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Project Portfolio

"A designer knows he has achieved perfection not when there is nothing left to add, but when there is nothing left to take away" - Antoine de Saint-Exupéry

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Introduction

This portfolio showcases several projects I have worked on. These represent a combination of personal, collaborative, and professional ventures. My hands-on experiences are significant to me, and I value their impact on my engineering abilities. Through this portfolio, I aim to highlight the lessons I've learned and, more importantly, display some things I've created that I think are pretty cool.

Note on Controlled Information

I have worked on projects sensitive to national security interests. Some of these projects contain information classified as controlled. Due to the restrictions involved, I cannot disclose specific details of these designs. I have included a *Professional Projects* section describing this work to the extent I am legally capable.

All information disclosed in accordance with Executive Order 13566: "Controlled Unclassified Information."

Test Structure for Liquid Bi-Propellant Rocket

Summary

- Designed and manufactured the rocket's internal aluminum structure
- Designed and welded the rocket's static-fire test stand
- Performed static FEA on bulkheads and longerons for axial loading from thrust and parachute deployment
- Performed buckling analysis on longeron sections

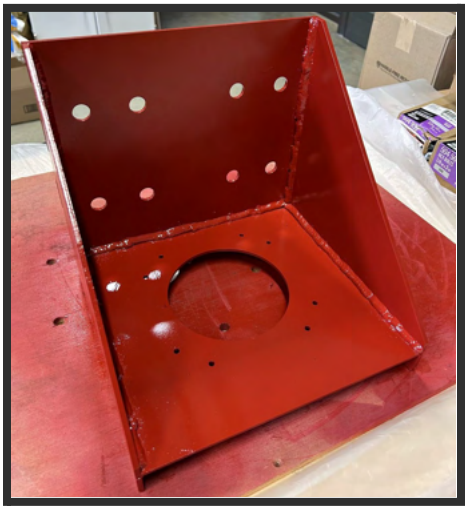
Lessons Learned

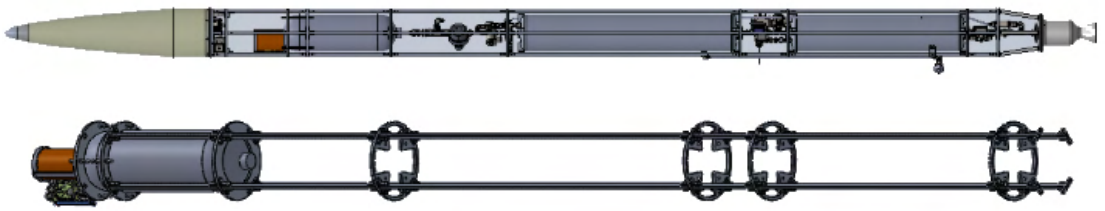
- Failed Iterations Produce Successful Parts

Reaching the final version of the part typically involves going through a few flawed iterations, and that's okay.

- Simulation-Driven, Physically-Validated

CAD only gets you so far. Always make sure to fit-check parts as soon as possible, and stress-test components as early as possible – whether that's dry-running mechanical systems or jumping on welds.





UCSD Rocket Club “Hermes” Solid Rocket

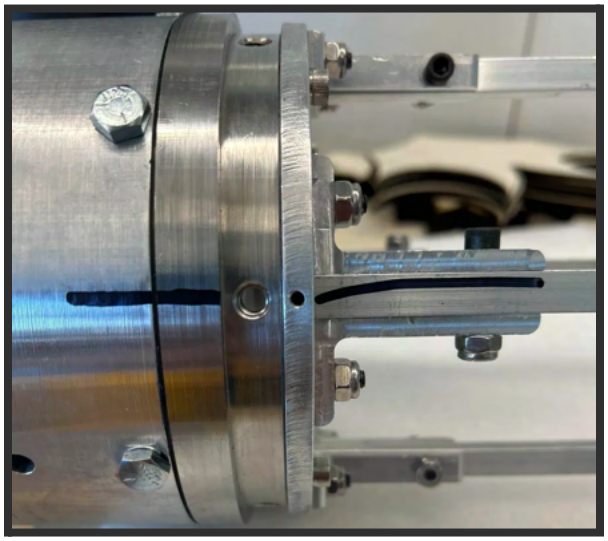
Summary

- Designed and manufactured the thrust chamber assembly for UCSD’s “M” class rocket
- Created a variable thrust chamber design capable of housing “M-Q” motors

Lessons Learned

- Design to What You Know And Around What You Don’t

I designed to the specs I knew would not change, and made the thrust chamber assembly variable because it was to accommodate various sizes of motor.



