Anthony M. Comer

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Education

Auburn University, Auburn, AL, USA **May 2020**
Bachelor of Science (B.S.), Aerospace Engineering

Auburn University, Auburn, AL, USA **May 2023**
Master of Science (M.S.), Aerospace Engineering

Auburn University, Auburn, AL, USA **Dec 2024**
Doctor of Philosophy (Ph.D.), Aerospace Engineering
A Generalized Flight Control Architecture for Transitioning Flight Vehicles with Flight Test Validation
Advisor: Dr. Imon Chakraborty

Experience

Assistant Professor:
Simulation to Flight Applied Research Laboratory (S2FAR) (01/01/25 – current)
Mechanical, Aerospace, and Biomedical Engineering Department, University of South Alabama

*** S2FAR Laboratory Director**
Performing research in the areas of: flight dynamics, flight mechanics and control, flight simulation, flight testing, rotorcraft dynamics and control, unmanned aerial systems (UAS), and electric vertical takeoff and landing (eVTOL) flight mechanics.

NASA Ames Interim Research Associate:
Aeromechanics Branch (08/26/24 – current)
NASA Ames Research Center (ARC), Mountain View, CA

*** Multi-fidelity ML-based Surrogate Models for Terrestrial and Planetary Aerial Vehicles**
Integrating flight dynamics, stability, and control considerations into a machine learning-based optimization platform for aerial vehicles aimed at martian flight. Major responsibilities include:

- Development of a stability and control assessment tool for rapid sizing optimization purposes
- Design and simulation of a full-envelope flight control system for a bi-plane tail-sitter VTOL vehicle
- Design and analysis of flight control systems for proposed martian flight vehicles
- Integration of MATLAB-based optimization processes into a Python environment

NASA Office of STEM Engagement Intern:
Flight Dynamics Branch (D317) (06/03/24 – 08/09/24)
NASA Langley Research Center (LaRC), Hampton, VA

*** Subscale Electric Aircraft for ResearCH (SEARCH)**
Developing a flight simulation, control system, and hardware development pipeline for rapid control law testing on inexpensive, low-risk subscale aircraft configurations. Major responsibilities include:

- Development of a flight control system for SEARCH with the intent for extension to VTOL operations
- Development of a flight simulation pipeline for rapid development of aerospace flight systems

- Piloted simulation testing with representative flight scenarios to ensure operational requirements
- Hardware model development and integration to deploy the controller to a Pixhawk flight controller
- Flight testing the developed control system on SEARCH and IMPACT vehicles on site (CERTAIN range)

Undergraduate/Graduate Research:

Vehicle Systems, Dynamics, and Design Laboratory (VSDDL) (01/13/19 – 12/14/24)
Department of Aerospace Engineering, Auburn University

*** VSDDL Lab Manager** (01/13/23 – 12/14/24)

Managing a team of graduate students through ongoing lab projects along with managing all lab purchases, including management of lab finances. Major responsibilities include:

- Coordinating graduate students for lab activities and tasks
- Progress check-ups and meetings with graduate students to ensure and relay work progress
- Communication with the lab director as required to maintain progress on specific activities
- Detailed cost accounting and cost projections for lab purchases

*** VTOL Subscale Model Flight Test Lead** (02/01/22 – 12/14/24)

Leading research and development aimed at extending VSDDL capabilities beyond simulation and into subscale modeling and hardware validation. Responsibilities include:

- Integration of flight control systems with Pixhawk flight controllers using the PX4 architecture
- PX4 firmware modification for flight control system monitoring and tuning with MATLAB/Simulink
- Design and manufacturing of various subscale models with extensive use of additive manufacturing
- Simulation, flight testing, and piloting of subscale vehicle models during flight test campaigns

*** VSDDL Flight Simulator Lead** (01/13/19 – 12/14/24)

Leading a team of graduate and undergraduate students in the design, construction, and improvements of flight simulators for research at VSDDL. Major responsibilities include:

- CAD design of simulator screen frame, projector gantry, instrument panel, and cockpit (SolidWorks)
- Construction and assembly lead for simulator screen, gantry, panel, and cockpit framework
- Finalizing computer specs, building computers, and interfacing with Auburn IT for final configuration
- Warp and blend calibration of simulator projectors, imparting training to other students
- Detailed cost accounting and cost projections for simulator construction, setup, and upgrades
- Modeling, simulation, and deployment of nonlinear vehicle models with varying inceptor layouts
- Training other lab members on simulator deployment and operations

*** VTOL Control Law Development and Optimization** (09/01/21 – 12/14/24)

Researching the development, optimization, and simulation of full-envelope flight control systems aimed at simplified vehicle operations of vertical takeoff and landing vehicles. Responsibilities include:

- Development of novel flight control system architectures
- Linearization and flight dynamics analysis of nonlinear flight vehicles
- Simulation and testing of flight control systems subjected to representative flight scenarios using MATLAB/Simulink-based simulation models
- Development of optimization algorithms aimed at optimizing novel control system parameters

*** VSDDL Flight Simulation Controls and Electronics Development** (05/01/21 – 12/15/23)

Conduct research and development activities aimed at developing force-feedback flight inceptors for piloted flight simulations. Responsibilities include:

- Development of novel control inceptor schemes using microcontrollers for piloted simulations
- Learning and implementing Arduino IDE software on physical systems, interfacing with simulations
- Design and testing of force feedback controllers for simulator inceptors used during simulation

*** General Aviation Aircraft Performance Modeling and Safety Research** (07/19/19 – 10/01/22)
In collaboration with Auburn's Aviation Department, conduct research aimed at modeling performance characteristics of General Aviation (GA) aircraft for safety research. Responsibilities to date include:
- Preparation of flight testing cards for data logging in a Cessna 172SP Skyhawk
- Post-processing of de-identified flight data records for statistical analysis of flight operations
- Developing a feasible and cost-effective solution for measuring flight control positions

Instructional and Leadership Roles

*** Course Instructor – ME 135** (01/13/25 – current)
Department of Mechanical Engineering, University of South Alabama
Teaching a 3 credit-hour undergraduate course on engineering graphics and communication, including computer-aided design and dimensioned drawing techniques using SolidEdge CAD software.

*** Course Instructor – AERO 3970** (08/21/23 – 05/02/24)
Department of Aerospace Engineering, Auburn University
Teaching a 1 credit-hour undergraduate course on MATLAB/Simulink with a focus on aerospace engineering applications, including dynamic system modeling and controller design techniques.

*** Graduate Teaching Assistant** (08/25/20 – 05/01/21)
Department of Aerospace Engineering, Auburn University
Assisted the professor with course material, grading, and student aid for Auburn University's capstone aerospace engineering aircraft design course (AERO 4710-4720).

*** Supplemental Instruction Leader (SI)** (01/09/18 – 05/01/20)
Office of Academic Support, Auburn University
Introducing active learning to students working through higher math at the university with the intent of increasing the retention rate in courses infamous for high drop rates.

*** Plainsman's Prep Leader (PPL)** (07/31/19 – 08/13/19)
Office of Academic Support, Auburn University
In collaboration with Auburn's Mathematics Department, assisted in leading a 10-day mathematics camp intended to help students increase their mathematics course placement.

*** Engineering Tutor** (04/23/18 – 07/29/19)
Engineering Student Services, Auburn University
Assisting students with engineering-specific courses ranging from Calculus I to Linear Differential Equations and Mechanics of Materials.

