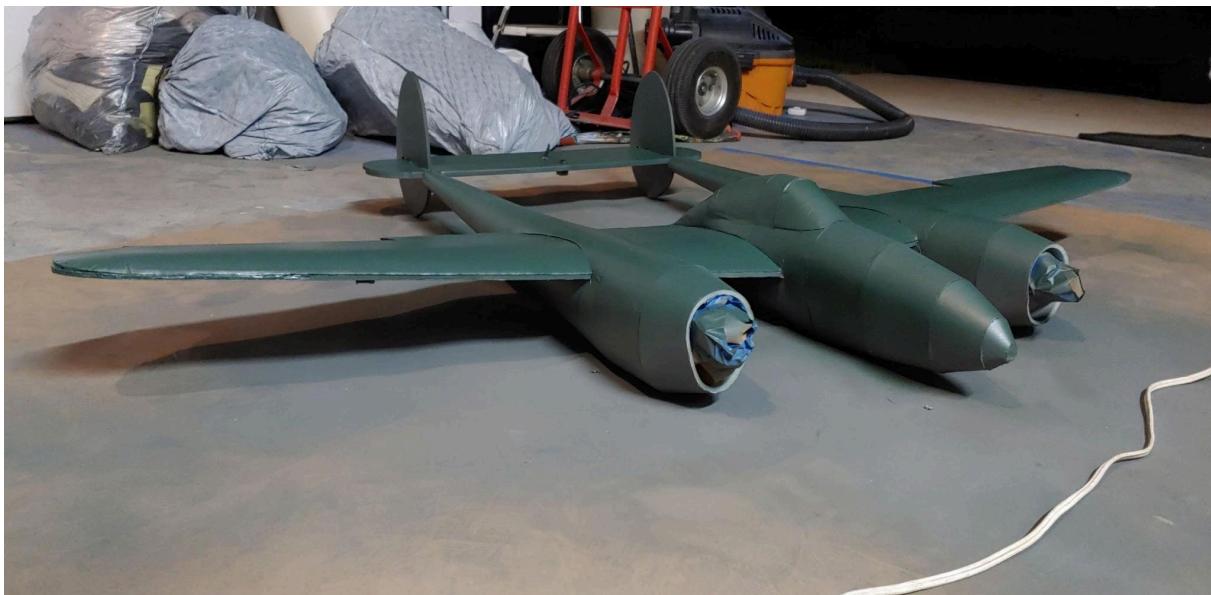
V1

Output:

