Madeline Bowne
PHD CANDIDATE IN AEROSPACE ENGINEERING

madelinebowne@gatech.edu
madelinebowne.github.io
LinkedIn | (856) 418-8136

Versatile PhD student with a foundation in mechanical, aerospace, and systems engineering, possessing skills in advanced design and simulation to guide design, decision-making and strategy. English minor with strong background in journalism, writing, outreach, and communication. Driven by a lifelong passion for research, I have integrated my investigative spirit into my cross-disciplinary PhD thesis, which combines engineering, space policy, economics, and novel CONOPs in a flexibility framework to identify pathways towards private ISAM in LEO. My career trajectory reflects a commitment to applying engineering problem solving and decision-making tools to real world problems. Passionate about the commercial space industry, space start-ups, and a future circular economy in space. Industry experience includes six internships in mechanical, systems, and propulsion engineering at Relativity Space, Redwire Space, Lockheed Martin, and Northrop Grumman. Upcoming internship at Gravitics for Summer 2025. 4 years of technical & communication leadership experience on the Rutgers FSAE team.

EDUCATION

Georgia Tech
MS in Aerospace Engineering. 4.0 Cumulative GPA. Graduate Researcher at ASDL. Pursuing PhD. Proposed thesis in April 2024

Rutgers University
BS in Mechanical Engineering, Minor in English. Summa Cum Laude with Highest Honors. Formula SAE for 4 years with various leadership roles

RELEVANT COURSEWORK

Orbital Mechanics | Regression Analysis | Scenario Writing and Path-gaming | Rocket Propulsion | System of Systems Engineering | Advanced Design Methods | Aircraft Design 1&2 | Statistical Methods and Probability | Space Logistics | Proposal Writing (undergrad)

HONORS & AWARDS

- **Matthew Isakowitz Fellow 2021:** Fellowship that connects future space leaders with internships and mentors
- **Rutgers Alumni-Industry Scholarship 2018:** Full tuition scholarship for academic excellence and impact
- **Boeing Leadership Scholarship 2018** :Scholarship for Leadership Excellence. Bestowed by the Department of Mechanical and Aerospace Engineering at Rutgers University.
- **Science Ambassador Scholarship '17,'18:** Scholarship to promote women in STEM. Runner-up finalist in 2018. Top ten finalist in 2017.
- **NJ Hall of Fame, Arete Scholarship 2016**
- **C-SPAN StudentCam Competition '11-'16:** 6-time winner of the national documentary competition
- **GSSPA Bob Stevens Journalism Scholarship 2016**
- **Al Neuharth Free Spirit Program 2015:** NJ Representative for the Newseum journalism scholarship and summit

ACADEMIC EXPERIENCE

Graduate Researcher at the Aerospace Systems Design Lab, Georgia Institute of Technology, Aug 2020-present

- Thesis dissertation: Designing a **flexibility framework** in python with real options analysis for Low Earth Orbit (LEO) on-orbit servicing infrastructures, integrating **environmental considerations, space congestion, space policy, orbital mechanics, and economic factors** to support a circular economy in space. Proposing novel collection-as-a-service CONOPs featuring warehouses at parking orbits. Related publications and talks: 2025 AIAA SciTech Forum 2025, 2025 SGx Lightning Talks, 2025 ASCEND

Developed several tools and simulations to inform **decision-making**:

- Built a **satellite constellation trade study tool** using graph theory and discrete event simulation to optimize capabilities for battlespace awareness. Created data vis. dashboard.
- Applied CASA software to study passive millimeter wave imaging in satellite formation design and developed image quality assessment method for the optimization program. Co-author for related AIAA SciTech 2022 publication.
- Formulated **reliability analysis tool** based on probabilistic risk assessment for NASA Marshall's Robust Mars trade study and authored internal report for NASA
- Developed parametric geometry/material sizing tool for 3D printed bistable mechanism given force and displacement reqs; chain beam constraint method and classical lamina theory formulation validated with FEA and physical testing. Created data vis. dashboard.
- Created **LS-Dyna (Ansys) simulations** for Active Debris Removal with net capture, validating results with physical net drop testing. Presenting at AIAA SciTech 2025.

TECHNICAL AND INTERPERSONAL STRENGTHS

Technical and Analytical Strengths

- **Advanced Modeling and Simulation Expertise:** Designed and implemented modeling tools using Python and MATLAB, leveraging methods such as regression analysis, discrete event simulations, graph theory, probabilistic risk assessment, and real options analysis. Demonstrates a proven ability to rapidly acquire and synthesize complex concepts, applying them to diverse aerospace challenges and decision-making tools.
- **Advanced Design:** Leveraged combined background in mechanical and systems engineering to develop innovative, risk-reduced designs by applying parametric studies, optimization techniques, and surrogate modeling
- **Systems Engineering:** Gained a comprehensive understanding of the V-diagram design process through hands-on leadership in Formula SAE, internships, and graduate research contributions.

