# Device Engineering Co-Op

BMW Manufacturing Co.

As a Device Engineering Co-Op working at BMW Manufacturing in Spartanburg, SC, I collaborated with a small, fast-paced, team to build/implement well-established prevention solutions, design specialty solutions, and research new technologies. My projects provided an opportunity to build confidence in root cause analysis, lean manufacturing, and error prevention philosophies/practices. Additionally, working hands-on to design, build, and program sophisticated error prevention systems improved my fabrication, programming, and problem-solving skills.
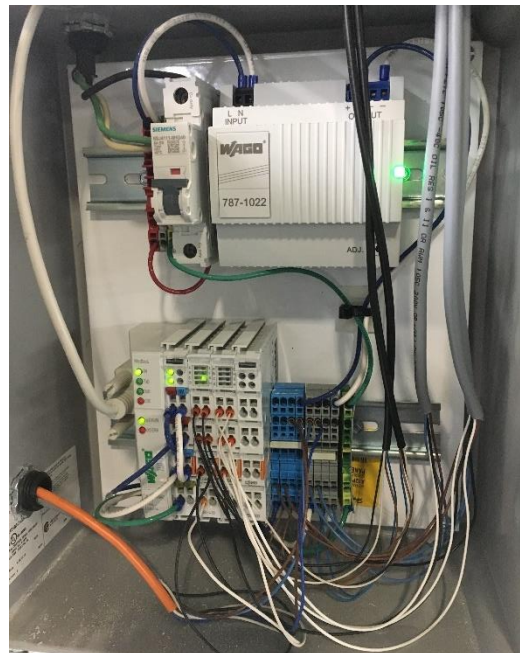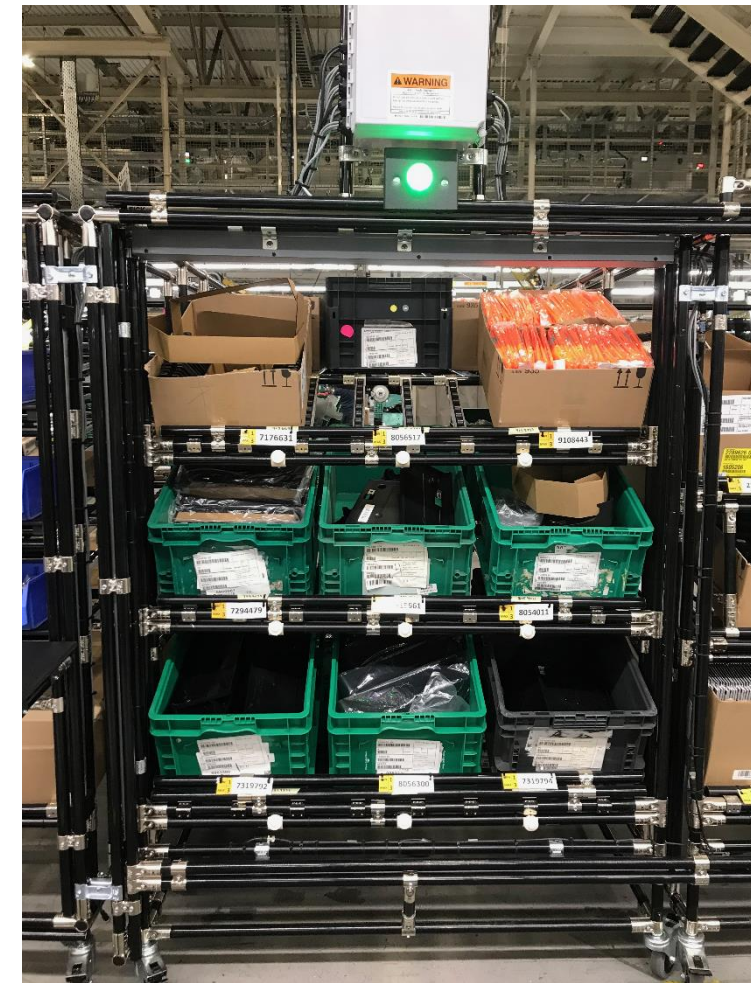
Project Experience
- Built, wired and programmed various electronic solutions
- Designed and implemented specialty solutions
- Researched new hardware technologies
- Tracked department performance metrics
- LOP data reduction and analysis
- Tracked solution locations and planned required moves
- Documented build information and wiring diagrams

