

***Carlos Montalvo***  
**University of South Alabama - Mobile, AL**  
*Associate Professor, Mechanical Engineering*

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## Education

**Ph.D. Aerospace Engineering, Georgia Institute of Technology, Atlanta, Georgia, May 2014**

- Area of Specialization: Flight Dynamics, Control and Design
- Thesis Topic: Meta Aircraft Flight Dynamics and Controls
- Advisor: Professor Mark Costello
- GPA: 3.75/4.00

**M.S., Aerospace Engineering, Georgia Institute of Technology, Atlanta, Georgia, August 2010**

- Area of Specialization: Flight Dynamics, Control and Design
- Thesis Topic: Effect of Canard Stall on Projectile Angular Rate Damping
- Advisor: Professor Mark Costello
- GPA: 3.90/4.00

**B.S., Aerospace Engineering, Georgia Institute of Technology, Atlanta, Georgia, May 2009 -  
Summa Cum Laude - GPA 3.78/4.00**

## Professional Experience

**University of South Alabama - Mobile, AL**

*Associate Professor - William B Burnsed Jr, Department of Mechanical, Aerospace and Biomedical Engineering* Aug 2014 - Present

- AIAA, Design/Build/Fly and University Student Launch Initiative Faculty Advisor
- Instructor for: Numerical Methods, Aircraft Controls, Vibrations and Dynamic Systems
- Student Success Collaborative Mechanical Engineering Faculty Ambassador
- Director of Facility for Aerial Systems and Technology
- Curriculum and Faculty Search Committee Member

**NASA Marshall Space Flight Center - Huntsville, AL**

*Summer Faculty Fellow - EV41 Guidance and Controls* June - August 2017 and 2018

- Electric Sail Dynamics and Control Analysis of a 6U Tethered Satellite
- Developed sophisticated multibody dynamic simulation
- Advised team on optimal tether deployment maneuver
- Created a Simscape multibody simulation for the Mars Ascent Vehicle

**Earthly Dynamics Corporation - Atlanta, GA**

*Research Engineer* Sep 2013-June 2014

- Created a multi body parafoil, tether, ship and aircraft simulation in FORTRAN
- Investigated lateral and longitudinal stability of a towed parafoil system
- Created a combinatorial tension and lateral stability control law for tethered systems
- Assisted in the design of a catch and release parafoil for UAV deployment from ships

**Center for Advanced Machine Mobility, Georgia Institute of Technology - Atlanta, GA**

*Graduate Research Assistant* May 2009-Spg 2014

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- Created a multi-body aircraft simulation software with magnetic, contact, gravity and aerodynamic forces to excite aircraft
- Developed a new magnetic force and moment model method for application to aerospace vehicles
- Created a complex control system for rendezvous maneuver
- Investigated canard damping for fin stabilized projectiles
- Developed projectile aerodynamic coefficient estimation code
- Assisted in extraction of aerodynamic coefficients for multiple projectiles
- Created a model predictive impact controller for a paddle controlled spin stabilized projectile

*Undergraduate Research Assistant* Aug 2007-May 2009

- Obtained aerodynamic coefficients of cardboard boxes using Georgia Tech's subsonic windtunnel
- Designed sting to mount boxes in subsonic windtunnel

**AREAI – Inc. – UAS Research and Development - Kennesaw, GA**

*Aerospace Engineer* Aug 2012-Nov 2013

- Developed a multi-agent path planning algorithm using hardware in the loop testing
- Created and wrote a NASA SBIR proposal for trajectory generation of multi airdrop systems Contract Awarded April 2013 - \$120,000

**Raytheon Missile Systems - Tuscon, AZ**

*Advanced Programs Senior Intern* May 2008 – Aug 2008

- Field tested Closed Combat Lethal Recon(CCLR) aircraft
- Improved flap control and optical guidance of CCLR aircraft

**Aerospace Combustion Laboratory – Georgia Institute of Technology - Atlanta, GA**

*Undergraduate Research Assistant* May 2007-August 2007

- Measured exit velocity and fuel distribution for GE 9H nozzle
- Utilized a Laser Doppler Velocimeter and a Mass Spectrometer

## Honors, Awards and Licenses

### SELF AWARDS

**Nominated for Excellence in Teaching**, University of South Alabama College of Engineering, Spring 2022  
**Top Prof** Azalea Chapter of Mortar Board Honor Society, March 23rd, 2021  
**Nominated for Excellence in Research**, University of South Alabama College of Engineering, Spring 2020  
**Nominated for AIAA Dannenberg Award**, Greater Huntsville Section Spring 2020  
**Excellent Reviewer Nominee of Journal of Guidance Control and Dynamics** - 2018  
**AIAA Outstanding Engineer**, Mobile Area Council of Engineers, 2017-2018  
**Remote Pilot License**, Small Unmanned Aircraft Systems, 2016-2018  
**Professor of the Year**, Tau Beta Pi, Fall 2016  
**Tau Beta Pi**, Engineering Honor Society, Fall 2015  
**Order of the Engineer**, Fall 2014  
**Achievement of Academic Excellence**, Office of Minority Education Development, 2009, 2010, 2014  
**Sloan Scholarship Recipient**, National Action Council for Minorities in Engineering, Inc, April 2011.  
**Fixed Wing Aerospace Senior Design Winner**, School of Aerospace Engineering, May 2009.  
**Sigma Gamma Tau**, Georgia Tech AE National Honors Society, October 2006 – May 2009.

### CONFERENCE AWARDS

**First Place Team Category** Ruthie Hill, AIAA Student Conference, 2020  
**Third Place Masters Category** Alicia Ratcliffe, AIAA Student Conference, 2018  
**Third Place Team Category** USLI, AIAA Student Conference, 2017  
**Third Place Masters Category** Lisa Schibelius, AIAA Student Conference, 2017

### STUDENT AWARDS

**Masters Thesis of the Year**, Nghia Huynh, March 6th, 2019  
**Third Place Masters Category** Brandon Troub, AIAA Student Conference, 2016  
**Innovation Showdown Winner**, Airbus, Faculty Mentor, Summer 2015

### STUDENT ORGANIZATION AWARDS

**AIAA Design, Build, Fly**, Faculty Advisor, Placed 57th out of 140 Teams, Wichita, KS, April 2016  
**AIAA Design, Build, Fly**, Faculty Advisor, Placed 37th out of 105 Teams, Wichita, KS, April 2018  
**AIAA Design, Build, Fly**, Faculty Advisor, Placed 18th out of 102 Teams, Tucson, AZ, April 2019  
**AIAA Design, Build, Fly**, Faculty Advisor, Placed 42nd out of 92 Teams, Wichita, KS, April 2020  
**AIAA Design, Build, Fly**, Faculty Advisor, Accepted into competition, 2020-2021  
**AIAA Design, Build, Fly**, Faculty Advisor, Placed 23rd out of 97 Teams, Wichita, KS, April 2022

**NASA University Student Launch Initiative**, Faculty Advisor, Competed - 2016  
**NASA University Student Launch Initiative**, Faculty Advisor, Competed - 2017  
**NASA University Student Launch Initiative**, Faculty Advisor, Accepted into competition - 2022

## Biography

Carlos Montalvo is an Associate Professor in the Mechanical Engineering Department at the University of South Alabama (USA) and the Director of the Facility of Aerospace Systems and Technology (FAST). Prior to this appointment at USA, he was a research engineer at Georgia Tech where he received his Bachelor's (2009), Masters (2010) and PhD (2014). His PhD research was on Flight Dynamics and Controls of Meta

Meta Aircraft is an aircraft of aircraft which combines many disciplines including multi-body dynamics, formation flight control, and non-linear aerodynamics. Montalvo has worked on numerous aerospace applications. He began working with the Army Research Lab during his Masters career where he worked on aerodynamic coefficient estimation of a smart projectile using coupled rigid body dynamics and computational fluid dynamics. He also worked on many other smart munitions ranging from indirect fire rounds with dithering canard control to direct fire rounds with more non-conventional control systems like microspoilers and rotating aerodynamic paddles. During his PhD career he worked on disaster aid relief using cardboard box micro-packages as well as guidance systems for parafoil package delivery.

