Mason Kaufman

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EDUCATION

University of Nevada, Reno Graduated Dec. 2021

- B.S. in Mechanical Engineering; Emphasis in Unmanned Autonomous Systems
  - **Relevant Courses:** Advanced Mechanics, System Analysis, Instrumentation, System Controls, Digital Control Design, Aerodynamics, Robotics

SKILLS AND CERTIFICATIONS

Software Proficiency: SOLIDWORKS, AutoCAD, CATIA, ANSYS, LabView, MATLAB, Simulink, Excel, Word, PowerPoint, Projects, Teams
Design & Analysis: Mechanical and Systems Engineering Principles, kinematic analysis, advanced joint design, material selection, GD&T
Fabrication Techniques: CNC milling, laser/plasma cutting, MIG/TIG welding, 3D printing, PCB design, laminate composite construction methods
Certifications: SOLIDWORKS Associate Mechanical Design, Abaras Advanced Composites Manufacture and Repair, NAR High Power Rocketry Level 2
Languages & Architectures: Python, Java, C++, VBA (Excel Macros), Raspberry Pi, Arduino, ESP32

EXPERIENCE

Nevada Electric Racing Team | Chief Engineer - *University of Nevada, Reno* Mar. 2020 - Present

As Chief Engineer of a new Formula SAE team, formed during COVID, I led my team through the countless design, manufacturing, integration, optimization and logistical hurdles in producing an 80 kW, 420v, electric race car for our first competition this June in Michigan.

- Directed cross-functional subteams, ensuring on-time achievement of project goals through efficient resource allocation. Implemented robust documentation practices and promoted collaboration and communication, establishing a foundation for continued development and success
- Achieved a 43% reduction in weight over initial design of the chassis, resulting in a final mass of 37kg while greatly enhancing torsional rigidity (~2.7 kN-m/deg verified experimentally). This also contributed to achieving our goal of 220 kg for the final vehicle mass with the driver
- Designed an aero-package capable of producing 530 N of downforce and 117 N of drag at only 35 mph, with a drag reduction system capable of reducing drag an additional 26% while maintaining nearly 91% of downforce thanks to countless hours of optimization, CFD, and scale testing.
- Utilized Matlab to create a multi-objective optimization program to simulate kinematics and determine optimal suspension geometry
- Spearheaded the design of a modular vehicle upright platform that prioritized adjustability for testing and promoting design flexibility for future iterations. I was also able to save the team over $7000 by implementing significant redesigns that allowed the parts to be machined in house
- Produced a custom ESP32 based thermal monitoring circuit, which ensures safe operation of our incredibly compact, 693 cell battery enclosure by implementing bit shifting to monitor 8 independent ADC chips through a multiplexer, communicating over CAN to the rest of the system
- Implemented an advanced data acquisition and telemetry system to gather valuable performance data during testing and competition events, enabling the team to better understand the current design and make data-driven decisions for further optimization and future iterations
- Incorporated a modular drivetrain mounting system, adding rigidity to the rear end assemblies and allowing easy integration into future designs
- Implemented custom firmware for the Vehicle Control Unit with logic which, given steering angle input, pedal travel, GPS data, inertial measurements, wheel speeds, motor RPM, torque, and comparison to a prediction algorithm, will modulate power sent to the wheels

Intercollegiate Rocket Engineering Competition | Project Manager - *North Seattle College* Sept. 2017 - Jan. 2019

Led 20-member team through the design, critical evaluation, fabrication, launch, and recovery of our high-powered sounding rocket and experimental payload, reaching our target apogee of 10,000 ft at competition at Spaceport America in New Mexico.

- Provided organizational leadership and design direction while managing the overall scope, schedule, budget and long term goals of the team
- Led weekly team meetings in addition to attending and supporting all subteam meetings, and regular design briefings, slowly establishing the collective experience and body of knowledge the team was missing
- Implemented creative problem solving solutions to overcome limited resources, including limited funding and access to high altitude testing.
- Performed extensive CFD and FEA analysis using ANSYS to investigate the complex airflow and potential transonic effects necessary to validate the feasibility of our novel modular hybrid ring-fin system, which allows for adjustment to the location of the center of pressure depending on mission and payload parameters, significantly aiding the team in the development of new experimental payloads
- Led development of guidance and navigation system for an autonomously controlled parafoil recovery system with long-range tracking and telemetry, capable of a delivering a resource-constrained 4 kg payload deployed at 10,000 ft to within 100 ft of a designated landing zone
- Fabricated a custom filament wound carbon fiber fuselage for evaluation of potential weight reductions without sacrificing strength
- Managed project schedule, BOM, budget, and maintained compliance with all rules and regulations (including ITAR and FAA restrictions)
- Established a local organization with fellow team members to provide students with resources for project-based learning opportunities

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Robotic Space Station Assembly - UAS Special Project | Team Lead - *University of Nevada, Reno* Feb. 2021 - May 2021

Developed preliminary proposal for use of an autonomous robotic manipulator arm for assembly of a Deep Space Gateway-style orbiting space station, inspired by unique capabilities of the Canadarm2 robotic system onboard the International Space Station.

