

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. Burnes Jr, Department of Mechanical, Aerospace and Biomedical Engineering Aug 2020 Present

- AIAA, Disc Golf Club, Rock Climbing Club Advisor
- Instructor for: Aircraft and Spacecraft Design, Instrumentation and Experimental Methods
- Project Based Learning Lecturer
- Aerospace Engineering Faculty Coordinator
- Research Projects with Navy, NASA and Alabama Space Grant Initiative

Assistant Professor - Department of Mechanical Engineering Aug 2014 - August 2020

- 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
- Graduated 5 Masters in Mechanical Engineering

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
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Earthly Dynamics Corporation - Atlanta, GA
Research Engineer Sep 2013-Jun 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

Honors, Awards and Licenses

SELF AWARDS

Top Prof Azalea Chapter of Mortar Board Honor Society, November 20th, 2024
Professor of the Year, Tau Beta Pi, Fall 2024
Nominated for Excellence in Teaching, University of South Alabama College of Engineering, Spring 2024
Nominated for Excellence in Teaching, University of South Alabama College of Engineering, Spring 2023
Top Prof Azalea Chapter of Mortar Board Honor Society, Fall 2022
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 Ratcliff, AIAA Student Conference 2018
Third Place Team Category USLI, AIAA Student Conference 2017
Third Place Masters Category Lisa

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.

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Research Activities

Research Statement

My research interests lie 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 control of multi-body systems including aircraft, quadrotors, parafoils, proj Tf 2.52i,J /T1_1 1 Tf ()Tj /T1_0

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- [9] Carlos Montalvo, Matthew Simmons, and Sytske Kimball. "Wind Tunnel Tests of a Pitot-Static Tube Array to Estimate Wind Velocity". In: arXIV (Jan. 2019) url: <https://arxiv.org/abs/1901.10600>.
- [10] Collin Carithers and Carlos Montalvo. "Experimental Control of Two Connected Fixed Wing Aircraft". In: MDPI - Aerospace- Q3 5.4 (11 October 2018) doi: [10.3390/aerospace5040113](https://doi.org/10.3390/aerospace5040113). [10]

arXiv:1901.10600v1 [cs.LG]

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[43] Dylan Calhoun et al. "Electric Sail Space Tether Deployment Mechanism". In: AIAA Region II Student Conference Mobile, AL. Apr. 2018.

[44] Harrison White and Carlos Montalvo. "Meta Aircraft Microprocessor Alternative and Multiplexer Fail-Safe Circuit". In: AIAA Region II Student Conference Mobile, AL. AL. pTf ()Tj XMe

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- [64] 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. 2010. doi: 10.2514/6.2010-8249.
- [65] 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. 2010. doi: 10.2514/6.2010-7510.

Technical Reports

- [66] 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/S0094757119304290>. EMC /LBody <</1.5Tj /T1_1(Simulation)
- [67] Carlos Montalvo and John Rakoczy. Mars Ascent Vehicle Sensitivity Analysis. NASA Marshall Space Flight Center Faculty Fellowship TM, Aug. 2018.
- [68] 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.
- [69] pa.sTj /T1_[r6 O Td (Carlos)Tj /T1_ [(Ep.a 91C1_0m9n()Tj]656iTd [(Cen) O Td (Carl736Td [(Rak)28 (o)-28 ()

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[79] Fox 10News- WALA. NASA's Mars rover to land Thursday; Local professor

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Funded and Closed

1. SherpaP., Ptsios-LutherN., MontalvoC., Design Build Glide - SouthAlabama iCorp - \$5000
9/26/2024-11/18/2024
2. MontalvoC., RichardsonJ., Davis C., University of South Alabama Project Orpheus Alabama
SpaceGrant ConsortiumOutreachProgramsfor SouthAlabama Launch Team, \$5,000Submitted
1/11/2024Accepted1/13/2024ProjectPeriod: 1/1/2024-5/1/2024
3. ReichertM., MontalvoC., CloutierR., Kimball S., TerweyW., LanicciJ., Navy Project), Submitted
to Departmentof Defense- June 23rd,2020 \$3,600,000AcceptedJan 11, 2021- 3 year program-
Ends 9/23/2023
4. MontalvoC., RichardsonJ., Klein D., Davis C., Box T., Ott E., JesseS., Miller Z., Jin A., Denton
B. University of South Alabama Project Helios Alabama SpaceGrant ConsortiumOutreach
Programs,\$5,000Submitted1/11/2023Accepted1/11/2023 ProjectPeriod: 1/1/2023, 1/1/2024
5. ColemanD., OttE., MontalvoC., Autonomous Throttleable Hybrid Rocket Engine USA SURF
Proposal- \$2,000(student)- Submitted2/27/2023Awarded4/19/2023
6. Alabama Space Grant Consortium\$10,000Grant for Alabama Burst Energtics Exploration
Satellite Year 2 - Awarded3/31/2021StartDate 8/14/2021End date 7/31/2022
7. MontalvoC., RichardsonJ., Kendall B., PattersonV., Box T., Davis C., Franklin C., Godfrey A.,
Patrick T., Alabama Space Grant for Accelerometer based Rocket Development (AS-
GARD) Alabama SpaceGrant Consortium (AS BSI ENCL 180) <T1M CID 340> BDC

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21. Carithers, Collin; Montalvo, Carlos; Mobile Atmospheric Sensing Package - Summer SURF Proposal - \$2,000 (Student) - \$500 (equipment) - Submitted 3/9/2017, Awarded 4/14/2017

