**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 CIFER", AIAA Aviation 2021 Forum, AIAA Aviation Forum, to be published