Hull Design for UCSD Human-Powered Racing Submarine

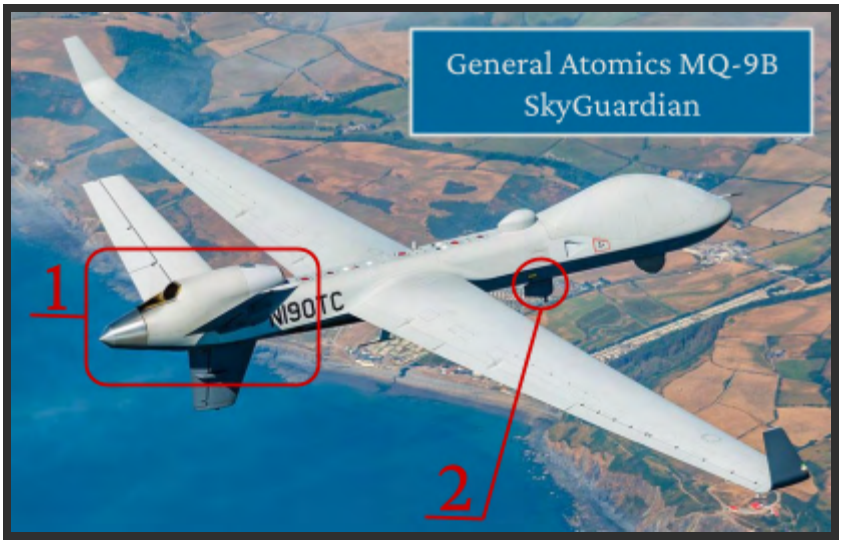
Description

- Designed the hull molds to be hydrodynamic while accommodating necessary drivetrain hardware
- Produced wooden plugs to cast the two halves onto. Molded the male and female casts with fiberglass composite, after which the casts were vacuum bagged and surface finished

Lessons Learned

- Filling the Gaps: Systems Integration & Bondo
  Creating the hull while the internal components were still being finalized presented some challenges regarding systems integration. Through effective communication (and lots of Bondo), we were able to make the hull accommodate all the necessary hardware.
- Collaboration vs Independence: Finding the Balance
  This project shaped my sense of when to work independently versus asking for help. It was a great learning experience in balancing productivity with being a good team member.

General Atomics MQ-9B



Engine Bay Re-Design & Design for Thermally-Resistant Structural Member in Engine Bay (**1**)

- Redesigned the structure of the MQ-9B Engine Bay to guarantee a full fire-proof seal and increase manufacturability
- I updated all of the manufacturing documentation for the engine bay to reflect the redesigns.
- Designed a reinforcing component for the engine's firewall around the complex curvature of the plane's outer aerodynamic surface. I utilized pre-existing mounting hardware and reinforced where the upper and lower halves of the engine bay meet.

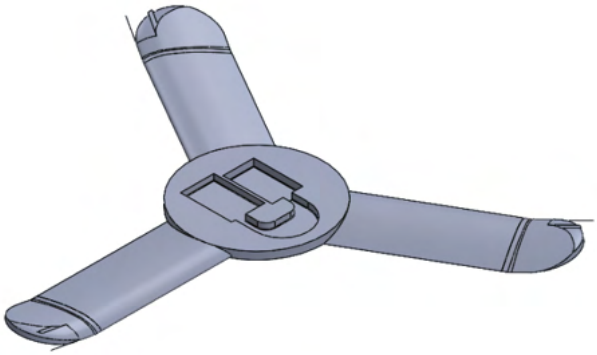
Ground Communications Radar Housing Unit (**2**)

- Contributed to the redesign of the internal structure of the unit that houses the plane's ground communications radar.
- I updated both the designs and the manufacturing documentation for this project, which deepened my understanding of GD&T and designing for manufacturability.

Boomerang Research at UCSD

Description

- Altered test boomerang designs to have lifted wingtips for research
- Scaled boomerang designs to still fly while fitting on the print bed of a Prusa Mini 3d Printer

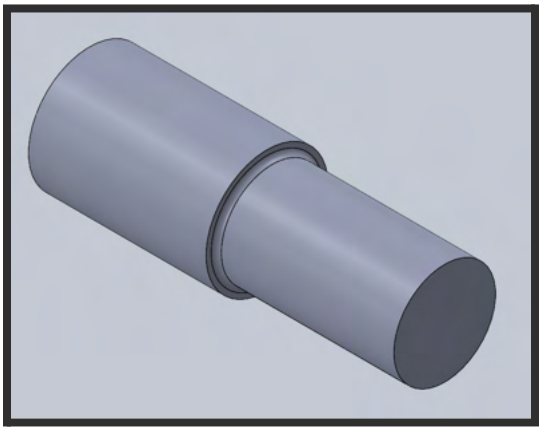


Lessons Learned

- Patience & Perseverance

There are many moments in research where things don't go as you'd like. This project helped me learn to keep a level head and appreciate the bumps along the road.