Dr. Montalvo has industry experience with Raytheon Missile systems where he worked on the Closed Combat Lethal Recon (CCLR) program which involved a tube launched UAV to intercept ground targets. He has also worked at AREA-I corporation where he worked on the Resource Allocation for Multi-Agent Path Planning (ReMAPP) which involved cooperative control algorithms for aircraft flying simultaneously to survey an area. Although he is not directly involved anymore, the program has gone on to a Phase II with multiple successful flight tests using the same algorithms he helped develop. Finally, he has also worked at Earthly Dynamics corporation where he was awarded a contract with the Maritime Applied Physics Corporation to work on a tethered parafoil for use in reconnaissance and range extension for sea-faring vessels. This work led to an article in the Journal of Guidance Control and Dynamics which investigated the lockout phenomenon for towed parafoils. Recently, Dr. Montalvo has participated in two separate Summer Faculty Fellowship programs at NASA Marshall. The first year involved work on the Electric-Sail program which uses multiple long tethers to interact with the solar wind to create propulsion while the second program involved modeling and simulation of the Mars Sample Return mission.

At South Alabama, Dr. Montalvo started the FAST lab in response to the growing aerospace demand in the South Alabama region. The FAST lab is involved in all types of unmanned aerial vehicle research with a focus on controls of multi-body systems including meta aircraft and rotorcraft systems. The basic research performed here includes a combination of Dynamic Simulation, Control System Design and Experimental Testing all geared to improve the performance of autonomous aerospace vehicles. Specifically, the lab is working on three main subject areas. The first is on autonomous control laws of fixed wing and rotary vehicles. The second is UAV utilization for the department of Earth Sciences and the final area is in Attitude Determination and Control design for small low Earth and deep space satellites. All of these projects involve multiple experiments as well as very sophisticated dynamic modeling.

In addition to research and professional work, Dr. Montalvo has maintained a balance of 60%,30%,10% between research, teaching and service. To that end, Dr. Montalvo helped create the aerospace engineering track designation for interested Mechanical Engineering students. As such, Dr. Montalvo advises all students interested in taking aerospace electives towards this track. As far as teaching, I am a strong supporter of kinesthetic learning. I think if an engineer is to truly be prepared for their future career they need to build and design something unique that they themselves got their hands on. I try to find ways for students to design and build outside the classroom.

## Research Activities

### Research Statement

My research interests lies at the intersection of flight dynamics, control and design of unmanned aerial vehicles with a focus on multi-body systems. I am involved in all types of unmanned aerial vehicle research with a focus on controls of multi-body systems including aircraft, quadrotors, parafoils, projectiles, spacecraft and tethered systems. Research has been conducted at the Facility of Aerial Systems and Technology (FAST) at the University of South Alabama (USA). Platforms include conjoined fixed wing aircraft called meta aircraft to electrically tethered cubesats called Electric Sails and everything in between. The basic research performed includes a combination of dynamic simulation coupled with applied estimation of custom made aircraft along with design of control systems and control mechanisms with the goal of experimental testing to improve the performance of autonomous aerospace vehicles. I have presented my research findings in the classroom as well as published in JOA, JGCD, SIMULATION, JOAE: Part G, Wind Engineering, JSR and Acta Astronautica with major research funding from NASA Marshall Space Flight Center (MSFC). I believe that my papers contribute to the growing area of autonomous drone research utilizing them for automatic control and disaster relief as well as atmospheric sampling and control of tethered satellites.

### Journals

- [1] Lisa Schibelius, Marine Leabeater, and Carlos Montalvo. “Project-Based Engineering Instrumentation Lab at Home Kit With CircuitPython”. In: *Journal of Advances in Engineering Education* (2022). Anticipated Submission in June.
- [2] Maxwell Cobar and Carlos Montalvo. “Takeoff and Landing of a Wingtip Connected Meta Aircraft with Feedback Control”. In: *Journal of Aircraft* 58.4 (2021), pp. 733–742. DOI: 10.2514/1.C035787. URL: <https://doi.org/10.2514/1.C035787>.
- [3] Nghia Huynh and Carlos Montalvo. “Simulation and Experimental Results of an Unmanned Towed System”. In: *Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering* 234.15 (June 2020), pp. 2167–2185. DOI: 10.1177/0954410020934059. URL: <https://journals.sagepub.com/doi/10.1177/0954410020934059>.
- [4] Sytske Kimball, Carlos Montalvo, and Madhuri Mulekar. “Assessing iMET-XQ performance and optimal placement on a small off-the-shelf, rotary-wing UAV, as a function of atmospheric conditions”. In: *MDPI - Atmosphere* 11 (June 2020), p. 660. DOI: 10.3390/atmos11060660. URL: <https://www.mdpi.com/2073-4433/11/6/660>.
- [5] Matthew Simmons and Carlos Montalvo. “Vibration Modes of an Electric Sail”. In: *Journal of Guidance, Control and Dynamics* 43.7 (Mar. 2020), pp. 1393–1398. DOI: 10.2514/1.G004924. URL: <https://arc.aiaa.org/doi/abs/10.2514/1.G004924>.
- [6] Sytske Kimball, Carlos Montalvo, and Madhuri Mulekar. “Evaluating temperature measurements of the iMET-XQ in the field under varying atmospheric conditions”. In: *MDPI - Atmosphere* 11.4 (Mar. 2020), p. 335. DOI: 10.3390/atmos11040335. URL: <https://www.mdpi.com/2073-4433/11/4/335/htm>.
- [7] Carlos Montalvo and Harrison White. “Braking Control Law for a Barbell Electric Sail”. In: *Acta Astronautica* (April 8th, 2019). DOI: 10.1016/j.actaastro.2019.04.005.
- [8] Carlos Montalvo, Matthew Simmons, and Sytske Kimball. “Wind Tunnel Tests of a Pitot-Static Tube Array to Estimate Wind Velocity”. In: *arXIV* (Jan. 2019). doi:arXiv:1901.10600 [physics.flu-dyn].
- [9] Collin Carithers and Carlos Montalvo. “Experimental Control of Two Connected Fixed Wing Aircraft”. In: *MDPI - Aerospace* 5.4 (113 October 24th, 2018). doi:10.3390/aerospace5040113. URL: <https://www.mdpi.com/2226-4310/5/4/113/pdf>.
- [10] Matthew Monkell, Carlos Montalvo, and Edmund Spencer. “Using Only Two Magnetorquers to De-Tumble a 2U CubeSAT”. In: *Advances in Space Research* (Sept. 2018). doi:10.1016/j.asr.2018.08.041.

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- [11] Carlos Montalvo and Bruce Wiegmann. “Electric Sail Space Flight Dynamics and Controls”. In: *Acta Astronautica* 148 (July 2018), pp. 268–275. DOI: 10.1016/j.actaastro.2018.05.009.
- [12] Brandon Troub et al. “Characterization of a Two-Dimensional Static Wind Field using Radial Basis Functions”. In: *Simulation: Transaction of the Society for Modeling and Simulation International* (May 2018). doi:10.1177/0037549718789492, p. 0037549718789492.
- [13] William Brown et al. “Measured and simulated analysis of a model rocket”. In: *Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering* 233.4 (Feb. 2018). doi:10.1177/0954410017752730, p. 0954410017752730. DOI: 10.1177/0954410017752730.
- [14] Joshua Paul Marshall, Joseph David Richardson, and Carlos Jose Montalvo. “Green’s function-based surrogate model for windfields using limited samples”. In: *Wind Engineering* 42.3 (Nov. 2017), pp. 164–176. DOI: 10.1177/0309524X17736479.
- [15] Brandon Troub, Brandi DePineuil, and Carlos Montalvo. “Simulation analysis of a collision-tolerant micro-airship fleet”. In: *International Journal of Micro Air Vehicles* (June 2017). doi:10.1177/1756829317705326.
- [16] Carlos Montalvo and Mark Costello. “Avoiding Lockout Instability for Towed Parafoil Systems”. In: *Journal of Guidance, Control and Dynamics* 39.5 (Jan. 2016), pp. 985–995. DOI: 10.2514/1.G001545.
- [17] Carlos Montalvo and Mark Costello. “Meta Aircraft Flight Dynamics”. In: *Journal of Aircraft* 52.1 (Jan. 2015). doi:10.2514/1.C032634, pp. 107–115. DOI: 10.2514/1.C032634.
- [18] John Dykes, Carlos Montalvo, and Mark Costello. “Use of Microspoilers for Control of Finned Projectiles”. In: *Journal of Spacecraft and Rockets* 49.6 (Nov. 2012), pp. 1131–1140. DOI: 10.2514/6.2010-8246.
- [19] Carlos Montalvo and Mark Costello. “Effect of canard stall on projectile roll and pitch damping”. In: *Proceedings of the Institution of Mechanical Engineers Part G: Journal of Aerospace Engineering* 225.9 (Feb. 2011). doi:10.1177/0954410011403578, pp. 1003–1011.