Skills
- Root Cause Analysis
- Process Improvement
- Lean Manufacturing
- Machine Shop Fabrication
- Prototype Development
- Data Analysis

Undergraduate Research Assistant

North Carolina State Supersonic Wind Tunnel

I worked as a researcher in NC State's Turbulent Shear Flow Laboratory (TSLA) throughout Summer 2018 where I trained under Dr. Venkat Narayanaswamy and the laboratories Ph.D. students in the supersonic wind tunnel lab for a month, learning the various experimental methods before being given my own project. I was then tasked with leading an experimental investigation of inlet unstart physics, a phenomenon which limits the further development of hypersonic aircraft. I planned and carried out experiments to characterize the flowfield of a model ramjet/scramjet engine under various conditions believed to influence the initiation of the phenomenon. In doing so, I gained an understanding of fluid dynamics and learned to collect, process, and analyze data to produce formal, publication quality, technical writing.
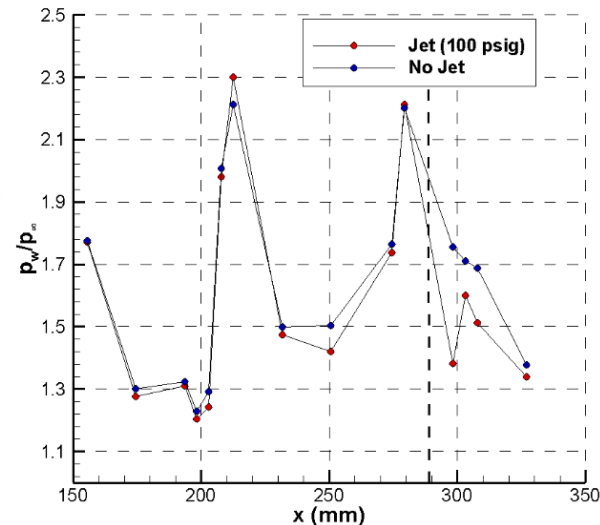

ace streakline flow visualization (note, (a) through (e) correspond to jet injection cases 1 through 5).
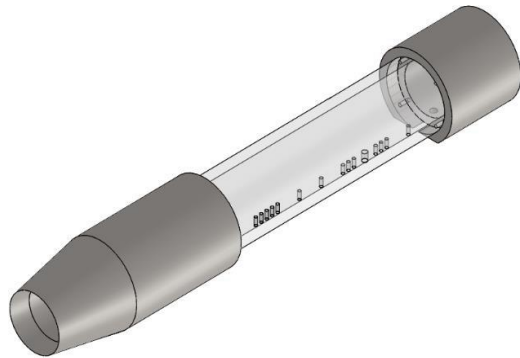
Figure 3: Wall static mean pressure profile for case 1 and 2 (no jet and 100 psig jet configurations).

