

# Vincent W. Hill

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## EDUCATION

### The University of Alabama

- Doctor of Philosophy
- Master of Science in Aerospace Engineering and Mechanics
- Bachelor of Science in Mechanical Engineering

*Tuscaloosa, AL*  
*Expected August 2022*  
*May 2020*  
*December 2017*

## EXPERIENCE

### Guidance, Navigation, and Control Engineer

*May 2020—Present*

#### AeroVironment, Inc.

*Moorpark, CA*

- Developed and tested GNC algorithms for large high-altitude long-endurance (HALE) UAS
- Conducted Monte Carlo simulations to analyze uncertainty & failure mode effects on control system performance
- Wrote flight test cards to evaluate control law performance
- Designed a control law to govern flexible wing shape through only control surface deflections
- Developed a Kalman Filter data fusion algorithm to improve aircraft height above ground level estimates
- Designed a control law for autonomous landing with minimal instrumentation
- Designed a control law to stabilize a system mode predicted to become unstable in stratospheric flight
- Primary flight test crew member for 13 flight hours to date
- Participated in 60 hours of flight test crew simulator training to date

### Dissertation Research

*June 2020—Present*

- Implemented a Python simulation testbed for multi-agent, multi-target GNC algorithm development
- Developed a probabilistic, measurement-based autonomous mission planning algorithm for UAS swarm operations using a random finite set multi-object tracking framework
- Developed a particle filter approach for multi-sensor fusion and cooperative navigation for robotic swarms

### Graduate Coursework Projects

*August 2018—May 2021*

- Designed an  $H_\infty$  robust control law for active gust rejection of a flexible aircraft
- Developed Python code for UAV navigation with loose INS/GPS integration and the extended Kalman Filter
- Estimated the position of a mobile rover using differential GNSS
- Designed and tested a coupled guidance-control algorithm for a lateral aircraft model
- Derived the equations of motion and designed a control system for an inverted pendulum with cart

### Research Technician

*March 2018—July 2018*

#### The University of Alabama – Remote Sensing Center

*Tuscaloosa, AL*

- Technician on climate change research program
- Led a team 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, GA*

- 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

*August 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**  
**The University of Alabama**

*August 2018—May 2020*

- 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**  
**The University of Alabama – Graduate Student Association**

*April 2020*

## PEER-REVIEWED JOURNAL PUBLICATIONS

1. **Vincent W. Hill**, Ryan W. Thomas, and Jordan D. Larson, "Autonomous Situational Awareness for Robotic Swarms in High-Risk Environments," in *IEEE Transactions on Control of Network Systems*, in review. Preprint: arXiv:2105.04764 [cs.ro], May 2021.

## REFEREED CONFERENCE PROCEEDINGS

1. Ryan Thomas, **Vincent Hill**, and Jordan Larson. "Hierarchical GNC for High Cardinality Random Finite Set Based Teams with Autonomous Mission Planning," AIAA 2021-0268. *AIAA Scitech 2021 Forum*. January 2021.
2. **Vincent W. Hill**, Ryan W. Thomas, and Jordan D. Larson, "Autonomous Situational Awareness for UAS Swarms," in *IEEE Aerospace 2021*. Preprint: arXiv:2104.08904 [cs.ro], Apr. 2021.
3. **Vincent W. Hill**, Jason Mukherjee, Derek Lisoski, Brian P. Danowsky, and Stephen Haviland. "In-Flight Stability Analysis and Envelope Clearance of the Sun glider Solar HALE UAS", *AIAA Aviation 2021 Forum*, AIAA Aviation Forum, accepted