## Conference Proceedings

- [20] Maxwell Cobar and Carlos Montalvo. “The Facility for Aerospace Systems and Technology Simulation: FASTSim - An Open-Source Configurable Software in the Loop Simulation Environment”. In: *AIAA AVIATION Forum - Chicago, IL*. Final Paper Submitted May 2nd, 2022. June 2022.
- [21] Julia Nelson and Carlos Montalvo. “Facility for Aerial Systems and Technology Python (FASTPy) Autopilot for a Remote-Controlled Car”. In: *AIAA Region II Student Conference Atlanta, GA*. Apr. 2022.
- [22] Maxwell Cobar et al. “Guidance, Navigation, and Control Subsystem Design for ABEX Satellite”. In: *AIAA SciTech Forum - San Diego, CA*. Jan. 2022. URL: <https://arc.aiaa.org/doi/10.2514/6.2022-1588>.
- [23] Carlos Montalvo. “Project Based Learning at South Alabama”. In: *American Control Conference - New Orleans, LA*. Presentation Only - Invitation. May 2021. URL: <https://www.youtube.com/watch?v=JFVihUxfK2o&list=LL&index=1>.
- [24] Maxwell Cobar, Carlos Montalvo, and Collin Buckner. “Disaster Response Fixed Wing UAV for Gulf of Mexico Field Campaign”. In: *AIAA SciTech Forum - Nashville, TN*. Jan. 2021. DOI: 10.2514/6.2021-1408. URL: <https://arc.aiaa.org/doi/abs/10.2514/6.2021-1408>.
- [25] Ruthie Hill et al. “Guidance, Navigation, and Control Subsystem Trade Study of AEGIS”. In: *AIAA SciTech Forum - Nashville, TN*. Jan. 2021. DOI: 10.2514/6.2021-0580. URL: <https://arc.aiaa.org/doi/abs/10.2514/6.2021-0580>.
- [26] Ruthie Hill et al. “Guidance, Navigation, and Control Subsystem Trade Study of AEGIS”. In: *AIAA Region II Student Conference Tuscaloosa, AL*. Apr. 2020.
- [27] Matthew Simmons and Carlos J. Montalvo. “Vibration Modes of a Barbell Electric Sail”. In: *AIAA SciTech Forum - Spaceflight Mechanics, Orlando, FL*. Jan. 2020. DOI: 10.2514/6.2019-1123.

- [28] Maxwell Cobar and Carlos Montalvo. “Developing Semi-Autonomous Flight Control Software For a Meta Aircraft of Two Fixed Wing Aircraft with a Raspberry Pi + Navio2 Flight Controller”. In: *Proceedings of the Early Career Technical Conference 2019, Birmingham, Alabama, USA*. Vol. 18. 3. Nov. 2019. URL: [https://www.uab.edu/engineering/me/images/Documents/about/early\\_career\\_technical\\_journal/Year\\_2019\\_Vol\\_18-Section3.pdf](https://www.uab.edu/engineering/me/images/Documents/about/early_career_technical_journal/Year_2019_Vol_18-Section3.pdf).
- [29] Edmund Spencer et al. “JAGSAT I: A NASA USIP CubeSat to Perform Measurements Of Plasma Density Irregularities In The Ionosphere For Scintillation Studies”. In: *American Geophysical Union Fall Meeting, San Francisco, CA*. Dec. 2019.
- [30] Collin Carithers et al. “Control Optimization of a Novel eVTOL/Pusher Transport Aircraft with Known Faults”. In: *AIAA AVIATION Dallas, TX*. doi:10.2514/6.2019-3269. June 2019. DOI: 10.2514/6.2019-3269. URL: <https://arc.aiaa.org/doi/abs/10.2514/6.2019-3269>.
- [31] Sytske Kimball, Carlos Montalvo, and Madhuri Mulekar. “Observing the atmosphere with drones – how good are the sensors and where should you put them?”. In: *Annual Meeting of the American Association of State Climatologists, Santa Rosa, CA*. June 2019.
- [32] Maxwell Cobar and Carlos Montalvo. “Simulation and Modeling for a Meta Aircraft Flight Program”. In: *AIAA Region II Student Conference Cocoa Beach, FL*. Apr. 2019.
- [33] Matthew Simmons and Carlos J. Montalvo. “Reduced Order Model of a Barbell Electric Sail”. In: *AIAA SciTech Forum - Advanced Propulsion Systems, San Diego, CA*. doi:10.2514/6.2019-1123. Jan. 2019. DOI: 10.2514/6.2019-1123.
- [34] Evan Anzalone et al. “Guidance and Navigation Design for a Martian Sample Return Ascent Vehicle”. In: *GNC Challenges with Robotic Deep Space Exploration - AAS Guidance and Control Conference - Breckenridge, CO*. 2019. URL: <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20190002100.pdf>.
- [35] Collin Carithers, Lisa Schibelius, and Carlos Montalvo. “Observing Atmospheric Parameters Using a Multirotor Platform”. In: *AIAA Region II Student Conference Mobile ,AL*. Apr. 2018.
- [36] Tobin Nelson and Carlos Montalvo. “Single Axis Attitude Control Utilizing Reaction Wheels”. In: *AIAA Region II Student Conference Mobile ,AL*. Apr. 2018.
- [37] Taylor Gallagher, Jason Borcz, and Carlos Montalvo. “Design Build Fly Regional Design Team for Raytheon/Cessna Competition”. In: *AIAA Region II Student Conference Mobile ,AL*. Apr. 2018.
- [38] Alicia Ratchliffe, Nghia Huynh, and Carlos Montalvo. “Multi-Objective Design of a Lightweight Towed Body”. In: *AIAA Region II Student Conference Mobile ,AL*. Apr. 2018.
- [39] Matthew Simmons and Carlos Montalvo. “Calibration of a Multi-Directional Pitot-Static Tube Array”. In: *AIAA Region II Student Conference Mobile ,AL*. Apr. 2018.
- [40] Dylan Calhoun et al. “Electric Sail Space Tether Deployment Mechanism”. In: *AIAA Region II Student Conference Mobile ,AL*. Apr. 2018.
- [41] Harrison White and Carlos Montalvo. “Meta Aircraft Microprocessor Alternative and Multiplexer Fail-Safe Circuit”. In: *AIAA Region II Student Conference Mobile ,AL*. Apr. 2018.
- [42] Sytske K Kimball et al. “Observing Atmospheric Parameters Using Quadcopters”. In: *Southeastern Coastal and Atmospheric Processes Symposium*. Feb. 2018.
- [43] Sytske Kimball et al. “Observing Atmospheric Parameters Using Quadcopters”. In: *98th Annual Meeting of the American Meteorological Society Austin, Texas*. Jan. 2018.
- [44] Brandon Troub et al. “Low-Cost, Multi-Purpose Autopilot for Ground and Aerial Vehicles using an Arduino MEGA with Transistor Array Safety Circuit”. In: *AIAA AVIATION Denver, CO*. doi:10.2514/6.2017-3140. June 2017-3140.
- [45] Lisa Schibelius and Carlos Montalvo. “Multi-MASS: A Fleet of Unmanned Aerial Vehicles for Atmospheric Characterization”. In: *AIAA AVIATION Denver, CO*. doi:10.2514/6.2017-4475. June 2017.

