Parker Melling

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EDUCATION

Georgia Institute of Technology **4.0 GPA; 104 credit hours completed**
B.S. Computer Science (Intelligence & Devices); B.S. Aerospace Engineering **Expected May 2029**

- **Relevant Coursework: Computing & Hardware:** Data Structures & Algorithms, Computer Systems & Networks, Computer Organization & Programming, Object-Oriented Programming & Design, Digital Design Laboratory, Circuits & Electronics;
  Mathematics: Linear Algebra, Discrete Mathematics, Differential Equations, Multivariable Calculus, Applied Combinatorics;
  Aerospace & Mechanics: Dynamics, Aerodynamics, Thermodynamics & Fluid Mechanics, Statics, Aerospace Experimental Methods;
  Design & Materials: Engineering Graphics & Visualization, Principles & Applications of Engineering Materials

WORK EXPERIENCE

NASA Armstrong Flight Research Center **May 2026 – August 2026**
Pathways Co-Op — Flight Instrumentation & Systems Integration Team Edwards, CA

- Owned the model-based fault-detection and isolation workstream for NASA's High-Performance Spaceflight Computing initiative as the sole developer, engineering a parameterized, physics-based MATLAB/Simulink actuator digital twin for CNN-based fault detection/isolation; the work supports two manuscripts in preparation
- Modeled permanent-magnet synchronous motor (PMSM) dynamics, motor/internal torques, current/voltage and PWM-drive behavior, Park/Clarke transformations, thermal/delay/fault dynamics, and supporting subsystem dynamics; calibrated the digital twin through system identification, frequency-response fitting, physics-based analysis, and MATLAB scripting; achieved $R^2 > 0.99$ through physical-actuator doublet validation while performing hands-on hardware/software integration, electronics handling, troubleshooting, and testing in an ESD-controlled laboratory
- Separately developed a flight controller for an experimental four-actuator hardware-in-the-loop testbed, implementing discrete PID control with band-limited derivative terms, washout filters, discrete transfer functions/integrators, and real-time C++/RISC-V execution
- Supported X-59 telemetry-van operations during preflight preparations for the X-59's first supersonic flight, monitoring RF telemetry return quality

NASA Marshall Space Flight Center **January 2026 – May 2026**
Pathways Co-Op — Flight Software Design & Development Team Huntsville, AL

- Deployed C++ capabilities into NASA's real-time, Linux-based Space Launch System hardware-in-the-loop environment—the established system used to validate flight software before Artemis III–V and future missions
- Resolved cross-endian flight-computer checksum failures by reconstructing byte-swapped parameter structures from generated metadata before hashing, restoring flight-representative validation in the operational ARTEMIS simulation
- Enabled launch-console personnel to rehearse I-Load checksum reporting and allowed simulation users to isolate data transmission as a source of unexpected behavior
- Developed Python modules for the Sherlock flight-software analysis framework covering MIL-STD-1750A and MIL-STD-1553B validity, automatic launch sequencing, attitude hold, autogenerated-file versioning, and caution, warning, and abort monitoring
- Authored 100+ unit and integration tests covering MIL-STD-1553B and MIL-STD-1750A data validity and mission behavior; documented the software for future users
- Created automated checks for launch-command acknowledgment, launch-mode timing, planned launch windows, separation events, and quaternion-based attitude drift across simulation minor frames
- Built source-grounded AI agents for Sherlock module generation and ARTEMIS onboarding, including a seven-agent workflow with human review and citation-backed answers
- Delivered seven pull requests; selected for an approximately 40-person NASA Pathways cohort from an internally reported applicant pool of roughly 40,000

PROJECTS

Optimal Powered-Descent Guidance **August 2025 – Present**
Propulsive Landers at Georgia Tech Atlanta, GA

- Extended the lossless-convexification framework underlying SpaceX powered-descent guidance with zero-order-hold and Chebyshev–Gauss–Lobatto polynomial solvers for three-degree-of-freedom, Rust-based onboard guidance
- Benchmarked both numerical methods across four 50-meter descent profiles and four resolutions using solve time, position/thrust root-mean-square error, and thrust-rate metrics
- Found that the Chebyshev formulation produced more accurate coarse-resolution trajectories and smoother controls in the study, supporting its selection as the team's primary onboard path-planning approach while identifying ground-truth validation as future work

