

Max Heil

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Education

The Ohio State University May 2026
Master of Science, Aerospace Engineering GPA: 4.0/4.0

The Ohio State University May 2025
Bachelor of Science, Aerospace Engineering with Honors Research Distinction GPA: 3.6/4.0

- **Coursework:** Guidance Navigation & Control, Spacecraft Controls, Continuous Time Optimal Control, Advanced Kinematics & Mechanisms, Energy Conversion & Storage Systems for Electrified Propulsion, Estimation & Filtering, Linear Systems, Dynamics & Vibrations, Orbital Mechanics, Space Mission Design, Advanced Math Methods, Numerical Methods, Aerodynamics, Experimental Fluid Mechanics, Gas Dynamics, Thermodynamics, Mechanical Design, Statics, Circuits

Skills & Certifications

Technologies: MATLAB, Python, LaTeX, Simulink, Ansys STK/Fluid, SolidWorks, LabVIEW, XFLR5, Altium, ROS, MS Office

Certifications & Awards: Ansys STK Level 1 Certified (Oct 2024, Ansys), Undergraduate Teaching Assistant Award Finalist (Aug 2024, Ohio State), Private Pilot Certificate (Jan 2024, FAA), Microsoft Office Specialist (Jan 2018, Microsoft)

Experience

Space Systems Engineer, Intern & Part-Time, Sierra Space – Denver, CO May 2025 – Present

- Support Systems Engineering and GNC teams on defense satellite programs, contributing to cross-disciplinary tasks across GNC, TCS, Propulsion, and mission systems.
- Engineer a robust on-orbit calibration tool for spacecraft GNC sensor suites supporting mission-critical performance.
- Lead the development, updates, and release of program-critical Interface Control Documents (ICD).
- Retained part-time to lead GNC calibration efforts and ongoing program deliverables beyond the summer internship.

Autonomous Systems Graduate Researcher, Full-Time, SOAR Laboratory – Columbus, OH May 2025 – Present

- Develop data-driven state-space models for nonlinear rigid-body dynamics and integrate them into constrained Model Predictive Controllers for trajectory tracking and guidance applications.
- Implement and analyze quantization-aware feedback and control, modeling finite word-length, saturation, and bandwidth limits in state and control channels.
- Quantify performance–bandwidth tradeoffs using structured parameter sweeps and Monte Carlo studies to evaluate prediction accuracy and closed-loop robustness.

Project Leader, Full-Time, NASA Human Lander Challenge – OSU, Marshall Space Flight Center Jan 2025 – Sept 2025

- Lead R&D of an autonomous cryogenic propellant transfer system to support on-orbit servicing for long-duration missions.
- Designed and implemented AI-driven alignment algorithms for autonomous docking in microgravity.
- Conducted fluid testing and launch survivability analyses to optimize cryogenic transfer systems, minimizing pressure drop, boil-off, and leakage while ensuring scalable compatibility with LH₂, LOX, and CH₄ propellants.
- Engineered a quick-release emergency disconnect mechanism to improve refueling safety factor by two orders of magnitude.

Space Systems Graduate Researcher, Part-Time, LADDCS Laboratory – Columbus, OH June 2024 – Dec 2025

- Explore intent estimation theory in the Hill frame by analyzing and categorizing unknown spacecraft maneuvers to determine best-fit intent models, leveraging probabilistic methods and game-theory approaches.
- Expand on current work by developing a larger set of basis maneuvers to more accurately predict intents.
- Incorporate Adaptive Monte Carlo (AMC) methods for Bayesian inference to reduce uncertainties in maneuver detection.
- Determine kill chain methods for acquiring, tracking, and asset protection for more robust space domain awareness.

Automated Manufacturing Engineer, Intern & Part-Time, Collins Aerospace – Cedar Rapids, IA May 2024 – Jan 2025

- Built robust simulations in Visual Components to evaluate bottlenecks in automated manufacturing modules.
- Presented renderings and results to leadership resulting in \$3M in funding for the automation project.
- Utilized Markforged Metal X metal 3D-printer to optimize strength-to-weight ratios and reduce production costs by \$24K+.
- Oversaw end-to-end validation of RFID system performance to streamline WIP tracking and enhance traceability.
- Operated Boeing 737 MAX simulators to develop expertise in test bed setup and troubleshooting methodologies.
- Selected to continue part-time after internship, providing continuity on automation project execution and validation efforts.

Aerospace Controls Undergraduate Researcher, Full-Time, SOAR Laboratory – Columbus, OH Sept 2023 – May 2025

- Develop data-driven control algorithms for UAVs using dynamic mode decomposition and model predictive control techniques.
- Investigate the impact of dither quantization on UAV control performance in resource-limited environments.
- Perform SITL and HITL testing using a PX4-Starling Autonomy drone to analyze real-world UAV dynamics.
- Design robust methods for experimental testing, including scheme implementation, simulation with ROS, and benchmarks.

Projects

Terrain Electromagnetic Reconnaissance and Regional Analysis Satellite (TERRASat) Aug 2024 – May 2025

- Design, build, and launch a 12U CubeSat with electric propulsion for Mars magnetic field characterization and AI-enabled data analysis.

Integrated Modeling and Prediction of Atmospheric Reentry Trajectory (Project IMPART) Aug 2024 – Dec 2024

- Develop a physics-based framework to predict reentry and impact footprint using atmospheric and orbital decay models

Avionics & Propulsion Engineer, Buckeye Space Launch Initiative (BSLI) Dec 2021 – Aug 2022

- Worked with a team of engineers to create and test rocket avionics and solid rocket motors for the Spaceport America Cup

Publications

Effect of Quantization on Data-Driven Model Predictive Control of Quadcopters 2026

Max Heil, Shahab Ataei, Debdipta Goswami

AIAA SciTech 2026 · Orlando, FL · Published · DOI: 10.2514/6.2026-0109

Autonomous Magnetized Cryo-Couplers with Active Alignment Control for Propellant Transfer (AMCC-AAC) 2025

Max Heil, John Horack, et al.

NASA Human Lander Challenge Forum · Huntsville, AL · Published · [HuLC.nianet.org/archives/](https://huLC.nianet.org/archives/)

Award: Best Prototype

CubeSat Mission Design to Measure Localized Magnetic Fields on Martian Surface Utilizing Artificial Intelligence and Atmosphere Breathing Electric Propulsion 2025

Jessica Sillus, Max Heil, Ian Harris, John Horack, et al.

AIAA 2025 Region III Student Conference · Cincinnati, OH · Published · DOI: 10.2514/6.2025-97796

Search and Reacquisition of Resident Space Object 2025

Max Heil, Nathan Savino, Stephanie Small et al.

AIAA 2025 Region III Student Conference · Cincinnati, OH · Published

Integrated Modeling and Prediction of Atmospheric Reentry Trajectory (IMPART) 2024

Max Heil

The Ohio State University · Columbus, OH · Preprint