Skills

Engineering/Research Software
MATLAB/Simulink, QGroundControl, PX4, SolidWorks, PrusaSlicer, Arduino, CONDUIT, CIFER, OpenVSP
Other Software
Adobe Photoshop, Sony Vegas Pro, Microsoft Office Suite, LaTeX, Pixelwix, Pixelwarp Evo, Blender

Engineering Skills

Aerospace engineering, flight simulation, flight systems, control system design, flight dynamics and modeling, flight hardware integration, flight testing, technical writing/written communication and oral communication/presentation experience, team management and interpersonal skills, 3D printing, flight test planning, attention to detail, technical competence

Achievements and Associations

- NASA OSTEM Intern – D317 (Summer 2024 – current)
- AIAA reviewer, reading and evaluating of papers in an honest manner (current)
- Team lead of the 2024 VFS DBVF competition Auburn team (Spring 2024)
- Gavin Research Fellowship Recipient (Fall 2020 – Spring 2024)
- FAA Part 107 remote pilot certified (May 2022 – current)
- Team lead of the 2023 VFS DBVF competition 1st place Auburn team (Spring 2023)
- Undergraduate/Graduate Research: VSDDL (Jan 2019-present)
- Member of Auburn University Rocketry Association (Fall 2017-Spring 2020)
- Achieved Dean's List (Fall 2018 Semester, Spring 2019 Semester)
- Ware Gaston Family Endowed Scholarship Recipient (2019-2020 Academic Year)
- Member of AIAA & VFS (current)
- Ranked Eagle Scout in Boy Scouts of America

Journal Publications

1. Comer, A and Chakraborty, I. ***"Flight Test Validation of an Explicit Model Following Trajectory Control System for Tilt-Wing VTOL Aircraft,"*** *in preparation for submission to Journal of the American Helicopter Society, 2025*
2. Comer, A and Chakraborty, I. ***"An Explicit Model Following Trajectory Control System for Multi-Rotor, VTOL, and Fixed-Wing Configurations,"*** *in preparation for submission to the CEAS Aeronautical Journal, 2025*
3. Comer, A and Chakraborty, I. ***"Design, Optimization, and Flight Testing of a Trajectory Control System for Lift-Plus-Cruise VTOL Aircraft,"*** AIAA Journal of Guidance, Control and Dynamics, submitted for review (Nov 12, 2024)
4. Chakraborty, I. and Comer, A. ***"Explicit Model Following Trajectory Control System for a Transitioning Urban Air Mobility Aircraft,"*** Sage Part G: Journal of Aerospace Engineering, undergoing revision (revisions sent July, 2024)
5. Comer, A. and Chakraborty, I., ***"Optimizing Explicit Model-Following Trajectory Control Laws for a Vectored Thrust Configuration,"*** Journal of the American Helicopter Society, 10.4050/JAHS.70.012007, (Published Online: Dec 16, 2024)
6. Comer, A. and Chakraborty, I., ***"Total Energy-Based Control Architecture Design and Optimization for a Lift-Plus-Cruise Aircraft,"*** AIAA Journal of Guidance, Control and Dynamics, 10.2514/1.G007605 (Published Online: Mar 31, 2024)
7. Comer, A. and Chakraborty, I., ***"Full Envelope Flight Control System Design and Optimization for a Tilt-Wing Aircraft,"*** Journal of the American Helicopter Society, 10.4050/JAHS.69.032003 (Published Online: Mar 13, 2024)

8. Chakraborty, I., Comer, A., Bhandari, R., Putra, S., Mishra, A., Schaller, R., Sizoo, D., McGuire, R., ***"Piloted Simulation Based Assessment of Simplified Vehicle Operations for Urban Air Mobility,"*** AIAA Journal of Aerospace Information Systems, 10.2514/1.I011249 (Published Online: Jan 17, 2024)

Peer-Reviewed Reports

1. Comer, A., Simmons, B., Asper, G., "***Design, Simulation, and Flight Testing of a Multi-Purpose VTOL Flight Control System,***" NASA Technical Memorandum (under review)

