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Zachary Maldonado

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EDUCATION

Duke University **Aug 2023 - May 2027**
B.S. in Mechanical Engineering; Aerospace Engineering Certificate
GPA: 3.93/4.00
Relevant Coursework: Mechanics of Materials, Heat Transfer, Fluid Mechanics, Thermodynamics, Mechanical Analysis for Design, Dynamics, Control Systems, Mechatronics, Aircraft Performance, Product Design, Space Systems Design, Optics

KEY COMPETENCIES

- **CAD & Analysis:** SolidWorks CAD & Simulation, Autodesk Fusion 360, Ansys FEA, PTC Onshape
- **Manufacturing:** Mill, Lathe, Waterjet, Additive, Composite Layup & Resin Infusion, Shop Fabrication, DFM, GD&T basics
- **Programming & Controls:** MATLAB, Python, LabVIEW
- **Hardware:** Electronics & Soldering, Sensors/Instrumentation, Electric Motors, System Integration
- **Clearance:** Active DoD Secret

RELEVANT PROFESSIONAL EXPERIENCE

Mechanical Systems Integration Intern | USAF Hypervelocity Wind Tunnel 9 (BNH) **May 2026 - Aug 2026**
- Developed system architecture and supporting hardware to enable cyclic blowdown sequences for a Mach 5–7 adjustable-contour nozzle wind tunnel to support aero-optical diagnostic research used in hypersonic reentry ground-tests
  - Created functional LabVIEW tunnel control software and NI hardware setups for solenoid valve sequencing, trigger signal configuration, pressure transducer & thermocouple data acquisition, operator interface and safety interlocks
  - Designed, built & tested a device to distribute trigger signals and power to fast-acting valves to enable pulsed run cycles
  - Modeled full tunnel and hardware assemblies with PTC Onshape; 3D printed ABS electrical housings and mounts
  - Built pebble-bed preheater & nitrogen plumbing system
- Proposed and modeled a linear-actuated mechanism and position feedback system for automated nozzle-throat height adjustment; evaluated preliminary thermal, structural, and manufacturing constraints; conducted technical design reviews

COMPETITIVE ENGINEERING TEAMS & PROJECT EXPERIENCE

President | Duke Combat Robotics (Formerly Social Outreach, VP) **Aug 2024 - Present**
- Using SolidWorks CAD and FEA to design & optimize 12 lb structural assembly informed by failure modes and load paths
- Manage/advise 6+ autonomous teams to rapidly prototype & develop lightweight robotic systems; Previously led 3 lb team
- Evaluating bolted connections, stresses, rotational inertia, mechanical power transmission, impact loading, etc. to develop dual vertical-spinner weapon system, aluminum chassis, and modular electronics packaging unit for Duke's first 12 lb bot
- Package control electronics, motors, wiring harnesses into structures that are 3D printed, milled, laser and/or water jet cut

Mechanical Product Design – Baking Buddy | Pratt School of Engineering **Aug 2026 - Present**
- Designed, built, tested handheld brushless battery-electric kitchen device in four days as an individual initial design sprint
- Part of extracurricular team developing a compact ingredient-dispensing system using motor-driven auger mechanisms and modular storage containers; Developed CAD assemblies & components with emphasis on design for assembly principles
- Integrating load-cell feedback & touchscreen inputs into dispensing architecture to enable weight-based ingredient delivery

Mechanisms/Structures Engineer | Duke Electric Vehicles (DEV) **Sep 2025 - May 2026**
- Responsible for surface modeling and fabrication of the large CFRP structures making up vehicle aerodynamic exterior
- Increased bending stiffness of vacuum-assisted resin infused parts with lightweight honeycomb and foam core material
- Used SolidWorks to design doors and spring-loaded locking mechanisms; led execution of vehicle exterior architecture
- Achieved 40% weight reduction for Duke's second-ever Urban Concept battery-electric vehicle

Electric Hydrofoil Kayak Study | Pratt School of Engineering **Aug 2024 - Dec 2024**
- Designed and built a remote controlled, levitating kayak prototype using hydrofoil lift and vectored aquatic thrust
- Analyzed & built mechanically self-adjusting canard buoyancy system to investigate passive lift control during acceleration
- Led design and fabrication of the rear wing to hit lift targets; 3D printed & coated aerodynamic sleeves for aluminum frame
- Completed successful on-water testing and validated proof-of-concept functionality

Structures Subteam Member | Duke Aero **Jan 2024 - April 2025**
- Designed the rocket nose cone assembly in SolidWorks and performed topology optimization FEA in Ansys of bulkhead
- Worked in shop to fabricate airframe components using 3-axis CNC milling, waterjet cutting, and carbon-fiber wet layups