- [46] Nghia Huynh, Alicia Ratcliffe, and Carlos Montalvo. “Dynamics of Multi-Purpose LightWeight Towed Systems”. In: *AIAA AVIATION Denver, CO*. doi:10.2514/6.2017-3551. June 2017.
- [47] Beecher Faust et al. “Experimental and Simulation Analysis of a High-Power Rocket”. In: *AIAA Region II Student Conference Starkville, MS*. Apr. 2017.
- [48] Nghia Huynh, Alicia Ratcliffe, and Carlos Montalvo. “Multi-Objective Design Optimization for a Light-Weight Towed System”. In: *AIAA Region II Student Conference Starkville, MS*. Apr. 2017.
- [49] Lisa Schibeli and Carlos Montalvo. “Design of an Atmospheric Sensing Package for a Quadrotor”. In: *AIAA Region II Student Conference Starkville, MS*. Apr. 2017.
- [50] Sytske K Kimball, Carlos Montalvo, and Lisa Schibeli. “Comparing quadcopter iMET Temperature, Pressure, and Humidity data with 10 m tower data”. In: *97th Annual Meeting of the American Meteorological Society Seattle, Washington*. Jan. 2017.
- [52] Brandon Troub and Carlos Montalvo. “Meta Aircraft Controllability”. In: *AIAA AVIATION Washington, DC, USA*. 2016.
- [53] Brandon Troub, Brandi DePineuil, and Carlos Montalvo. “Simulation Analysis of a Collision-Tolerant Micro-Airship Fleet”. In: *AIAA Region II Student Conference Huntsville, AL*. Apr. 2016.
- [54] Kent Lino et al. “Comparison of OpenRocket to Standard Six Degree of Freedom Rocket Simulation”. In: *AIAA Region II Student Conference Huntsville, AL*. Apr. 2016.
- [55] Lisa Schibeli and Carlos Montalvo. “Simulation Analysis of a Speed-Controlled Single-Cylinder Vehicle”. In: *AIAA Region II Student Conference Huntsville, AL*. Apr. 2016.
- [56] Alicia Ratcliffe and Carlos Montalvo. “Orbital Mechanic Simulation of a 1U CubeSAT”. In: *Proceedings of the 15th Early Career Technical Conference 2015, Birmingham, Alabama, USA*. Nov. 2015.
- [57] Carlos Montalvo, Joe Richardson, and Joshua Marshall. “Robust Three-Dimensional Characterization of a Complex Atmosphere at High Resolution using Multi-Agent Windmappers”. In: *AIAA AVIATION, Dallas, TX, June 18th*. doi:10.2514/6.2015-2856. 2015.
- [58] Jubaraj Sahu, Mark Costello, and Carlos Montalvo. “Development and Application of Multidisciplinary Coupled Computational Techniques for Projectile Aerodynamics”. In: *Seventh International Conference on Computational Fluid Dynamics (ICCFD7), Big Island, Hawaii*. July 2012.
- [59] Thomas Herrmann et al. “Design, Simulation, and Experimental Testing of Humanitarian Aid Airdrop Micro Packages”. In: *AIAA Atmospheric Flight Mechanics Conference Minneapolis, MN*. Aug. 2012.
- [60] Carlos Montalvo and Mark Costello. “Meta Aircraft Connection Dynamics”. In: *AIAA GNC/AFM Minneapolis, MN*. 2012. DOI: 10.2514/6.2012-4677.
- [61] Carlos Montalvo and Mark Costello. “Estimation of projectile aerodynamic coefficients using coupled CFD/RBD simulation results”. In: *AIAA Atmospheric Flight Mechanics Conference, Toronto, Ontario, Canada*. doi:10.2514/6.2010-8249. 2010.
- [62] Mike Ward, Carlos Montalvo, and Mark Costello. “Performance Characteristics of an Autonomous Airdrop System in Realistic Wind Environments”. In: *AIAA Atmospheric Flight Mechanics Conference, Toronto, Ontario, Canada, August 2nd*. doi:10.2514/6.2010-7510. 2010. DOI: 10.2514/6.2010-7510.

## Technical Reports

- [63] Ross Lambert, James Allen, and Carlos Montalvo. *Deployment of an Electric Sail Tether System using a Smart Controller*. 80NSSC18P2217. Bangham Engineering Incorporated, Feb. 2019. URL: <http://www.sciencedirect.com/science/article/pii/S009457659785429X>.
- [64] Carlos Montalvo and John Rakoczy. *Mars Ascent Vehicle Sensitivity Analysis*. NASA Marshall Space Flight Center Faculty Fellowship TM, Aug. 2018.
- [65] Carlos Montalvo and John Rakoczy. *Electric Sail Space Flight Dynamics and Controls*. 219848. NASA Marshall Space Flight Center Faculty Fellowship TM, Aug. 2017, pp. 135–144.

- [66] Carlos Montalvo. *Meta Aircraft Flight Dynamics and Controls*. PhD Thesis, Georgia Institute of Technology, May 2014.
- [67] Mark Costello, Carlos Montalvo, and Frank Fresconi. *MultiBoom: A Generic Multibody Flight Mechanics Simulation Tool for Smart Projectiles*. ARL-TR-6232, Oct. 2012.

## Online Segments

- [68] Thomas Becnel. *Design, Build, Fly*. 2022. URL: <https://www.southalabama.edu/departments/publicrelations/pressreleases/031022dbf.html> (visited on 05/08/2022).
- [69] El Jaya. *Dominicano doctor Carlos Montalvo Vásquez colaboró en proyecto de la NASA, Marte 2020*. 2021. URL: <https://www.eljaya.com/115727/dominicano-doctor-carlos-montalvo-vasquez-colaboro-en-proyecto-de-la-nasa-marte-2020/> (visited on 03/10/2021).
- [70] La 91FM. *Audio Now Digital*. 2021. URL: <https://player-prod.audionowdigital.com/share/La91FM?lang=eng&streamId=04c39a5bf26b33fc7db827c523fd7f9c&stationId=f29aaf58-7042-4645-bc15-ea14eedad28f&referrer=shareStream>.
- [71] Hoy. *Dominicano formó parte proyecto Perseverance que llegó a Marte*. 2021. URL: <https://hoy.com.do/dominicano-formo-parte-proyecto-perseverance-que-llego-a-marte/> (visited on 03/10/2021).
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## Books

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## Contracts/Proposals/Budgets/Grants

### Current Support

1. Reichert M., Montalvo C., Cloutier R., Kimball S., Terwey W., Lanicci J., **NavSea Typhoon**), Submitted to Department of Defense - June 23rd, 2020 - \$3,600,000 - Accepted Jan 11, 2021
2. Alabama Space Grant Consortium \$10,000 Grant for **Alabama Burst Energetics Exploration Satellite Year 2** - Awarded 3/31/2021 - Start Date 8/14/2021
3. Montalvo C., Richardson J., Kendall B., Patterson V., Box T., Davis C., Franklin C., Godfrey A., Patrick T., **Alabama Space Grant for Accelerometer based Rocket Development (AS-GARD)** Alabama Space Grant Consortium Outreach Programs, \$5,000, Submitted 10/25/2021, Accepted 11/9/2021 - Project Period: 12/1/2021-12/1/2022

### Pending Support

1. Latif S., Montalvo C., Subcontract from UAH - **Alabama Burst Energetics eXplorer (ABEX) Mission** AstroPhysics Research and Analysis (APRA) - Submitted to NASA Proposal #: NNH21ZDA001N-APRA - 12/17/2021

### Funded and Closed

1. Alabama Space Grant Consortium \$10,000 Grant for **Alabama Burst Energetics Exploration Satellite** - Awarded 9/12/2020 - Concluded 8/6/2021
2. Montalvo, C., **ASGC CubeSat Subsystem Teams and Faculty Mentors** Alabama Space Grant Consortium August 22nd, 2018 - \$3,000 - Program concluded - 5/5/2020
3. Montalvo, Carlos; **Design of Tether Deployer for Spacecraft Applications** - Senior Design Project - \$2,000 - NASA Marshall Space Flight Center - Submitted 8/27/2018 - Awarded 10/2/2018 - Program Concluded 5/5/2020
4. Powers, Joey; Wiegmann, Bruce; Montalvo, Carlos; **Electric Sail Simulation Analysis Tool** - NASA TIP QUAD Charts Proposal Submitted 7/18/2017, Full Proposal submitted 7/26/2017, Re-Submitted as NASA TE and Awarded 10/4/2017, \$35,000, Costed 3/13/2019, Award Documents Sent 6/20/2019 - Program concluded 6/25/2020
5. Cobar M., Montalvo C., **Meta Aircraft Flight Testing** - Summer SURF Proposal - \$2,000 (student) - Submitted 3/1/2019 - Awarded April 12th, 2019
6. Sherman W., Montalvo C., **Fault Tolerant Control of an Urban Air Taxi** - Summer SURF Proposal - \$2,000 (student) - Submitted 3/1/2019 - Awarded April 12th, 2019