Skills

- Wind tunnel operation
- Experimental testing
- MATLAB
- TecPlot
- Data Analysis
- Technical Writing
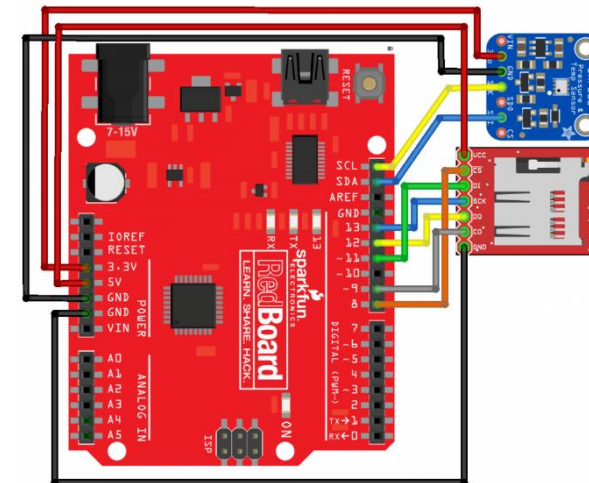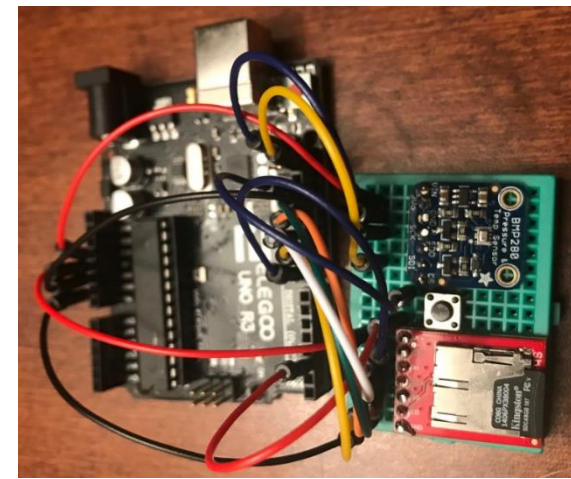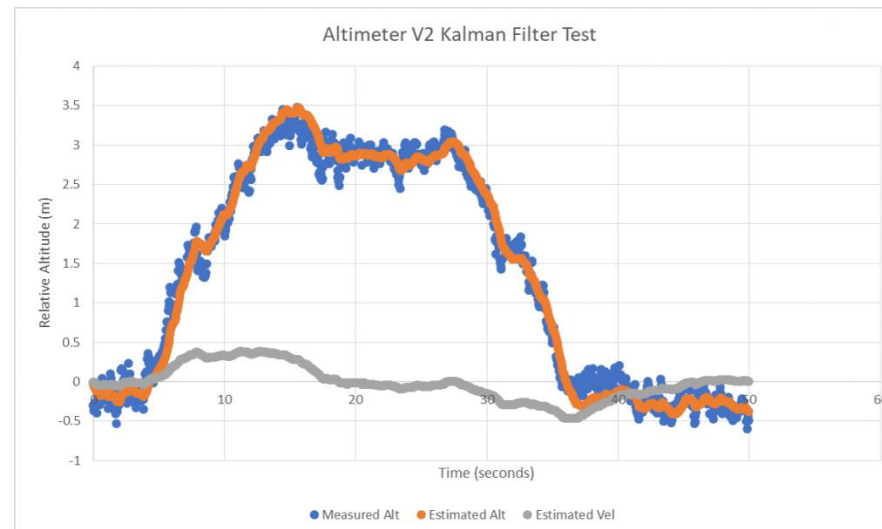
Arduino Flight Computer

Personal Project

The aim of this project is to develop a functional altimeter for model rocketry applications built around the Arduino micro-controller platform and a BMP280 barometer. This device should accurately measure the altitude relative to the launch pad and record the data to an SD card. Substantial information regarding the in-flight characteristics of a model rocket launch can be extrapolated from the altitude measurements, allowing state estimation of the height, velocity, and acceleration profiles of flights using a Kalman Filter.

This project is a work in progress. Presently, the basic altitude measurement, data recording, and a simplified Kalman Filter are implemented. Moving forward, a more advanced Kalman filter and improved hardware will be used, with the first full test launch targeted for Q1 2019.

Objectives:
- Base Altimeter: Measure altitude and record data to a SD card - COMPLETE
- State Estimation: Estimate instantaneous velocity and acceleration – PARTIALLY COMPLETE
- Event Detection: Monitor state estimate to detect Launch, Landing, and Apogee
- Visualization: MATLAB software to display all flight data

Altimeter V2 Kalman Filter Test

Relative Altitude (m)

Time (seconds)

● Measured Alt ● Estimated Alt ● Estimated Vel

Skills
- Soldering
- Wiring
- Arduino IDE
- Electronic Prototyping
- State Estimation
- Problem Solving

Mazda Miata Project Car

Personal Project

On 6/4/2015 I purchased a Black 1994 Mazda Miata with 240100 miles. Since purchasing the vehicle, I have put hundreds of hours of work into repairing, modifying, and improving it. I have gained invaluable hands-on, problem-solving skills while increasing both the reliability and aesthetics of the vehicle.

