

Kanan Thummar

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Education

California Polytechnic State University – San Luis Obispo (Cal Poly)

December 2026

Master of Science in Aerospace Engineering

GPA: 3.492

Thesis Topic: Development of a Digital Dual Propeller Synchronization Platform for Close Proximity Aerodynamic Characterization

California Polytechnic State University – San Luis Obispo (Cal Poly)

June 2025

Bachelor of Science in Aerospace Engineering

GPA: 3.653

Research Experience

M.S. Thesis Research – Dual-Propeller Flight Test Stand

January 2026 – Present

- Designed and built a dual-propeller flight test stand to study synchronized electric propulsion behavior, phase-locking, thrust, torque, and propeller performance metrics.
- Developed embedded control software for dual ODrive S1 motor controllers using CAN communication, velocity control, encoder feedback, and real-time phase-error correction.
- Implemented a Teensy 4.1 dual-CAN architecture with each ODrive on an independent CAN bus to improve encoder update rate, reduce bus contention, and increase control-loop reliability.
- Tuned a closed-loop phase-lock controller using PID control, common-time encoder extrapolation, speed-gated offset calibration, velocity lead compensation, derivative limiting, and correction slew-rate limiting.
- Reduced phase-error RMS to below 1° with over 99% of samples within $\pm 5^\circ$ during 10-second synchronization runs through iterative testing and controller tuning.
- Integrated SD-card data logging, high-rate telemetry capture, run naming, test-duration control, and post-run metrics including RMS phase error, worst-case error, and percent within $\pm 3^\circ$ and $\pm 5^\circ$.
- Developed a MATLAB post-processing workflow to pair flight test stand data with ODrive telemetry, compute thesis-relevant performance metrics, and generate publication-quality plots.

Open-Jet Wind Wall / VortexField Apparatus (VF_a)

January 2026 – Present

- Designed and validated a modular 32-fan open-jet wind wall for controlled inflow generation and propeller-interaction research.
- Developed 3D-printed diffuser shrouds, honeycomb inserts, and an ESP32/Python PWM control system to improve flow quality and repeatability.
- Mapped the velocity field with hot-wire anemometry in MATLAB and benchmarked propeller thrust and torque coefficients against Cal Poly Low Speed Wind Tunnel data.

Aerospace Engineering Experience

SLO Propulsion Technologies – NILE Project

September 2024 – Present

- Designed a SolidWorks test stand structure for a 1,000 lbf liquid bi-propellant rocket engine and supported FEA-based load checks for a 7-second burn case.
- Led manufacturing planning by creating build documentation, establishing timelines, and coordinating integration with fluids and electronics teams.
- Delivered a technical presentation to 50+ stakeholders, contributing to additional funding for the feed system.

Autonomous Nerf-Blaster Turret – Aerospace Senior Lab

May 2025 – June 2025

- Designed and integrated mechanical and electrical hardware for a three-person, \$25 autonomous targeting system in four weeks, including SolidWorks-designed 3D-printed components, gearing, DC-motor integration, wiring, and electronics layout.
- Selected a \$3 automotive door-lock actuator over a \$40 linear actuator; co-redesigned the trigger linkage and 12 V power system after a current spike destroyed the original supply, adding a fused automotive battery for reliable firing.
- Implemented a 1D Kalman filter and firing software, then integrated ultrasonic detection, encoder-feedback alignment, and subsystem code into an autonomous detect–orient–engage–fire sequence.
- Developed the test matrix and validated targeting at 0° , $\pm 30^\circ$, and $\pm 60^\circ$ using a barrel-aligned laser, identifying accumulated positioning error while demonstrating autonomous operation.

W.H.A.L.E. Spacecraft – Aerospace Senior Design

September 2024 – June 2025

- Led propulsion design for a four-satellite, five-year mission; selected dual 22 N ASCENT thrusters, designed the hybrid regulated feed-system architecture, and co-sized 71.7 kg of ASCENT and 8.9 kg of GN2 with a 20% margin.
- Developed lifecycle reliability models and selected dual thrusters to eliminate a single-point failure and meet five-year throughput requirements, achieving approximately 89% modeled propulsion-subsystem reliability.
- Ran ANSYS Fluent GN2 plume analysis at approximately 260 psi, identifying a 29.7° plume cone that drove thruster relocation to reduce contamination risk.
- Co-led thermal design and built a 72,884-node, 27,626-element ANSYS Transient Thermal model using team-supplied heat loads to assess hot/cold cases and guide radiator sizing, component placement, insulation, and material selection.

