Jaden Xander Hernandez

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Education

Purdue University August 2022 – May 2026
Bachelor of Science in Aeronautical and Astronautical Engineering *GPA: 3.27 / 4.00*
Awards: Northrop Grumman S.P.A.C.E. Award, Purdue University Presidential Scholarship
Relevant Coursework: Rocket Propulsion, Spacecraft Electric Propulsion, Aerodynamics, Thermal Sciences

Experience

Nak-seung Hyun Research Program February 2025 – Present
Undergraduate Research Assistant (Design Engineer) *West Lafayette, IN*

- Evaluated lift trends at varying ranges of wing motion and flapping frequencies for a biomimetic ornithopter robot by conducting unsteady vortex lattice method analysis using the Ptera Software library in Python.
- Improved coefficient of lift by 50% over traditional NACA airfoils by designing biomimetic airfoil profiles in MATLAB.
- Estimating airfoil and wing performance for gliding with XFOIL and XFLR5 before designing wing spars in SolidWorks.
- Developing parametric elliptical wing profiles in SolidWorks to accelerate prototyping and laser cutting fabrication.
- Manufacturing 6-10 mm shaft and linkage connectors via stereolithography with less than a 3% defect rate.
- Programming FFT MATLAB scripts to filter hundreds of force transducer data sets and evaluate lift and moment trends.

Projects

Solid Rocket Motor Design and Analysis October – November 2025

- Formulated a three-point star port geometry to produce a 4.6 inch by 1.2 inch, H91 class propellant grain in SolidWorks.
- Estimated chamber pressure in openMotor, ensuring a safety factor of 1.39 for an 800 psi maximum operating pressure.
- Programmed a MATLAB trajectory analysis to predict an apogee of 3374 ft, within 0.05% of OpenRocket predictions.
- Constructing a model rocket to validate openMotor ballistics and MATLAB trajectory, pending launch in November 2025.

Five Dynamics – Ultra-Lightweight Rocket Design August 2025 – Present

- Leading the design of a 10,000 ft apogee, ultra-lightweight rocket (<250 g) powered by a G-class solid rocket motor.
- Optimized motor selection by estimating propellant/inert mass in MATLAB, meeting specific impulse requirements.
- Leveraging OpenRocket to optimize airframe features and overall stability to increase predicted apogee by 73%.
- Modeling preliminary airframes in SolidWorks and utilizing FEA to ensure a structural safety factor of over 1.25.

Workflow to Estimate Heat Transfer for High Altitude Flight March 2025 – May 2025

- Developed a MATLAB-based UI to estimate convective heating on high-altitude sounding rockets, achieving results within 10% of Ansys simulations while reducing simulation time by 90% compared to typical finite element methods.
- Streamlined the workflow for approximating insulation thickness based on desired internal temperature and intended insulation material, allowing users to make design considerations for insulation earlier in a rocket's design process.

Analyzing the Aerodynamic Performance of Flexible Finite Wings April 2025

- Designed a 12 inch span wing using the NACA 0012 airfoil geometry in Autodesk Inventor to be manufactured via FDM.
- Additively manufactured and tested 3 wings made of TPU filament with differing flexibility to analyze trends between wing flexibility and lift coefficient from subsonic wind tunnel data for -4° to 16° angles of attack.
- Verified correlation between lift force and trailing edge deformation up to 0.1 inches through FEA in Autodesk Inventor.

Purdue SIGBots – VEX Robotics Competition Robot Design August 2022 – May 2024

- Oversaw design of an award-winning, holonomic 15" robot in 2024, achieving a record of 5 wins and 4 losses at tournaments.
- Coordinated documentation and time management via Gantt charts to assure timely robot development across subteams.
- Designed components in Autodesk Inventor and additively manufactured them with consideration for durability, manufacturability, and fabrication time to be easily implemented and sustainably used in head-to-head competition.

Mars Sample Retrieval Mission Design August 2023 – December 2023

- Created MATLAB models using the patched conics method for a hypothetical Mars sample retrieval mission to design an 11,000 kg, three-stage spacecraft with a mission delta-V budget of 19 km/s.
- Researched and selected launch vehicles capable of meeting a 9 km/s delta-V budget to achieve a 500 km low Earth orbit.
- Authored and presented a 72-page design report detailing mission parameters and design specifications, leading to the group's recognition for the Northrop Grumman S.P.A.C.E. Award for excellence in design communication.

Skills

CAD & Analysis: Siemens NX, Autodesk Inventor, SolidWorks, Autodesk Fusion 360, Ansys Fluent (CFD), ASME Y14.5
Programming & Simulation: MATLAB, Simulink, Python, C, OpenRocket, openMotor, XFLR5, XFOIL, NASA CEA
Project Tools: Aras Innovator, Jira, Gantt Charts
Fabrication: Fused Deposition Modeling, Stereolithography, Laser Cutting
Data Acquisition: Subsonic/Supersonic Wind Tunnels, Dual Column Tensile Tester, Force Transducers