Mark Hartigan

Georgia Institute of Technology
School of Aerospace Engineering
https://mchartigan.github.io/

Education

Georgia Institute of Technology, Atlanta, GA — Expected Graduation: May 2026
- Doctor of Philosophy in Aerospace Engineering — GPA: 4.00
- Focus on spacecraft guidance, navigation, and control

Purdue University, West Lafayette, IN — Graduated: May 2021
- BS in Aeronautics and Astronautics Engineering, minor Computer Science — GPA: 3.93
- Graduated Cum Laude through the Honors College; National Merit Scholar

Awards and Honors

- National Merit Scholarship – Purdue University — August 2017 – May 2021
- Dean's List and Semester Honors — Fall 2017 – Spring 2020
- Warren G. Koerner Scholarship (AAE merit-based scholarship) — July 2018, July 2019
- Northrop Grumman SPACE Award for Rocket Design — April 2019

Work Experience

Vestigo Aerospace, LLC | *Flight Software Designer* — May 2021 – August 2021
- Wrote flight software for a deployable dragsail, a commercial satellite deorbiting product for SmallSats
- Developed register-level firmware in C for a microcontroller, implementing multiple interfaces (SPI, UART)
- Presented in a code design review with subject matter experts to evaluate the software for flight

Northrop Grumman Corporation | *GNC Analysis Intern* — May 2020 – August 2020
- Performed GNC analysis on Commercial Resupply Service missions for the International Space Station
- Conducted independent research to study pseudospectral dynamic optimization and implemented separately within a C++ and Python model to generate propellant-optimal attitude maneuvers
- Developed an accurate rotational dynamics model in Simulink to simulate spacecraft attitude slews
- Analyzed steady-state attitude error between Star Trackers and its effect on mission requirements
- Wrote mass property calculation scripts to assist Monte Carlo analysis of Human Landing System designs
- Presented results for all the above and made data-based recommendations for improving future missions

GE Aviation | *Lean Six-Sigma Manufacturing Intern* — May 2019 – August 2019
- Applied lean six-sigma training to military turbine airfoil production lines to decrease lead time
- Leveraged lean practices across the manufacturing plant to improve quality and flow of the value stream
- Drafted a floorplan of the facility in AutoCAD 2018; created a system for continuous maintenance

The Fourth River Co. | *Engineering Intern* — May 2018 – August 2018
- Performed IT tasks on Windows and Linux operating systems and wrote programs to automate tasks
- Aided with engineering projects, including AutoCAD drafting, proposals, and report compilation
- Worked on construction sites with power tools installing and servicing fuel tank systems and piping

Research and Projects

Space Systems Design Lab | *Graduate Research Assistant* — August 2021 – Present
- Design, assemble, and test additively manufactured cold gas propulsion systems for CubeSat swarms
- Perform qualification testing of CubeSat propulsion system flight hardware for 3 federally-funded missions

- Design and analyze propulsion systems using SolidWorks for vibration, structural stability, and thermal properties

FEMTA Suborbital Flight Experiment | *Project Manager* August 2019 – May 2021

- Managed team of ~50 undergraduates through multiple stages in the engineering design cycle while coordinating mission details with NASA representatives and presenting research at institute conferences
- Designed system to measure thrust produced by a micropropulsion device using plasma spectroscopy
- Utilized a modified Linux kernel to develop mission-critical processes and software in C
- Developed an accurate system-wide model in SOLIDWORKS and machined flight hardware
- Performed vacuum chamber experiments to verify and validate flight hardware designs
- Designed (Kicad & LTSpice), tested, and manufactured custom PCBs for flight avionics

Design and Analysis of a Spacecraft Propulsion System August 2020 – December 2020

AAE 33900: Aerospace Propulsion

- Planned a deep space mission to deploy a research probe on Europa – similar to the Europa Clipper – with a focus on the design and analysis of propulsion systems used (from launch vehicle to delta-V engine)

Creating a Social Networking Platform August 2020 – December 2020

CS 30700: Software Engineering

- Constructed a social media site with similar functionality to Twitter, Facebook, or Reddit from the ground up
- Managed the project using Agile methodology by implementing month-long design sprints followed by reviews and planning meetings
- Developed a frontend using a combination of React.js, HTML, and CSS in conjunction with a Node.js backend utilizing Google's Firebase database and hosting services

Purdue Orbital | *Avionics Design Lead* September 2018 – August 2020

- Led software team creating flight computers for a Level 2 rocket launched from a balloon platform
- Developed a flight computer on a Raspberry Pi platform after prototyping using Arduinos
- Wrote software, modified Linux architecture, and integrated sensors to achieve mission specifications
- Applied signal processing techniques to clean data and achieve accurate telemetry for missions
- Worked with other subteams and the FAA to coordinate a mission test with Raven Aerostar

Mentorship Experience

Honors First Year Engineering | *Teaching Assistant* August 2018 – May 2021

- Wrote autograders for Python and MATLAB assignments to deploy on remote Gradescope servers
- Helped design a GUI using PyQt5 for TAs to manage and answer student questions pertaining to projects
- Aided learning in class by providing guidance to students, assisting the professors, and grading work

Engineering Mentor Corps | *First Year Engineering Mentor* August 2020 – December 2020

- Mentored 12 First-Year Engineering students by organizing virtual meetings, providing advice, professional development planning help, and directing them towards campus resources

Honors College Mentor April 2018 – October 2019

- Mentored a group of freshmen in a first-year Honors College "Evolution of Ideas" course
- Encouraged collaboration, created group norms, and fostered a psychologically safe environment
- Learned leadership skills to improve group dynamics, identify implicit biases, and support diversity

Conference Presentations

Hartigan, M., Degener, M., (2021). "Using Plasma Spectroscopy to Measure Thrust of Micropropulsion Systems". In *Spring 2021 AAE Research Symposium Series*. West Lafayette, IN.

Lumpp, B., Ayhan, D., Deperna, J., **Hartigan, M.**, Hawn, E., Johnson, A., Kinsella, J., Kracke-Bock, C., Patel, J., (2020). "Zero-Gravity Testing of a FEMTA Thruster Through Plasma Spectroscopy". In *Fall 2020 Purdue Undergraduate Research Conference*. West Lafayette, IN.

Lumpp, B., Chow, J., Deperna, J., **Hartigan, M.**, Johnson, A., Kinsella, J., (2020). "Developing a Numerical Model of the FEMTA Propellant Management Experiment". In *Fall 2020 Purdue Undergraduate Research Conference*. West Lafayette, IN.

Chow, J., Czech, C., Degener, M., Franks, .N, Govindhan, A., **Hartigan, M.**, Kiddy, S., Kracke-Bock, C., Lumpp, A., Lumpp, B., Menon, A., Patel, R., Shahin, T., Soberg, J., Yu, Y., (2020). "Suborbital Testing of a Small Satellite Propulsion System". In *Spring 2020 Purdue Undergraduate Research Conference*. West Lafayette, IN.