Space Policy and Strategic Foresight

- **Space Policy Research:** Conducting policy-focused research on orbital congestion and environmental sustainability, creating a framework to analyze strategies that align private sector incentives with international space policy goals. Thesis integrates quantitative analysis and strategic recommendations for a circular economy in space.
- **Strategic Thinking:** Applying path-gaming and scenario writing methodologies to forecast long-term impacts of policy and design decisions, incorporating uncertainty analysis into thesis proposal
- **Proposals and Advocacy:** Thesis proposal presentation influenced the Georgia Tech Research Institute to fund ASDL research on space sustainability. Joined the NCAC Policy and Advocacy Task Force (SGAPP) in 2025.

Communication and Collaboration

- **Leadership:** VP and design lead for Formula SAE, technical lead for various ASDL projects
- **Outreach:** Coordinated professional development and networking events for Rutgers' Alumni-Industry Scholarship program. Led sponsor relations, industry & community outreach, and promotional efforts for Formula SAE.
- **STEM Advocacy:** Organized and delivered STEM workshops for young girls as part of the Academy at Rutgers for Girls in Engineering and Technology, inspiring future engineers

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INDUSTRY EXPERIENCE

Relativity Space, Long Beach, CA, Two Internships: Summer '22 and Fall '23
Mechanical Engineering Intern in Turbomachinery, Aeon R
- Produced re-designs and novel geometry for various 3D printed turbomachinery components to reduce weight, iterating on geometry and material
- Developed rapid iteration method for weight-reduction of 3D printed parts, including parametric design and topological optimization

Redwire Space, Jacksonville, FL, Summer '21
Mechanical Engineering Intern for the Archinaut satellite
- Designed mass off-loader for the demonstration of the Archinaut's 10m beam print
- Calculated the cause of a jamming error in the Archinaut's Transform Detection System and developed short-term and long-term redesigns
- Designed the mechanical GSE to support and actuate the solar surrogate array during thermal vacuum testing

Lockheed Martin: Moorestown, NJ, Summer '20
Systems Engineering, RMS, AEGIS, Command & Decision
- Created MATLAB tool that feeds threat simulation data through existing C++ propagation algorithm and compares results with updated propagation methods, using Monte Carlo simulation to evaluate error

Northrop Grumman Innovation Systems: Dulles VA, Summer '19
Propulsion & Systems Engineering, Antares Rocket program
- Performed torque testing in thermal and ambient conditions to test Propellant Disconnect Initiators for stress relaxation
- Saved hours by creating Excel VBA tool that instantly compares As-Designed parts with every As-Built part in their previous mission
- Helped perform work packages to test Commodity Control software changes

Northrop Grumman Innovation Systems: Chandler, AZ, '18
Mechanical Engineering 7-month Co-op, Design, Integration, and Testing, Launch Vehicles
- Designed test fixture & performed Instron flight-like load testing on 3D-printed rocket umbilical brackets
- Completed several structural analyses of ground support equipment (GSE), identified issues in previous analyses and proposed cheap & effective solutions
- Compiled work package for critical attach hardware proof testing
- Completed lay-ups with carbon fiber materials and assisted in testing for R&D

Rutgers Formula Racing, Formula SAE 2016-2020
Design & Testing Lead: 2019-2020 ● ● ● Vice President: 2017-2019 ● ● ● General member: 2016-2017
- Managed static & dynamic vehicle testing, managed team deadlines and scheduling, reinforced data acquisition and analysis architecture with various scripting tools using MoTeC i2 Pro, MATLAB, and Excel, developed driver training system based on Key Performance Indicators
- Designed, simulated, machined, and assembled components and testing mechanisms for various subteams
- Applied communication skills for management, outreach, business presentations, industry/university relations, and recruitment. Produced promotional videos.

SKILLS

- **Programming:** MATLAB, Python, R, VBA, Linux, C++, extensive experience coding simulations, tools, & models
- **CAD & FEA:** Siemens NX 11 & Teamcenter, SolidWorks, Inventor, AutoCAD, ANSYS, LS-Dyna, Abaqus
- **Manufacturing:** Manual Mill & CNC Mill, Lathe, Carbon Fiber Lay-Ups, 3D Printing (FDM, SLA, PBF)
- **Data Analysis:** JMP Statistical Analysis, Excel, MoTeC, R, Regression Analysis
- **Mathematics:** Calc 1-5, statistics & probability, mathematics related to orbital mechanics & astrodynamics
- **Design:** Advanced Design Methods, System Design Optimization, Surrogate Modeling, Graph Theory, Discrete Event Simulations, Geometric Dimensioning & Tolerancing, Design for 3D Printed Components (FDM, SLA, PBF)
- **Digital Media:** Video & Photo Editing, Adobe Creative Cloud Software, Final Cut Pro
- **Interpersonal:** Technical Writing, Public Speaking, Event planning, Team Coordination, Project Management