

Vincent W. Hill

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EDUCATION

The University of Alabama Tuscaloosa, Alabama
Doctor of Philosophy Expected August 2022

The University of Alabama Tuscaloosa, Alabama
Master of Science in Aerospace Engineering and Mechanics May 2020

The University of Alabama Tuscaloosa, Alabama
Bachelor of Science in Mechanical Engineering December 2017

RESEARCH EXPERIENCE

Dissertation Research *August 2020—Present*

- Implemented a Python simulation testbed for multi-agent, multi-target GNC algorithm development
- Designed a simultaneous target assignment and trajectory optimization algorithm for UAS swarm operations
- Developed a probabilistic, measurement-based autonomous mission planning algorithm for UAS swarm operations using a random finite set multi-target tracking framework

PROJECT EXPERIENCE

Guidance, Navigation, and Controls Engineer *May 2020—Present*
AeroVironment, Inc. *Simi Valley, CA*

- Developed and tested GNC algorithms for large high-altitude long-endurance (HALE) UAS
- Designed an H_∞ robust control law to govern flexible wing shape through only control surface deflections
- Designed a PI control law for autonomous landing with minimal instrumentation
- Designed an LQR control law to stabilize a system mode predicted to become unstable in stratospheric flight
- Wrote flight test cards to evaluate control law performance
- Primary flight crew member for 13 flight hours to date, 3 as GNC Officer and 10 as Flight Dynamics Officer
- Conducted Monte Carlo simulations to analyze uncertainty & failure mode effects on control system performance
- Participated in 60 hours of flight test crew simulator training to date

Graduate Coursework Projects *August 2018—Present*

- Designed an aeroelastic wing to place the flutter boundary at Mach 0.3 using the p-k method
- Conducted flight envelope trim analysis of an F-16 wind tunnel model
- Designed and tested a coupled guidance-control algorithm through Linear-Quadratic Regulator (LQR) and Linear Quadratic Integrator (LQI) optimal control schemes, respectively.
- Derived the equations of motion and designed an LQR control system for an inverted pendulum with cart
- Estimated the position of a mobile rover using differential GNSS
- Developed Python code for UAV navigation with loose INS/GPS integration

Graduate Research Assistant *May 2019—November 2019*
The University of Alabama *Tuscaloosa, Alabama*

- Front line researcher on a project partnering with NASA civil servants
- Performed parametric analysis of an Urban Air Mobility aircraft model for design optimization
- Conducted aerodynamic analysis using AVL and OpenVSP

Research Technician *March 2018—July 2018*
The University of Alabama – Remote Sensing Center *Tuscaloosa, Alabama*

- Research technician on US\$1 million project funded by Copenhagen University and Alfred Wegener Institute
- Led a team of undergraduate and graduate students to manufacture a ground-penetrating radar system
- System was completed and deployed to Greenland's EastGRIP research station in July 2018

Co-Op (Four Terms) *January 2015—August 2017*
Delta Air Lines – Operations Support Engineering *Atlanta, Georgia*

- Served as a first responder for a 24/7 operations support engineering hotline
- Authored over 100 unique aircraft repair technique substantiations which are subject to FAA audit

- Directed Delta maintenance technicians during on-site disposition of severe aircraft damages

LEADERSHIP

Professional Development Committee Chair

August 2019—May 2020

The University of Alabama – Graduate Student Association

- Organized and moderated two professional development events, a research grant writing experts' panel and a life as a new professor discussion panel

Alumni Mentor

July 2019—May 2020

MentorUPP

- Partnered with two mechanical engineering upperclassmen to develop concrete plans to achieve realistic goals
- Provided advice on resume building, study habits, grad school admissions, and job searches
- Under my direction, senior mentee received fully funded offer to his first-choice MS program
- Junior mentee received offer from his first-choice company for a summer 2020 internship

TEACHING

Graduate Teaching Assistant

August 2018—May 2020

The University of Alabama

- Grader for two classes per semester
- Gave a total of 15 lectures on elementary glider design, technical writing, dynamics, and fluid mechanics

AWARDS

Graduate Student of the Year

April 2020

The University of Alabama – Graduate Student Association

REFEREED CONFERENCE PROCEEDINGS

1. Weihua Su, Wei Song, and **Vincent Hill**. "Real-Time Hybrid Simulation and Experiment for Aeroelastic Testing of Flexible Wings", AIAA SciTech 2019 Forum, AIAA SciTech Forum, (AIAA 2019-2032) <https://doi.org/10.2514/6.2019-2032>
2. **Vincent W. Hill**, Ryan W. Thomas, and Jordan D, Larson. "Autonomous Online Planning and Guidance for UAS Swarms in High-Risk Environments", AIAA SciTech 2021 Forum, AIAA SciTech Forum, to be published
3. Ryan W. Thomas, **Vincent W. Hill**, and Jordan D, Larson. "Hierarchical GNC for High Cardinality Random Finite Set Based Teams with Autonomous Mission Planning", AIAA SciTech 2021 Forum, AIAA SciTech Forum, to be published
4. **Vincent W. Hill**, Ryan W. Thomas, and Jordan D, Larson. "Autonomous Situational Awareness for UAS Swarms", IEEE Aerospace 2021 Forum, IEEE Aerospace Forum, to be published
5. **Vincent W. Hill**, Jason Mukherjee, Derek Lisoski, Oliver Chiang, Brian P. Danowsky, and Stephen Haviland. "In-Flight Stability Analysis and Envelope Clearance of a Solar-Powered HALE UAS with CIPHER", AIAA Aviation 2021 Forum, AIAA Aviation Forum, to be published