Cal Poly Racing Formula Society of Automotive Engineers (SAE)

September 2022 – December 2024

- Designed custom front-wing main-element and flap airfoils in JavaFoil and NX, improving C_L/C_D by approximately 30% while meeting an 80 lbf downforce requirement at 60 mph.
- Performed preliminary 2D STAR-CCM+ studies with 1–10 cm mesh refinement over three months of design iteration to refine wing geometry before manufacturing.
- Co-manufactured and instrumented carbon-fiber front/rear wing main elements with 16 pressure taps; post-processed runway-test data and supported tuft testing for flow separation.
- Redesigned front-wing endplate fabrication around a 3D-printed core and composite layup, reducing production time approximately 30% from 7 to 5 hours per pair.

Space Environments Lab

January 2024 – June 2024

- Conducted vacuum and thermal experiments evaluating atomic oxygen exposure on Mylar and Kapton samples and surface-finish effects on thermal transfer.
- Designed custom multi-layer insulation blankets for thermal protection testing under vacuum conditions.

Work Experience

Assembler & Test Technician Intern – Quantic M-Wave

July 2023 – August 2023

- Tuned and tested RF isolators and circulators at 70 K using vector network analyzers and cryogenic test setups.
- Assembled and tested 50+ waveguide isolators and circulators per day while maintaining quality standards.
- Improved testing procedures, increasing accuracy by 5% and strengthening process reliability.

Leadership

Technical Director & Chief Safety Officer – SLO Propulsion Technologies, NILE Project

September 2024 – Present

- Directed a 10-person engineering team across structures, fluids, electronics, and software integration for a 1,000 lbf liquid bi-propellant engine test stand.
- Established subsystem requirements, safety constraints, and integration plans to align teams before cold-flow and hot-fire operations.
- Led site preparation and day-of-test operations for hot-fire campaigns, coordinating 15 engineers while maintaining procedural discipline.
- Led the design and deployment of a spaceport-capable test site for Cal Poly's liquid bi-propellant engine program at Paso Robles Airport within six months.

Propulsion Lead & Thermal Co-Lead – W.H.A.L.E. Spacecraft Senior Design

September 2024 – June 2025

- Led propulsion and co-led thermal work in a three-person group within a 28-person spacecraft team, coordinating GNC, structures, power, and space-environment interfaces through PDR, CDR, and final symposium reviews.
- Presented subsystem decisions to Firefly Aerospace at Vandenberg and Maxar/Lanternis reviewers, incorporating feedback into architecture and analysis.

Aerodynamics Lead – Cal Poly Racing

September 2023 – June 2024

- Led 15 new engineers with a co-lead through aerodynamic design, manufacturing, and testing by assigning work, managing schedules, mentoring members, and approving parts for competition readiness.
- Coordinated composite and machined front- and rear-wing production to deliver the aerodynamic package on schedule for competition.

Skills

Computer/Analysis: MATLAB, Python, Arduino IDE, NX, SolidWorks, Fusion 360, Microsoft Office Suite, ANSYS Fluent, ANSYS Transient Thermal, STAR-CCM

Embedded/Controls: Teensy 4.1, ESP32, ODrive S1, CAN Communication, PID Control, Encoder Feedback, PWM Control, SD-Card Data Logging

Testing/Instrumentation: Subsonic and Supersonic Wind Tunnels, Water Tunnels, Hot-Wire Anemometry, Ultrasonic Sensors, Rotary Encoders, Data Acquisition

Manufacturing: Manual Milling, Manual Turning, Additive Manufacturing, Welding, Carbon Fiber Layups, 3D-Printed Prototyping

Publications and Presentations

Thummar, K., and Hiremath, N. “Design and Validation of a Multi-Fan Modular Open-Jet Wind Wall for Controlled Inflow Generation.” Presented at the AIAA Region VI Student Conference, March 2026.