Car Maintenance/Repair Experience
- Brakes and Rotors
- Suspension Replacement
- Master and Slave Cylinder
- Minor Bodywork – dent removal and repainting front bumper
- Interior Work – carpet removal, seat replacement, speaker wiring
- Basic Maintenance – oil change, valve cover gasket, differential fluid, shift boot, brake fluid, battery replacement

Before

After
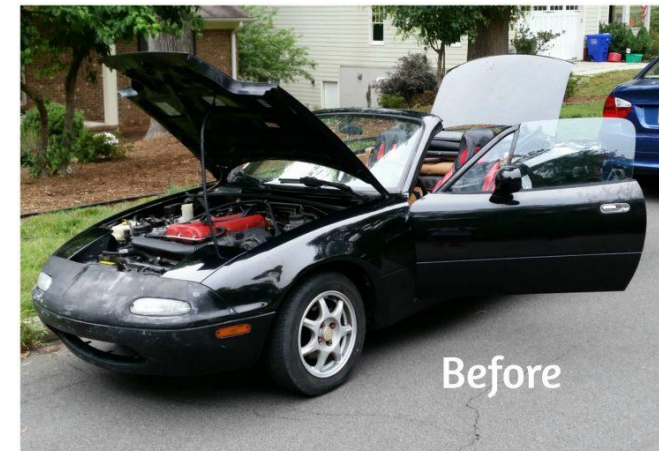
Skills
- Automotive repair
- Root cause analysis
- Hand tool operation
- Problem solving
- Part sourcing
- Budget tracking

3D Printing Design - Team Lead

Freshman Engineering Design Competition

The objective for the Freshman Engineering Design Competition was for teams of four to designing a device with two distinct functions, made of at least 90% 3D printed material. My team elected to design a 3D printed modular multi-tool. Our two distinct functions being a multi-tool and having the ability to switch which tools you include. The most challenging part of the project was designing the multi-tool's frame to be modular while also achieving acceptable structural integrity.

In addition to leading team meetings and delegating work, my primary responsibility was in the actual printing of the parts. I worked closely with our 3D modeler and used university 3D printers to produce numerous part iterations.

Parts Designed:
- USB Holder
- Bottle Opener
- Phillips/Flat Head Screwdriver
- 3/8th in. Wench
- Pins
- Washer Clips
- Side Frame

Skills
- Solidworks
- 3D Printing
- Iterative Design
- Team Leadership

Water Bottle Rocket

Academic Project

The final project for Aerospace Vehicle Performance (MAE 250) required that a team of three members work together to computationally model a water bottle rocket launch. The model was then run under various parameters and variations to determine the ideal water bottle rocket design. The computational information was then used to make informed design decisions when constructing a water bottle rocket. The water bottle rocket was then tested and the physical results were compared the computational predictions.

Ø 2.5 cm

PARACHUTE Ø 45.3 cm

SAFETY STRING

11.5 cm

Ø 7.2 cm

EJECTION FLAP 9.0 cm

∧ 60°

10.0 cm 29.3 cm

5.5 cm

6.0 cm

7.3 cm

6.2 cm

0.7 cm

Ø 3.0 cm

FUEL TANK CAPACITY : 1.0 L

MASS OF ROCKET : 74 g

https://seanmurray.wordpress.ncsu.edu/

Please see my online portfolio which includes further project examples and work samples

My primary role on the team was developing the water bottle rocket simulation software in MATLAB based on the theoretical equations derived in the classroom.

Skills

- MATLAB
- Rocket Simulation
- Rocket Design
- Performance Testing
- Technical Writing
- Data interpetation