

# Madeline Bowne

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## Professional Summary

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Versatile PhD candidate from Georgia Tech with interdisciplinary foundation in mechanical, aerospace, and systems engineering, combining advanced design and simulation expertise for improved decision-making. Extensive industry experience through 7 internships at both start-ups and primes (Gravitics, Relativity Space, Redwire, Lockheed Martin, Northrop Grumman) spanning mechanical, GNC/avionics, systems, and propulsion engineering. Cross-disciplinary research integrates engineering, space policy, and economics to develop practical frameworks for commercial space infrastructure. Strong communication background with English minor and 4 years of technical leadership in Formula SAE. Passionate about start-ups, commercial space infrastructure, and a future circular economy in space.

## Education

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**Georgia Institute of Technology:** *MS and PhD (in progress), Aerospace Engineering*

- **Dissertation:** "Flexibility Framework to Screen Strategies & Options for Sustainable On-Orbit Servicing Infrastructures in LEO". Thesis proposed April 2024. Defense planned for Fall 2025.
- GPA: 4.0/4.0 — **Highlighted 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

**Rutgers University:** *BS in Mechanical Engineering, Minor in English*

- GPA: 3.738/4.0 — Summa Cum Laude with Highest Honors. Rutgers Alumni-Industry Scholar.
- **Formula SAE:** Design Lead (2019-2020), Vice President (2017-2019), General Member (2016-2017)
  - Designed, simulated, tested, and manufactured various components using CAD/FEA tools
  - Started the data acquisition subteam and developed analysis architecture using MATLAB, Excel, and MoTeC
  - Led sponsor relations, industry partnerships, outreach, and fundraising initiatives

## Professional Experience

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**GNC/Avionics Engineering Intern**

*Marysville, WA*

*Gravitics*

*Summer 2025*

- GNC Software Development: Coded Python utility functions for guidance, navigation & control suite
- Hardware Integration: Designed/tested wire harnesses and Raspberry Pi software for prototype hatch doors
- Mission Planning: Calculated propellant mass budgets for attitude control system operations

**Propulsion Components Engineering Intern, Turbomachinery**

*Long Beach, CA*

*Relativity Space*

*Summer '22 & Fall '23*

- Weight Optimization: Redesigned 3D-printed turbomachinery components for significant mass reduction
- Advanced Design Methods: Developed rapid design iteration methodology to develop novel geometries for 3D-printed turbomachinery components

**Mechanical Engineering Intern, Archinaut Satellite**

*Jacksonville, FL*

*Redwire (prev. Made in Space)*

*Summer 2021*

- Mission-Milestone Contribution: Designed mass off-loader for 10m-beam print demonstration
- Problem Resolution: Diagnosed jamming error in Transform Detection System, developed solutions
- Test Engineering: Designed mechanical GSE for solar surrogate array thermal vacuum testing

**Systems Engineering Intern, AEGIS Command & Decision**

*Moorestown, NJ*

*Lockheed Martin*

*Summer 2020*

- Code Development: Created MATLAB tool integrating threat sim. data w/ C++ propagation algorithms
- Analysis & Validation: Implemented Monte Carlo simulation to evaluate accuracy of the propagation method

**Systems/Propulsion Intern & Mechanical Engineering Co-Op Intern**

*Chandler, AZ; Dulles, VA*

*Northrop Grumman Innovation Systems*

*June-Dec '18 & Sum.'19*

- Test Engineering: Performed torque & thermal testing for Propellant Disconnect Initiators

- Process Improvement: Created Excel VBA tool to streamline As-Designed/As-Built comparison
- Software Testing: Helped perform work packages to test launch commodity control software changes
- Test Engineering: Designed test fixtures and performed Instron load testing on 3D-printed components
- Analysis & Problem-Solving: Completed several structural analyses of ground support equipment (GSE), identified issues in previous analyses and proposed cheap & effective solutions

## Featured Research Experience

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### Aerospace Systems Design Lab: *Graduate Research Assistant*

- **Thesis dissertation:** Developing a flexibility framework to evaluate novel Collection-as-a-Service (CAAS) CONOPs for satellite servicing in LEO. Incorporated multiple flexible options, sources of uncertainty, and policy schemes within a discrete event simulation, using Monte Carlo analysis. Identifying servicing architectures that reduce costs and emissions while supporting sustainable operations like satellite collection and refurbishment to advance a circular space economy.
  - Thesis proposal led the Georgia Tech Research Institute to fund ASDL research on space sustainability and it inspired related thesis topics and grand challenges
- **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 visualization dashboard
  - Applied CASA software to study passive millimeter wave imaging in satellite formation design and developed image quality assessment method for the optimization program
  - 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 requirements. Chain beam constraint method and classical lamina theory formulation validated with FEA and physical testing. Created data visualization dashboard
  - Created LS-Dyna (Ansys) simulations for Active Debris Removal with net capture. Validated results with physical net drop testing and determined manufacturing requirements.

## Technical Skills

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**Programming:** MATLAB, Python, R, VBA, Linux, C++.

**CAD & FEA:** Siemens NX 11 & Teamcenter, SolidWorks, Inventor, AutoCAD, ANSYS, LS-Dyna, Abaqus

**Manufacturing:** Manual Mill, Lathe, Carbon Fiber Lay-Ups, 3D Printing (FDM, SLA, PBF)

**Data Analysis:** JMP Statistical Analysis, Excel, R, Regression Analysis

**Mathematics:** Calc 1-5, statistics & probability

**Design, Modeling, & Simulations:** Advanced Design Methods, System Design Optimization, Surrogate Modeling, Graph Theory, Discrete Event Simulations

**Digital Media:** Video & Photo Editing, Adobe Creative Cloud Software, Final Cut Pro

**Interpersonal:** Technical Writing, Public Speaking, Event planning, Team Coordination, Project Management

## Featured Publications and Presentations

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- "Impact of Policy on the Establishment of the LEO-based Collection-As-A-Service Concept" Bowne M, Sarton du Jonchay T, Mavris DM. AIAA ASCEND 2025. (Available online in July)
- "Collection-As-A-Service to Incentivize On-Orbit Servicing in LEO" [🔗](#) Bowne M, Sarton du Jonchay T, Mavris DM. AIAA SciTech 2025.
- "Leveraging Flexibility to Create Circular Space Economies" 2025 SGx Lightning Talks. [🔗 Slides on website](#) [🔗](#)
- "Satellite Formation Design to Enhance Passive Millimeter Wave Imaging Mission Performance" [🔗](#) Bender T, McNabb J, Birbasov N, Bowne M, Robertson BE, Sudol A, Mavris DM, Lourenco N.

## Honors, Invitations, and Awards

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Space Generation Fusion Forum Delegate (2025) | Matthew Isakowitz Fellow (2021) | Rutgers Alumni-Industry Scholarship (2018) | Boeing Leadership Scholarship (2018) | Science Ambassador Scholarship Finalist (2017) and runner-up (2018) | 6x National C-SPAN StudentCam Competition Winner (2011-2016)