C. Montalvo

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7. Cloutier, Rob. and Montalvo C., **Model-Based Systems Approach for Space Architecture Design** - White Paper response to RFP EUR001-2019 - \$4,500 - Submitted 2/22/2019 - Awarded Friday 3/15/2019
8. Montalvo, C., **Roll Control Strategy Trade Study in Support of Mars Sample Return Mars Ascent Vehilce** - NASA Marshall Space Flight Center - Submitted 8/8/2018 - Awarded - 9/19/2018 - \$25,000 - Closed 5/15/2019
9. Montalvo, Carlos **Drone Stadium Security Systems** - Senior Design Project - \$11,000 - University of South Alabama - Submitted to Zeke Aull Police Chief - 08/13/2018 - Accepted - 1/16/2019 - Completed April 16th, 2019
10. Bangam M., Montalvo C., **Two Kilometer Tether Deployment on a Frozen Ice Sheet** Submitted by Bangham Engineering - SBIR, \$99,945 Awarded June 7th, 2018 - Independent Consulting - \$14,200.
11. Montalvo C., **Marshall Faculty Fellowship Program** - NASA Marshall Space Flight Center, June 5th, 2018 - August 11th, 2018 - Submitted January 17th, 2018 - Awarded April 5th, 2018 and Attended - \$15,000
12. Cobar M., Montalvo C., **Quadrotor Autopilot Review** - Summer SURF Proposal - \$2,000 (student) - Submitted 3/15/2018 - Awarded April 1st, 2018 - Student Declined
13. Montalvo, Carlos; **Electric Sail Deployer** - Senior Design Project - \$2,000 - NASA Marshall Space Flight Center - Submitted 9/14/2017 - Awarded 9/21/2017
14. Carithers, Collin; Montalvo, Carlos; **Mobile Atmospheric Sensing Package** - Summer SURF Proposal - \$2,000 (Student) - \$500 (equipment) - Submitted 3/9/2017, Awarded 4/14/2017
15. Montalvo, Carlos; Kimball, Sytske; Mulekar, Madhuri **Development, Testing and Validation of Unmanned Aerial Vehicle Based Sensors for Atmospheric Research**, Research and Scholarly Development Grant Program, \$25,000, ORED Internal Funding Opportunities, Submitted 3/1/2016, Awarded 4/3/2017
16. Montalvo C., **Marshall Faculty Fellowship Program** - NASA Marshall Space Flight Center, June 5th, 2017 - August 11th, 2017 - Submitted January 17th, 2017 - Awarded March 31st, 2017 - Accepted and Attended - \$15,000
17. Montalvo C., Bill Brown, Beecher Faust, Rockwell Garrido, Carson Schaff, and Michael Wiesneth **USALS Roll Angle Controller** Alabama Space Grant Consortium Outreach Programs, \$5,000, Submitted 11/29/2016, Accepted 12/9/2016 - Project Period: 11/29/2016-11/29/2017
18. **Certificate of Authorization for Operation of Small Unmanned Aircraft Systems** - Submitted 12/17/2015. Approved by the Federal Aviation Administration on 4/4/2016. - N-Number Obtained for Iris+ Quadcopter
19. C. Montalvo, E. Spencer, S. Lateef, S. Russ **NASA Undergraduate Student Instrumentation Project**, Contract Awarded March 2016, \$100,000 for equipment
20. C. Montalvo, **Atmospheric and Geophysical Sensing using Autonomous Aerial Vehicles**, The Facility for Aerial Systems and Technology, Internal USA Federal Development Council. Contract Awarded May 2016, \$5,000
21. **Experimental Analysis of Atmospheric Data using Autonomous Sensing Quadcopters** - Summer UCUR Proposal - Marina Swanopoe - \$2,000 (Student) - \$500 (equipment) - 3/20/2016
22. C. Montalvo, **USALS Hazard Detection and Wind Turbine** - Submitted to ASGC - 11/6/2015 - Contract awarded \$5,000 - 12/3/2015
23. Brandi Depineul - Summer UCUR Proposal - **Coordinated Flight of Blimps** - 3/13/2015 - Accepted 4/15/2015 - \$2,000 (Student) - \$500 (equipment)
24. Alicia Ratcliffe - Summer UCUR Proposal - **Orbital Mechanics of a 1U CubeSat** - 3/13/2015 - Accepted 4/15/2015 - \$2,000 (Student) - \$500 (equipment)
25. C. Montalvo, **Towed Magnetic Anomaly Detection with a Light-Weight Projectile**, Subcontractor for AREA-I, Prime: Office of Naval Research, \$24,000, 2/28/2015
26. C. Montalvo, **Robotic Landing Gear Blender Animations**, Subcontractor for Georgia Tech, Prime: DARPA, \$25,000
27. N. Alley, B. Efstathios, D. Khueme, C. Montalvo, **Multi-Agent Management System**, NASA SBIR, Nov 2012 - Topic S3.05 Proposal No. S3.05-9503 Contract #: NNX13CL44P, SBIR (50% Contribution), Contract Awarded April 2013 - \$120,000

28. M. Costello, C. Montalvo, Smart Projectile, Aerospace Engineering, U.S. Army Research Laboratory, \$313,000 Sept 2012-2015, Created detailed funding plan – (10% Contribution)
29. M. Costello, M. Ruzzene, C. Montalvo, Rotorcraft Robotic Landing Gear, Aero and Hydrodynamics System, DARPA, \$551,000 Sept 2012-2015, Created detailed funding plan – (10% Contribution)

### Rejected Proposals

1. Dale Thomas and many other **Alabama Experiment for Galactic-ray In-situ Shielding**, Submitted to CubeSat Launch Initiative, NNH19ZCQ001O, 11/4/2019, No budget requested - NASA Removed Secondary Payloads
2. U Nair, University of Alabama in Huntsville, **RII Track-2 FEC: Bridging Critical Gaps in Environment Prediction through Harnessing of Data Revolution** - NSF EPSCOR - Subcontract award to University of South Alabama - Kimball, Terwey, Montalvo, Gong, Shaban - \$775,460 - Submitted Jan 24th, 2020 - Rejected September 2020
3. University of Auburn in Partnership with many school including the University of South Alabama. Chakraborty, Imon - PI - Carlos Montalvo - Co-I, **Advancing Design Paradigm for Revolutionary Vertical Lift Flight Vehicles**, NASA Announcement NNH19ZEA001N-ULI: D.4 University Leadership Initiative (ULI) - Step A Proposal. No Budget Requested - Submitted 6/30/2020 - Rejected August 28th, 2020
4. Buckner, Collin and Montalvo, Carlos **Cooperative Waterproof Aerial Surveillance Drones** submitted to *Advanced Naval Technology Exercise (ANTX)* on 12/3/2019, No budget requested. Rejected 1/31/2020
5. Henry, Charlie; Montalvo, Carlos; **Assessment of Conditions in Disaster Stricken Areas using Multiple UAS Strategies for Rapid Disaster Responses and Relief** - Advancing NOAA Application of Unmanned Aircraft Systems (UAS) Internal NOAA FY2019 Request for Proposals from the NOAA UAS Program Office within the Office of Oceanic and Atmospheric Research - Letter of Intent Submitted 12/17/2018 - Letter of Intent Accepted 12/21/2018 - Full Proposal Submitted 3/1/2019 - \$188,989.72 - Rejected 11/11/2019
6. University of Auburn in Partnership with many school including the University of South Alabama. Chakraborty, Imon - PI - Carlos Montalvo - Co-I, **Advancing Design Paradigm for Revolutionary Vertical Lift Flight Vehicles**, NASA Announcement NNH18ZEA001N-ULI2: D.4 University Leadership Initiative 2 (ULI2) - Step A Proposal. No Budget Requested - Submitted 8/27/2019 - Rejected 11/8/2019
7. Montalvo C., **Making Urban Air Taxis Safe with Fault Tolerant Control System** - Notice of Intent, System Wide Safety Project NASA Nspires, Submitted 6/3/2019, No budget requested - Rejected 7/20/2019
8. U Nair, University of Alabama in Huntsville, **RII Track-2 FEC: Bridging Critical Gaps in Environment Prediction through Harnessing of Data Revolution** - NSF EPSCOR - Subcontract award to University of South Alabama - Kimball, Lanicci, Terwey, Montalvo - \$799,825 - Submitted Jan 25th, 2019
9. Montalvo, C. **Development of a Prototype Urban Aircraft with Fault Tolerant Control Architecture** - White paper submitted to Airbus Engineering Mobile, AL 3/15/2019 - Rejected - 9/4/2019
10. Montalvo C., **CAREER: System Identification and Fault Tolerant Control Architecture for Urban Air Mobility and Multibody Systems** Submitted to NSF CAREER July 18, 2019 - \$500,008 - Rejected 8/9/2019
11. Montalvo C., **MSFC Early Career Initiative Partnering RFI - Technical Development of the Electric Sail** - RFI Submitted June 21st, 2019 - Full Proposal due July 19th, 2019 - Award 10/1/2019 - 10/1/2021 - \$100,000 - Proposal canceled and never submitted
12. Montalvo C., **Making Urban Air Taxis Safe with Fault Tolerant Control System** - Sloan Scholar Mentoring Network Seed Grant, May 1st, 2019 - \$4,970
13. Simmons, M., and Montalvo, C., **Mars Ascent Vehicle Architecture Analysis** - NASA Marshall Space Flight Center - Submitted 3/21/2019 - \$50,000 - Rejected 3/29/2019