V2

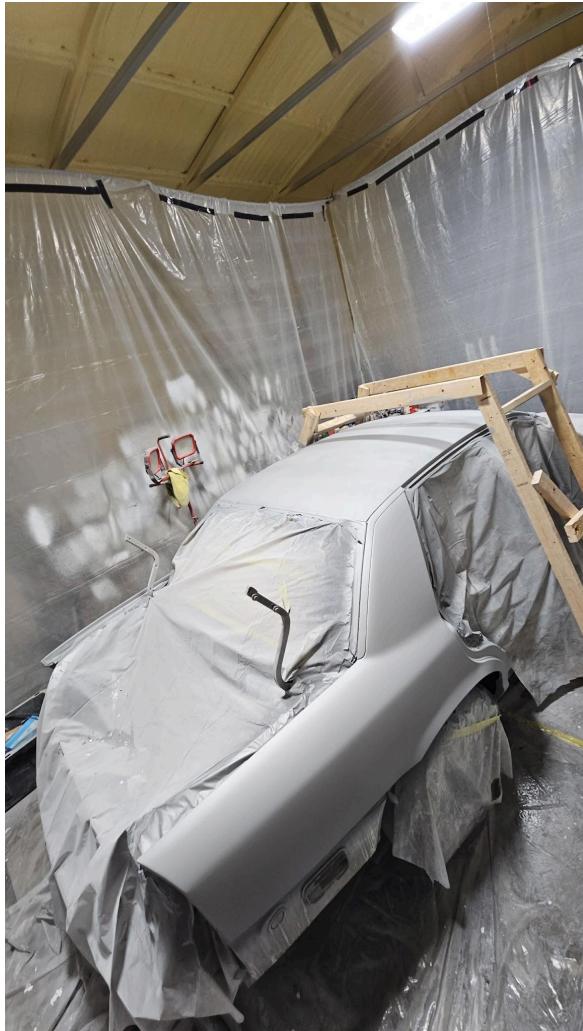


4. DIY RC Airplanes

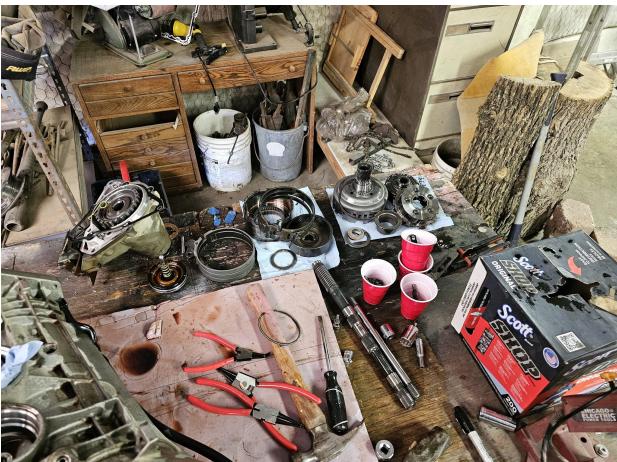


5. Car Projects

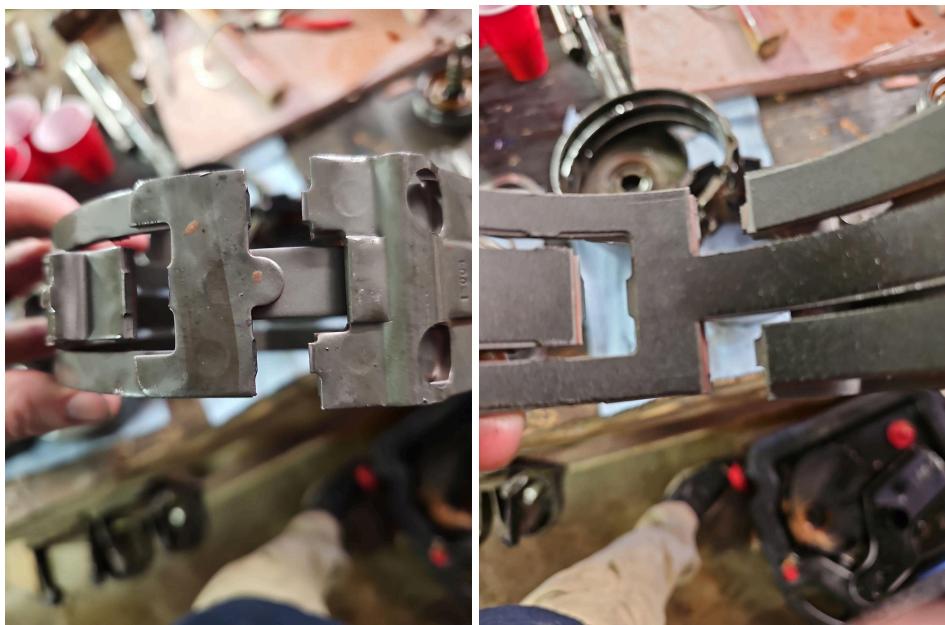
I painted my car. It took 4 months of working all day 3 days a week. It was much more difficult and took much more time than I expected.



Transmission rebuild: I removed and rebuilt an automatic transmission which did not have reverse, I fixed the problem. I had never done this or anything similar before. It was very overwhelming at the start and I definitely thought I was in over my head, and was concerned I would not be able to recognize the root cause, but I did



Root cause: Reverse band stretched, unable to constrict and fully constrain reverse drum.



New Band:



Old Band:

Engine Rebuild: I had to replace the head gaskets on my car. I treated this like an opportunity to learn more about engine maintenance, it was a lot of work, a large time commitment, a lot to learn, and I thoroughly enjoyed it.