- Derived the forward, inverse, and velocity kinematic equations in MATLAB, and created a simple motion planning algorithm
- Created working 3D models in SOLIDWORKS of the manipulator and station modules to import into Simulink for simulation
- Determined requirements for scaled terrestrial model to acquire appropriate parts for real world prototyping

Inflatable Lunar Habitat - Senior Capstone Project | Team Lead - *University of Nevada, Reno* Sept. 2019 - Dec. 2020

Led the development of a comprehensive preliminary proposal for a inflatable habitat module designed to sustain a crew of 30 indefinitely, taking advantage of lunar lava tubes for protection against radiation, thermal fluctuations, and micro-meteorites

- Coordinated the research and development of design requirements and delegated tasks for the completion of project deliverables
- Created detailed SolidWorks model highlighting life support, storage, crew accommodation, airlocks, and system redundancies
- Optimized design for mission requirements and the predicted payload capabilities of the SpaceX Starship launch vehicle
- Conducted engineering analysis including thermal flux, power consumption, and structural analysis under various conditions
- Produced technical reports including patent and market research, preliminary designs reviews, risk assessment analysis, and final technical evaluation

SAE Baja Engineering Competition | Rear-end Lead - *Seattle Pacific University* Sept. 2017 - Dec. 2018

Led eight-member team in analysis, redesign, and optimization of rear-end assemblies for an off-road racing vehicle

- Improved handling responsiveness, traction under acceleration, and enabled an overall weight reduction of 48 lbs
- Designed integrated inboard braking system with SolidWorks to improve suspension response over rough terrain by reducing unsprung weight by 22 lbs and increased maneuverability in corners through optional isolated wheel braking
- Increased vehicle stability by lowering the center of mass more than 2 inches through a complete redesign of drivetrain assembly

PERSONAL ROCKETRY ACHIEVEMENTS

- Earned Level 2 high power rocketry certification from the National Association of Rocketry (NAR) with the successful flight and recovery of a custom-built rocket which reached over 1100 ft/s with a 6,900 ft apogee
- Qualified as an NAR Range Safety Officer, which has allowed the opportunity to host educational launch events for students
- Developed custom flight control computer with integrated altimeters, Inertial Measurement Units, GPS tracking with long range telemetry, active stabilization capability via servo actuated canards, and ability to trigger multiple stages and parachute deployments
- Designed and programmed multi-axis ground station tracking/camera system with automatic zoom to accompany flight control computer
- Received a Washington NASA Space Grant in recognition of the innovative approaches and dedication demonstrated throughout the project

WORK EXPERIENCE

Dabblish - Custom Design and Engraving Services - *Reno, Nevada* Feb. 2019 - Present

- Provided maintenance, calibration, and operational assistance for laser engravers and CNC plasma cutters
- Assisted in assembly and installation of industrial 2.5D CNC milling machine and provided ongoing maintenance
- Designed and installed industrial grade dust collection/ventilation system for shop space

KPS3 - Marketing and Software Development Agency - *Reno, Nevada* Jan. 2019 - April 2020

- Repaired 22 kW, 72 module solar array and provided ongoing maintenance
- Assisted in the installation and configuration of building access control and security system
- Facilitated the installation of mesh networks and wire management after building renovation

VOLUNTEER ORGANIZATIONS

Habitat for Humanity, Truckee Meadows:

- Consistently volunteered in building projects, using engineering skills to construct safe and stable homes for those in need

League to Save Lake Tahoe - Keep Tahoe Blue:

- Organized and participated in regular cleanup and conservation efforts aimed at preserving local natural resources and habitats

SAE Foundation - A World in Motion:

- Mentored K-12 students in STEM principles, fostering their interest and understanding of science and engineering

PROFESSIONAL ASSOCIATIONS

Theta Tau Professional Co-ed Engineering Fraternity
American Society of Mechanical Engineers
SAE International