14. Spencer E., Latif S., Russ S., and Montalvo C., **A Cubesat Experiment To Investigate Electron Scale Plasma Density Irregularities and Wave Activity in the Ionosphere** Submitted May 18th, 2018 via NSPIRES - 18-HTIDS18-0059 - Accepted for Step 2 Proposal - Submitted July 20th, 2018 - \$519,692 - Rejected 1/16/2019
15. Montalvo C., Kimball S., **Vaisala Sensor Analysis** Submitted September 17th, 2018 to Chris Vagasky at Vaisala - \$37,089 - Rejected 1/8/2018
16. Kimball S. and Montalvo C., **4D Sampling and Modeling of the Earths' Lower Atmosphere Using Small Unmanned Aircraft Systems** Subcontract award with Chilson P (Oklahoma University) - \$800,000 - Submitted April 12th, 2018 via NSPIRES - 17-EVS3-17.1-0030, Rejected - 9/26/2018
17. PI: Cloutier, Rob **Insitute for Autonomous and Resilient Space Habitats** Submitted to NRA: Space Technology - Research, Development, Demonstration, and Infusion 2018 (SpaceTech-REDDI-2018), Submitted July 26th, 2018 - Step 1 Proposal no budget requested - Rejected August 31st, 2018
18. Montalvo C., **Fault Tolerant Control Architecture of a Multi-Tilt-Rotor Air Taxi** - Sloan Scholar Mentoring Network Seed Grant, August 1st, 2018 - \$4,980 - Rejected 8/28/2018
19. Montalvo C., **CAREER: Electric Sail Dynamic Modeling and CubeSat Tether Deployment Demonstration Mission from ISS** Submitted to NSF CAREER July 19,2018 but missed the deadline due to a combination of Cayuse and administration issues - \$530,171
20. Montalvo C., **Electric Sail Dynamic Modeling and CubeSat Tether Deployment Demonstration Mission From ISS** - Heliophysiscs Early Career Investigator Program - NASA - Submitted March 20th, 2018 - Step 1 Proposal - No budget requested - Rejected July 18th, 2018
21. Montalvo C., **Fault Tolerant Control Architecture of a Multi-Tilt-Rotor Air Taxi** - Sloan Scholar Mentoring Network Seed Grant, March 5th, 2018 - \$4,980 - Rejected 7/6/2018
22. Montalvo, Carlos; Wiegmann, Bruce; Zank, Gary; Spencer, Edmund; Bryan, Thomas; **Electric Sail Dynamic Modeling and CubeSat Tether Deployment Demonstration Mission from ISS** Small Satellite Technology Program NASA STMD - \$408,076 - Submitted 9/21/2017 - Rejected 12/1/2017
23. Green, Montalvo, Yazdani, Bindele, Lewis, Parrish, **NSF INCLUDES: Laying the Foundation: Math to STEM for Girls of Color** - \$299,997K - Submitted - 5/20/2017
24. Montalvo C., **Office of Naval Research Summer Faculty Research Program**, \$10,000, Submitted December 12th, 2016, Rejected 2/24/2016 - Submission Comments "Reach out to someone before you apply"
25. **Experimental Analysis of Autonomous Meta Aircraft** - Summer UCUR Proposal - Jake Magnin - \$2,000 (Student) - \$500 (equipment) 3/20/2016
26. S. Kimball, W. Terwey, C. Montalvo, **Investigating Sea Breezes and Associated Convective Activity in the Mobile Bay Area: A Climatological, Numerical Modeling and UAS-Observational Study**, Submitted to NSF 5/27/2016 - \$428,183 - Contract Rejected November 2016
27. **Towed Magnetic Anamoly Detection (MAD) aerodynamic modeling and simulation for rotary wing platforms #N15A-T009**, 30 months, \$750,000, PI: Mr. Dan Kuehme, C-Pi: Dr. Carlos Montalvo, Proposal Submitted: 1/14/2016, Contract rejected: 3/10/2016
28. Optimal Synthesis - AF SBIR - **Calculated Air Release Point (CARP) Navigation Update Due to Ground Effects** - 2/24/2015
29. C. Montalvo **Measured and Simulated Motion of an Autonomous Fixed-Wing Meta Aircraft**, Internal USA Federal Development Council. \$5,000, 1/26/2015
30. Cleary, John C, Sytske K, Montalvo, Carlos J, Beebe, Donald, Nelson, David A, Green, Andre M, Mishra, Nutan S, **NSF-MRI: Acquisition of a Research Grade Subsonic Wind Tunnel**, \$432,887 1/22/2015
31. C Montalvo, A. Lewis, M. Ward, M. Costello, **Low Magnetic Signature Expendable Unmanned Aerial Vehicle (UAV) for Anti-Submarine Warfare (ASW)**, Office of Naval Research, Jan 2014 Principal Investigator, Assisted in writing SBIR proposal for Earthly Dynamics Corporation. (50% Contribution)
32. M. Costello, M. Ward, C. Montalvo, E. Leylek, **Advanced Towed Systems Navigation**, Office of Naval Research, Nov 2012, Assisted in writing a white paper for ONR on Advanced Towed Systems using complex modeling, simulation and flight testing (30% Contribution)

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## Patents and Invention Disclosures

- *Device and Method for Tracking and Enhancing the Performance of a Subject Operating a Wheel-Based Longboard* - Invention Filed with Intellectual Property Department at the University of South Alabama - Spring 2016 - US Patent Filed April 7th, 2018 - Docket Number - 2017-030-ENG

## Teaching Activities

### Teaching Statement

My teaching philosophy at its core is to captivate students so that they not only grasp difficult concepts but they also enjoy coming to class. Studies have shown that students learn better if they enjoy and respect the professor that is teaching. I try and participate in light-hearted conversation with the students while breaking down fundamental concepts into pattern recognition rather than “which equation do I use”. Using these patterns I then have students use the tools design new systems and new problems which will help them in their future career. Every problem I engage in an academic setting is geared towards their future career. Theory is the foundation of engineering but engineers also design and build everything from buildings to unmanned aerial vehicles. It is important to apply the theory and the fundamentals to real world problems.

In addition to real world problems, I am a strong supporter of kinesthetic learning. I think if an engineer is to truly be prepared for their future career they need to build and design something unique that they themselves got their hands on. It’s not enough to learn theory on a whiteboard. I try to find ways for students to design and build outside the classroom.

To that end, I also encourage students to be creative. I show students that there is more than one way to solve a problem because that is what will be required of them in their future career. Furthermore, I believe that the cooperation between computer and human will only increase. My goal then is to educate students on many of the tools that students can use to make their engineering design better. I don’t want them to be afraid to pick up a computer and use it to their advantage. I want them to be literate not only when it comes to theory but also when it comes to programming and general software capabilities on a personal machine.

In general my teachings interests include control system dynamics as well as space and aircraft mechanics with a strong influence in simulation using a computer programming skills. Since 2014 my teaching evaluations have been very positive. In 2014 I taught two sections of ME Analysis and 80% of the students gave me a rating of Excellent with the other 20% in the Average and Good category. In this class, the students mentioned that I was very knowledgeable and I made the class interesting. The criticisms I received were to slow down and to make the class more accessible to introductory students. In the 2018-2019 calendar year, I oversaw three Capstone Design Projects, a graduate Nonlinear Controls course, Aerodynamics and Dynamic Systems & Controls. In my main course, Dynamic Systems and Controls, I received an 85.7% excellent rating with the other 14.3% in the good category. I received numerous positive comments and only received negative comments pertaining to computer programming and the class being at 8am. No comments were made at my teaching style.