GTXR Simulations — Mach and Roll Rocket **August 2025 – Present**
Georgia Tech Experimental Rocketry Atlanta, GA

- Developed machine-learning surrogate models for fin-flutter prediction within a genetic rocket-configuration optimizer, reducing each candidate evaluation from approximately one minute to less than one second
- Expected to contribute to upcoming team trajectory-simulation development for a solid rocket designed to approach the Karman line

Byte Fight AI Bot **March 2026 – April 2026**
Georgia Tech Byte Fight Atlanta, GA

- Engineered a competition bot for strict CPU constraints using multithreaded minimax, alpha-beta pruning, iterative deepening, beam search, and breadth-first search
- Optimized search and evaluation with Zobrist hashing, SIMD vectorization, and simultaneous perturbation stochastic approximation parameter tuning

MedSignal **September 2025**
Georgia Tech HackGT 12 Atlanta, GA

- Built a Fast Healthcare Interoperability Resources (FHIR)-compliant application connecting patients and physicians for real-time medication management
- Integrated prescription scanning with OpenAI vision models, geolocation-based pharmacy lookup, and QR-code patient linking
- Implemented JSON Web Token authentication, encrypted storage, end-to-end Medplum FHIR synchronization, medication reminders, adherence dashboards, and a workflow chatbot

Autonomous 3D-Printed Pacing Drone **May 2025 – August 2025**
Individual Project Fishers, IN

- Designed, fabricated, wired, and integrated a custom autonomous drone spanning roughly three feet from propeller tip to propeller tip and weighing about seven pounds fully assembled; combined its 3D-printed airframe, power electronics, ArduPilot flight control, and Mission Planner waypoint planning to execute programmed flight paths
- Performed Fusion 360 finite-element analysis and applied spherical infill modifiers, increasing predicted arm strength by 17%; root-caused a failed MOSFET and completed two test flights to approximately 25 feet above ground level

PUBLICATION

A. X. Lin, F. A. Adekola, J. D. Farkas, P. R. Melling, and N. Marwah. "Evaluating Numerical Solving Methods for Optimal Powered Descent." *AIAA Regional Student Conferences*, 2026. doi:10.2514/6.2026-112394

LEADERSHIP

Georgia Tech Supersonics — Cobra Aerodynamics / Kestrel Flight Controls **August 2025 – January 2026**
Atlanta, GA

- **Cobra:** Developed aerodynamic models in OpenVSP and Athena Vortex Lattice (AVL); evaluated stability derivatives, trim, and linearized behavior to assess the aircraft's natural stability
- **Kestrel:** Developed a cascaded PID outer-loop flight-control architecture in MATLAB/Simulink using virtual rate commands that interfaced with an existing nonlinear dynamic inversion (NDI) architecture; transitioned the work before full implementation when beginning the NASA Marshall rotation

Team Co-Lead **June 2023 – May 2025**
FRC Competitive Robotics Fishers, IN

- Led Java software development for two competition robots, integrating teleoperated and autonomous modes across drivetrain, vision, aiming, and game-piece handling systems
- Developed state estimation with calibrated camera-based three-dimensional pose estimation, sensor fusion, and beam-break sensing for automated loading
- Implemented predictive auto-aim and anti-tip controls, increasing shot rate by more than 50% and eliminating competition tip-overs
- Helped lead the team to an Indiana State Runner-Up finish and qualification for the FIRST Robotics World Championship

SKILLS

Programming Languages: Java, MATLAB, Python, C++, C, Rust, JavaScript
Development: Linux, Git, CMake; embedded C++ code generation from Simulink; SIMD vectorization in Byte Fight
Aerospace/Modeling: Simulink, ArduPilot/Mission Planner, OpenVSP, AVL, RASAero, RocketPy
CAD/Analysis: Onshape, Fusion 360 finite-element analysis
Technical Areas: Control systems, system identification, fault identification and isolation, embedded systems, hardware-in-the-loop simulation, trajectory optimization, machine learning

HONORS

- NASA Armstrong Flight Research Center Special Act Award — exemplary performance during Summer 2026 Pathways rotation

- U.S. Presidential Scholars Nominee; Perfect ACT Scorer; National Economics Olympiad Participant
- FIRST Robotics Competition Indiana State Runner-Up and FIRST Robotics World Championship Qualifier
- Franklin College Math Day Competition Champion; Georgia Tech Faculty Honors