Simulation & Programming

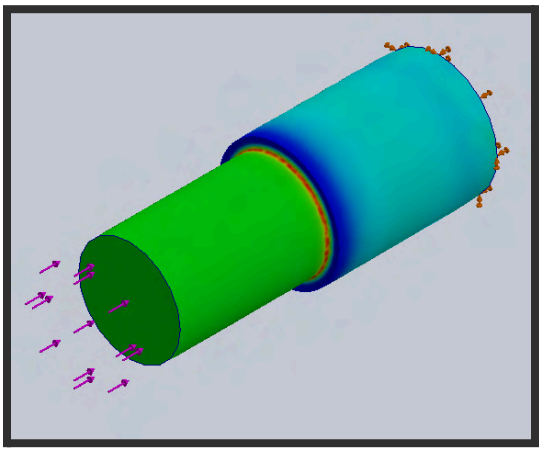


Power-Transmission Shaft Fatigue Analysis Code

- Created a shaft design code that provides the user with an appropriate shaft diameter according to Gerber-DE Failure Theory given a set of conditional inputs
- Designed code to provide accurate analysis considering user-chosen material properties, alternating & mean bending/torque loads, operating temperature, surface finish, reliability factor, and diameter & fillet ratios

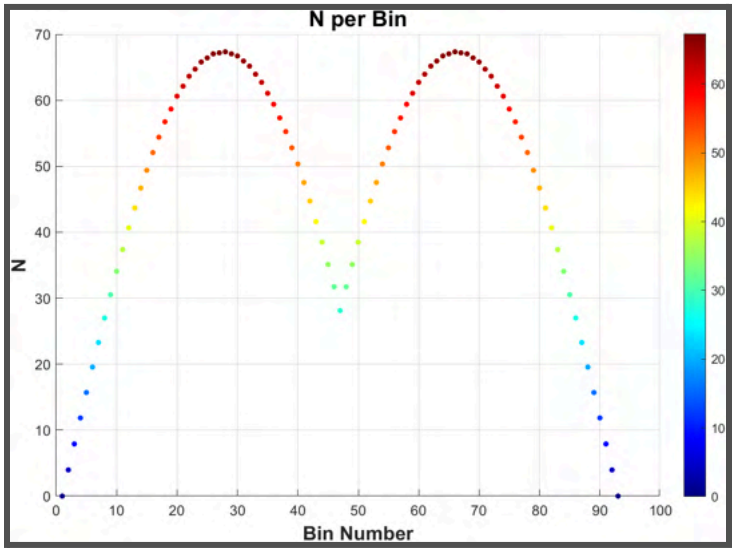
Airplane Wing Analysis Code

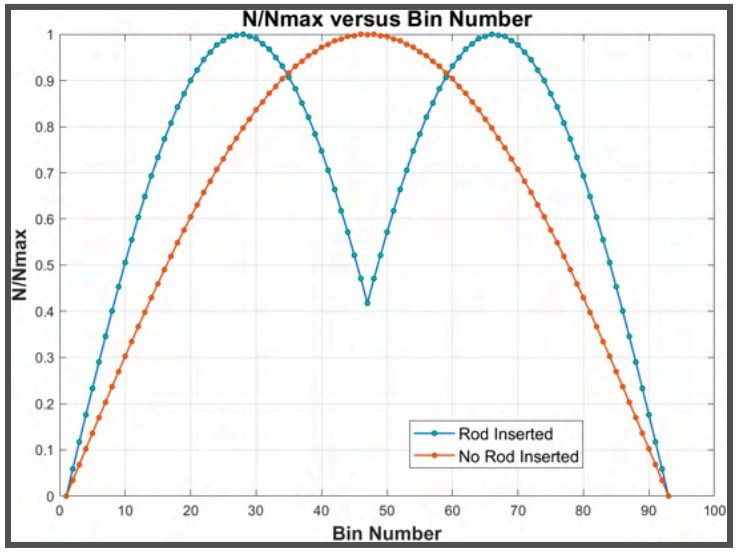
- Made code that analyzes and graphs the internal forces, internal moments, skin panel shear stresses, wing tip displacement, tip twist, and tip bending slope for an airplane wing given variable distributed loading
- Applied code to stringer selection for wing structure



Nuclear Reactor Neutron Proliferation Simulation

- Created a code which simulates the propagation of neutrons through the core of a nuclear reactor
- Integrated inputs to control the size of the simulated reactor, neutron proliferation factor of the fissile material, and initial neutron saturation of the reactor
- Added a system that simulates the insertion of control rods, creating bounded instances in the reactor core that stop neutron proliferation





N= # of Neutrons, Bin Number= Quantized Location in Reactor, Nmax= Max # of Neutrons

Surfboard Repair

Hermosa Beach

“Franken-board”

Mr. Pointy