Over the course of the last 7 years I have taught Vibrations, EG101 (Intro to Engineering), Dynamic Systems and Control, Instrumentation, Aircraft Stability and Control, Nonlinear Controls, Aerodynamics, Spacecraft Design, Aircraft Design, numerous Directed Independent Studies and overseen on average 2 to 3 capstone projects. That constitutes about 12 unique courses that I have taught and about 5 that I developed on my own. Some of these courses are new electives in aerospace engineering to facilitate the new aerospace engineering track. In all of these classes, my evaluations have been positive (over 75%) for the last 7 years. My students describe me as approachable, friendly, tough, and willing to answer any questions no matter how silly or “stupid” the question may be. I am genuinely excited each and every day to step into a classroom and I hope that I can encourage some students to find their passion in engineering as well. I am proud to be a step in my students path to success and I think my evaluations speak for themselves.

### Formal Instruction

## C. Montalvo

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- Aircraft Design (AE 468) - Spring 2021 - 27 Students, Spring 2022 - 24 students
- Spacecraft Design (ME490) - Fall 2020 - 35 students, Fall 2021 39 students
- Subsystems Analysis and Design of Low Earth Orbit (LEO) Satellites (EG490) - Summer 2020 - 7 students, Summer 2021 - 5 students
- Instrumentation (ME316) - Fall 2019 - 23 students, Spring 2020 - 50 students, Fall 2020 - 23 students, Spring 2021 - 45 students, Fall 2021 24 students, Spring 2022 36 students
- Fundamentals of Aerodynamics (AE361) - Spring 2019 - 19 students
- Nonlinear Systems Dynamics and Control (ME 590) - 3 Students Fall 2017, 4 Students Spring 2019, 7 students Spring 2020
- Systems Dynamics and Controls (ME426) - Fall 2016 - 64 Students, Spring 2017 - 24 Student, Fall 2017 - 46 Students, Spring 2018 - 22 students, Fall 2018 - 48 Students, Spring 2019 33 students, Fall 2019 - 46 Students, Spring 2020 - 23 students
- Introduction to MATLAB (ME 490) May-mester 2016, 2017 - 12, 30 students
- Aircraft Stability and Control (AE 469) Spring 2016 - 30 Students, Spring 2017 - 30 Students, Spring 2018 - 27 students
- Mechanical Vibrations (ME 472) Spring 2016 - 30 Students, Fall 2018 - 36 students
- ME Analysis (ME 328) Fall 2015 - 40 Students
- ME Analysis I (ME 228) Fall 2014 - 40 students ,Spring 2015 - 40 Students,

### **Informal Instruction**

#### *Volunteer Presentations*

- E-Week Banner Judge - 2018-2019
- Solar Eclipse Fall 2018
- Exploring Engineering Spring 2019

#### *UCUR - Undergraduate Curriculum for Undergraduate Research*

#### *SURF - Summer Undergraduate Research Fellowship*

- Developing a Semi-Autonomous Flight Control Software for a Meta Aircraft of Two Fixed Wing Aircraft with a Raspberry Pi and Navio2 Flight Controller - Summer 2019 - Maxwell Cobar
- Mobile Atmospheric Sensing Package - Summer 2017 - Collin Carithers
- Experimental Analysis of Autonomous Meta Aircraft - Summer 2016 - Jake Magnin
- Using Collision as a Passive Control Method for a Micro-Airship Fleet - Summer 2015 - Brandi De-Pineuil
- Orbital Mechanic Simulation of a 1U CubeSat - Summer 2015 - Alicia Ratcliffe

#### *Directed Independent Study*

- Dynamic Systems Simulation and Modeling - Fall 2021
- FASTlab Datalogger - Summer 2021
- Aerial Data Acquisition - Fall 2019
- Spaceflight Mechanics - Fall 2019
- Radio Controlled Aircraft Design - Fall 2017, Fall 2018, Fall 2019, Fall 2021
- Meta Aircraft Electronic Component Design - Fall 2017
- Design of an Autonomous Waypoint Controller for a Quadcopter Using Fortran - Fall 2016
- Experimental Analysis of a Rocket using Commercial Off the Shelf Sensors - Fall 2016
- Autonomous Control of an RC Truck - Fall 2016
- Experimental Flutter Analysis - Spring 2016
- AutoCAD Rendering of a Quadcopter - Spring 2016
- Fixed Wing Autopilot Experimental Test with an Arduino - Spring 2016
- Meta Aircraft Component Design - Spring 2015
- H-Rocket Aerodynamic Coefficient Estimation - Spring 2015
- Machine Vision Control of a Multi-Body CubeSat Simulation - Spring 2015
- Towed Systems Analysis - Fall 2015
- OpenRocket and Boom Six-Degree of Freedom Simulation Comparison - Fall 2015

### Graduate Thesis Chair

1. “Experimental Testing of an Electric Sail Tether Deployer” - Slater Dozier December 2020
2. “Characterizing Vibration Modes of an Electric Sail” - Matthew Simmons - December 2019
3. “Development of a Non-Linear Cooperative Control Law for Multi-Purpose Towed Systems with Disturbance Sensitive Payloads” - Nghia Huynh - Spring 2018 - **Award for Masters Thesis of the Year in the Mathematics, Physical Sciences and Engineering Category**
4. “Simulation and Flight Testing of Connected Autonomous Aircraft” - Brandon Troub - Spring 2018
5. “Utilizing Unmanned Aerial Vehicles for Atmospheric Data Acquisition” - Lisa Schibelius - Spring 2018

### Graduate Thesis Committee Member

1. “Methodology for Building a Framework for Apron Planning, Design, Optimization and Expansion: A study of unique systems and best practices with the aim of unifying system practices at airports” - Adam Wing - TBD
2. “Planetary Surface Habitat as a System” - Bhushan R. Lohar - TBD
3. “The Digital Twin and its Applications” - Jonatan Loaiza Roman - TBD
4. “Measuring Complexity in Manufacturing Systems” - Alan Fitzmorris - TBD
5. “Energy Dynamics of Geomagnetic Storms and Substorms Using the WINDMI Model” - Pavithra Srinivas - December 2019
6. “Zika Virus Transmission Using Two Overlapping Seir Models” - Audrey McGee - Spring 2018
7. “A Time Domain Impedance Probe Using Adaptive Filtering to Model Ionosphere Plasma” - David Clark - Fall 2017
8. “Dynamic Cone Penetrometer Testing of Two Mississippi Barrier Beaches: Cat and West Ship Island” - Jacqueline Wittmann - Summer 2016
9. “Characterization of a Three Dimensional Windfield Using a Boundary Discretization Numerical Technique” - Joshua Marshall - Spring 2016

### Undergraduate Thesis Committees

1. “JAGSAT-1 Flight Software Development and Hardware in the Loop Validation” - William Sherman - **Chair** - Summer 2021
2. “Multi-Objective Design of a Lightweight Towed System” - Alicia Ratcliffe - **Chair** - Fall 2017
3. “Analysis of Simulation for Optimal Control of the 2015 Endurance USA Supermileage Vehicle” - Lisa Schibelius - **Chair** - Spring 2016

### Undergraduate Research Advisor

1. Julia Nelson - FASTsim - (Fall 2021 - Present)
2. Aaron Godfrey - ABEX - (Fall 2021 - Present)
3. Caroline Franklin - ABEX - (Fall 2021 - Present)
4. Wei Min Patrick - ABEX - (Fall 2021 - Present)
5. Drew Russ - JagSAT - (Fall 2019 - Present)
6. Darcey D’Amato - AEGIS - (Spring 2020 - Spring 2021)
7. Joseph Geuho - NOAA - (Fall 2019 - Fall 2020)
8. Ruthie Hill - AEGIS - (Fall 2019 - Spring 2021)
9. Will Sherman - NOAA, AEGIS - (Fall 2019 - Spring 2021)
10. Maxwell Cobar - AEGIS/Meta/UAM - (Summer 2019 - Spring 2021)
11. Kenneth Tucker - UAM (Fall 2018 - Spring 2019)
12. Collin Carithers - MMMASS, Meta, UAM (Summer 2017 - Spring 2019)
13. Rockwell Garrido - USLI - (Fall 2016 - Spring 2017)
14. Matthew Wojociewksi - FASTPilot, USLI - (Fall 2016 - Spring 2017)
15. Marina Swanepoel - FASTPilot - (Fall 2016 - Spring 2017)
16. Bill Brown - USLI - (Fall 2016 - Spring 2017)
17. Michael Wiesneth - USLI - (Fall 2016 - Spring 2017)
18. Beecher Faust - USLI - (Fall 2016 - Spring 2017)
19. Matthew Monkell - JagSAT - Summer 2017