22. 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

23. Montalvo C., Marshall Faculty Fellowship Program - NASA Marshall Space Flight Center, J(acult)3-1T1_2 1 T

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21. Montalvo C., Kimball S., Vaisala Sensor Analysis Submitted September 17th, 2018 to Chris Vagasky at Vaisala - \$37,089 Rejected 1/8/2018
22. Kimball S. and Montalvo C., 4D Sampling and Modeling of the Earth's Lower Atmosphere Using Small Unmanned Aircraft Systems Subcontract award with Chilson P (Oklahoma University) - \$800,000 Submitted April 12th, 2018 via NSPIRES - 17-EVS3-171-0030 Rejected - 9/26/2018
23. PI: Cloutier, Rob Institute 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
24. 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
25. 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 administrative issues - \$530,171
26. Montalvo C., Electric Sail Dynamic Modeling and CubeSat Tether Deployment Demonstration Mission From ISS - Heliophysics Early Career Investigator Program - NASA - Submitted March 20th, 2018 - Step 1 Proposal - No budget requested - Rejected July 18th, 2018
27. 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
28. 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
29. Green, Montalvo, Yazdani, Bindele, Lewis, Parrish, NSF INCLUDES: Laying the Foundation: Math to STEM for Girls of Color - \$299,997K Submitted - 5/20/2017
30. 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"
31. Experimental Analysis of Autonomous Meta Aircraft - Summer UCUR Proposal (Jake Magnin - \$2,000 (Student) - \$500 (equipment)) 3/20/2016
32. 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
33. Towed Magnetic Anomaly 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
34. Optimal Synthesis of AF SBIR of Calculated Air Release Point (CARP) Navigation

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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 to 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.

To that end, I have students design and build something like an airplane in Aircraft Design or a rocket in Spacecraft Design. 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. A secondary goal is to educate students on many computer tools. 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 teaching interests include control system dynamics as well as space and aircraft mechanics with a strong influence in simulation using 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 the 2018-2019 academic year, I oversaw 3 Capstone Design Projects, a graduate Nonlinear Controls course, Aerodynamics and Dynamic Systems & Controls. In 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.

Over the course of the last 10 years I have taught Vibrations, EG101 (Intro to Engineering), Dynamic Systems & Control, Instrumentation Aircraft Stability & Control, Nonlinear Controls, Aerodynamics, Spacecraft Design, Aircraft Design, numerous Directed Independent Studies and overseen on average 2 capstone projects. That constitute about 12 unique courses that I have taught and about 5 that I developed on my own. In all of these classes, my evaluations have been positive (over 75%). My students describe me as approachable, friendly, tough, and willing to answer any questions no matter how silly 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.

Formal Instruction

- Aircraft Design (AE 468)- Spring 2021- 27 Students, Spring 2022- 24 students, Spring 2023- 33 students, Spring 2024- 52 students
- Spacecraft Design (AE464/ME490)- Fall 2020- 35 students, Fall 2021- 39 students, Fall 2022- 34 students, Summer 2023- 38 students, Fall 2024- 33 students
- Subsystems Analysis and Design of Low Earth Orbit (LEO) Satellites (EG490)- Summer 2020- 7 students, Summer 2021- 5 students
- Insulation for Subsystem (EG490)- Fall 2022- 10 students, Fall 2023- 10 students, Fall 2024- 10 students

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5. "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
6. "Simulation and Flight Testing of Connected Autonomous Aircraft" - Brandon Troub - Spring 2018
7. "Utilizing Unmanned Aerial Vehicles for Atmospheric Data Acquisition" - Lisa Schibelius - Spring 2018

Undergraduate Thesis Committees

1. "Reconfigurable Python Autopilot Software for RC Aircraft" - Kate Doiron - Chair - Spring 2025
2. "New Oyster Farming Gear Type For Bama Bay Oyster Farm" - Felicity Bryant - Chair - Spring 2025
3. "Waypoint Autonomous Controls for RC Car" - Aramis Hofmann - Chair - Spring 2025
4. "JAGSAT-1 Flight Software Development and Hardware in the Loop Validation" - William Sherman - Chair - Summer 2021
5. "Multi-Objective Design of a Lightweight Towed System" - Alicia Ratclife - Chair - Fall 2017
6. "Analysis of Simulation for Optimal Control of the 2015 Endurance USA Supermileage Vehicle" - Lisa Schibelius - Chair - Spring 2016

Graduate Thesis of Thesis

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20. Matthew Wojciewski FASTPilot, USLI - (Fall 2016 Spring 2017)
21. Marina Swanepoel FASTPilot - (Fall 2016 Spring 2017)
22. Bill

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External Afliations and Service

Service Statement

My service to the departments part of the research, teaching and service workload (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 Learning Outcomes 3.738 - (TJ /T1_1 1 5 O T2 1 Tf ()Tj /T1_O 1 Tf 1.621 O Td (the1_1

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Conferences/Workshops/Presentations

- AIAA SciTechOrlando, FL - Jan 2025 Session Chair
- AIAA SciTechOrlando, FL - Jan 2024 Session Chair
- AIAA AVIATION Conference San Diego, CA - Jun 2023
- USA Conference on Teaching and Learning - Mobile, AL - May 2023
- AIAA SciTechConference San Diego, CA - Jan 2022
- AmericanControlConference New Orleans, LA - May 2021
- AIAA SciTechConference Nashville, TN - Jan 2021
- AIAA Scitech X - Boston, MA - Jan 2021

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- ^ Read/Write/Speakin Fluent Spanish
- ^ U.S. SecretSecurityClearance- Summer2008
- ^ GeorgiaTech SurfClub President2009-2012
- ^ Non-technicalInterestslongboardingsurfng, hiking, rafting,guitar,flm making, kiting, skimboard-
ing, biking