20. Kent Lino - USLI - (Fall 2014 - Spring 2016)
21. Nghia Huynh - USLI, TOMAD - (Fall 2014 - Spring 2016)
22. Andrew Tindell - USLI - (Fall 2014 - Spring 2016)
23. Lisa Schibelius - SAE - (Fall 2014 - Spring 2016)
24. Alicia Ratcliffe - CubeSAT, TOMAD - (Fall 2014 - Spring 2016)
25. Jake Magnin - Meta - (Fall 2015 - Spring 2017)
26. Brandi Depineuil - Blimpage - (Spring 2015 - Spring 2016)

#### **Student Organization Faculty Advisor**

- Rock Climbing Club - 2021-Present
- Disc Golf Club - 2020-Present
- American Institute of Aeronautics and Astronautics - 2015-Present
- University Student Launch Initiative - 2016-2019
- Design, Build, Fly - 2014-2019

#### **Senior Capstone Design Faculty Advisor**

- Design, Build, Fly, 2014-Present
- University Student Launch Initiative, 2015-Present
- Urban Air Taxi - 2018-2020
- Low Speed Windtunnel Design - 2019-2020
- UAV Drone Security - 2018-2019
- Electric Sail Tether Deployer Mechanism - 2017-2019
- CubeSat Attitude Determination and Control System - 2016-2021
- Longboard Performance Sensor, 2015-2016
- Indoor Package Delivery Service, 2014-2015

#### **Substitute Lecturer**

- Undergraduate Dynamics (ME 2203) Fall 2013 and Spring 2014 – 80 Students
- Nonlinear Controls (AE 8803) Fall 2013 – 30 Students
- Introduction to 3D Graphics Animation Using blender – Shortcourse – Summer 2013
- Advanced Dynamics (AE 6210) – Fall 2012 – 30 Students
- Intro to Aerospace Engineering (AE 1350) - Teaching Practicum (AE 8803) – Fall 2012 – 7 Students
- Mechanical Vibrations (AE 6230) – Fall 2011 – 10 Students
- What Engineers Do - March 2010-2013 – 30 Students
- 1-to-1 Tutor – Georgia Tech Success Center – Spg 2010 – 1 Student.

#### **Student Grader**

- Flight Dynamics (AE 3521) – Fall 2012
- Mechanical Vibrations (AE 6230) – Fall 2011

## **External Affiliations and Service**

### **Service Statement**

My service to the department is part of the research, teaching and service work load (60%, 40%, 30%) which includes membership in the curriculum committee where I try and make overall changes to the mechanical engineering curriculum. The largest contribution to this committee is the introduction of a new aerospace engineering track designation. Over the past 5 years I have been on numerous faculty search committees hiring 3 faculty members in the department. At the college level I serve as faculty advisor for the DBF (Design Build Fly), University Student Launch Initiative (USLI), UAM (Urban Air Taxi) Team, and AIAA (American Institute of Aeronautics and Astronautics) student organizations as well as co-advise the CubeSat organization designing and building Jagsat-I. I thoroughly enjoy working with the students on hands on projects. At the University level I help on the Drone committee to instate policies related to operation of

drones on campus. I am also the Vice Chair of the AIAA Professional chapter here in Mobile and oversee all professional chapter events including outreach activities and socials/networking events. I am part of two technical committee (TC) the first being the Atmospheric Flight Mechanics TC and the other being Space Tethers.

### **Professional Society Affiliations**

- Senior Member/Vice Chair of Mobile, American Institute of Aeronautics and Astronautics - Greater Huntsville Professional Section - July 2019 - Present
- Technical Committee Member - Atmospheric Flight Mechanics - Accepted Jan 3rd, 2019
- Technical Committee Support Staff - Space Tethers - Accepted February 5th, 2019
- Member, Tau Beta Pi
- Member, Order of the Engineer
- Member, Academy of Model Aeronautics
- Member, Azalea City Model Aeronautics
- Guidance, Navigation and Control Lead for Gamma Ray Burst Satellite, Alabama Space Grant Consortium

### **AIAA Student Chapter Activities**

- Current Member Count: 25
- Official Chapter Kickoff - November 2015
- Region II Student Conference Attendance - 5 Students 2015, 5 Student Presentations - April 2016, 5 Student Presentation April 2017 - Third Place Masters Division and Third Place Team Division, 20+ students April 2018, 1 student April 2019, 5 students April 2020
- Region II Student Conference Host School April 5-6th 2018
- Volunteer Activities: Paper Airplanes E-Week Open House 2016-2019, JROTC Summer Event 2017
- Design, Build, Fly Faculty Advisor - 2015-2021
- University Student Launch Society Faculty Advisor - 2015-2021
- CubeSat Faculty Co-Advisor for Jagsat-1 - 2017-2021
- Urban Air Taxi Faculty Advisor - 2018 - 2020
- Exploreum Event July 26th, 2019

### **Reviewing Activities for Archival Journals**

- MDPI Sensors, Energies, Aerospace, Drones - 2018-2019
- Atmosphere 2017
- SpringerPlus (2016)
- Journal of Aerospace Engineering (2012, 2013, 2014)
- Journal of Guidance, Control, and Dynamics (2011, 2013)
- Journal of Aircraft (2013)

### **Conferences/Workshops/Presentations**

- AIAA SciTech Conference - San Diego, CA - Jan 2022
- American Control Conference - New Orleans, LA - May 2021
- AIAA SciTech Conference - Nashville, TN - Jan 2021
- AIAA Scitech Forum - Orlando, FL - Jan 2020
- AIAA AVIATION 2019 - June - Dallas, TX
- AIAA SciTech Conference - Jan 2019 - San Diego, CA
- International Society of Atmospheric Research using Remotely Piloted Aircraft (ISARRA) - July 2018, Boulder, CO
- AIAA Atmospheric Flight Mechanics Conference - June 2018, Atlanta, GA
- AIAA Atmospheric Flight Mechanics Conference - June 2017, Denver, CO
- AIAA Region II Student Conference - April 2016, Huntsville, AL - 5 students attended each giving one presentation, April 2017 - 5 students gets 3 presentations
- Attitude Determination and Control System - Auburn CubeSat PDR - 12/5/2015

- Meta Aircraft Flight Dynamics and Controls - University of Tuscaloosa, Tuscaloosa, AL - Fall 2015
- AIAA Atmospheric Flight Mechanics - June 2015, Dallas, TX
- Meta Aircraft Flight Dynamics and Controls - UC Merced, Merced, CA - Spring 2015
- AIAA Atmospheric Flight Mechanics – Aug 2012, Minneapolis, MN - Gave 3 presentations
- Purdue Prospective Faculty Workshop – 2 Day Workshop on “What is Expected of Faculty”, “Mentoring Graduate Students”, “Proposal Writing” and many others

### University of South Alabama Committees

- University and College Computing Committee - Member - 2020 - Present
- College of Engineering Faculty Affairs Committee - **Chair** - 2019 - Present
- Mechanical Curriculum Committee **Chair** - 2016 - Present
- Student Success Collaborative - Student Retention - 2014-2018
- Faculty Search Committee (Multiple) - 2014-Present
- Drone Committee - UAV Policy - 2015 - 2018
- Faculty Social Committee Chair - Fall 2017-2018 - Planned external events for the college and department.

### Other Qualifications/Skills

- **Proficient Programs:** Microsoft Office Suite, LibreOffice, AutoCAD, Solid Edge, Mathematica, Qt Designer, Blender, Gimp, Inkscape, Slic3r, Pronterface, Git, Simulink, Simscape, Simscape Multibody, Kerbal Space Program, OpenRocket
- **Proficient Programming Languages:** MATLAB, C/C++, Fortran, Python, Bash, Unix/Linux, OpenGL, LaTeX, Java, Arduino, CircuitPython
- Part 107 Drone Pilot
- Read/Write/Speak in Fluent Spanish
- U.S. Secret Security Clearance - Summer 2008
- Georgia Tech Surf Club President 2009-2012
- Non-technical Interests: longboarding, surfing, hiking, rafting, guitar, film making, kiting, skimboarding, biking

Citations

Journals [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19]

Conferences [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40]  
[41] [42] [43] [44] [45] [46] [47] [48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62]

Tech Reports [63] [64] [65] [66] [67]

Online Sources [68] [69] [70] [71] [72] [73] [74] [75] [76] [77] [78] [79] [80] [81] [82] [83] [84]

Books [85] [86] [87] [88] [89]