Conference Publications

1. Chakraborty, I. and Comer, A., ***"A Middle-Loop Control System Enabling Simplified Vehicle Operations and Tactical Maneuver for Transitioning VTOL Aircraft,"*** VFS 81 Forum, Virginia Beach, VA, May 20-22, 2025 (to appear)
2. Comer, A., Mishra A., and Chakraborty, I., ***"Extension of a Full Envelope Flight Control System to CTOL/STOL Capabalities on a Urban Air Mobility Tilt-Rotor,"*** AIAA SCITECH 2025 Forum, Orlando, FL, Jan 6-10, 2025, AIAA-2025-0658
3. Mishra A., Comer, A., and Chakraborty, I., ***"Integrating Flight Dynamics Constraints into the Conceptual Design of a Vectored Thrust UAM Vehicle,"*** AIAA SCITECH 2025 Forum, Orlando, FL, Jan 6-10, 2025, AIAA-2025-2349
4. Comer, A., Chakraborty, I., Putra, S.H., Bhandari, R., Kunwar, B., and Davis, B., ***"Design, Optimization, and Flight Testing of a Trajectory Control System for Lift-Plus-Cruise VTOL Aircraft,"*** AIAA AVIATION 2024 Forum, Las Vegas, NV, July 29 - August 2, 2024, AIAA-2024-4563
5. Comer, A. and Chakraborty, I., ***"Explicit Model Following Trajectory Control System for Multiple Vertical Takeoff and Landing Configurations,"*** 34th Congress of the International Council of the Aeronautical Sciences, Florence, Italy, Sep 9-13, 2024
6. Comer, A., Chakraborty, I., Yevhenii, K., Taheri, E., Putra, S.H., Bhandari, R., and Kunwar, B., ***"Flight Testing of Explicit Model-Following Trajectory Control System for Lift-Plus-Cruise and Tilt-Wing Configurations,"*** VFS 80 Forum, Montreal, Canada, May 7-9, 2024, DOI: 10.4050/F-0080-2024-1306
7. Chakraborty, I. and Comer, A., ***"Optimizing Explicit Model-Following Trajectory Control Laws for a Vectored Thrust Configuration,"*** VFS 80 Forum, Montreal, Canada, May 7-9, 2024, DOI: 10.4050/F-0080-2024-1277
8. Comer, A., Bhandari, R., Putra, Stefanus H., and Chakraborty, I., ***"Design, Flight Control Law Development, and Flight Testing of a Subscale Lift-Plus-Cruise Aircraft,"*** AIAA SCITECH 2024 Forum, Orlando, FL, Jan 8-12, 2024, AIAA-2024-2644
9. Comer, A., Mishra, A.A., and Chakraborty, I., ***"Total Energy Flight Control Architecture Optimization for a Tilt-Wing Aircraft,"*** AIAA AVIATION 2023 Forum, San Diego, CA, June 12-16, 2023, AIAA-2023-4510
10. Comer, A. and Chakraborty, I., ***"Flight Control System Architecture for Urban Air Mobility Simplified Vehicle Operations,"*** AIAA SCITECH 2023 Forum, National Harbor, MD, Jan 23-27, 2023, AIAA-2023-0399
11. Chakraborty, I. Comer, A., Bhandari, R., Putra, S., Mishra, A., Schaller, R., Sizoo, D., McGuire, R., ***"Flight Simulation Based Assessment of Simplified Vehicle Operations for Urban Air Mobility,"*** AIAA SCITECH 2023 Forum, National Harbor, MD, Jan 23-27, 2023, AIAA-2023-0400

12. Chakraborty, I., Mishra, A.A., Comer, A., and Leonard, C., ***"Total Energy Based Flight Control System Design for a Lift-Plus-Cruise Urban Air Mobility Concept,"*** AIAA SCITECH 2021 Forum (virtual event), Jan 11-15 and 19-21, 2021, AIAA-2021-1899

13. Chakraborty, I., Comer, A., Mishra, A.A., Dewey, J., and Leonard, C. ***"A Reconfigurable Human-in-the-Loop Flight Simulator Framework for Future Flight Vehicle Concepts,"*** AIAA AVIATION 2020 Forum, Reno, NV, June 15-19, 2020, AIAA-2020-3190

14. Comer, A. and Chakraborty, I., ***"Data-Driven General Aviation Aircraft Performance Modeling and Safety Research,"*** AIAA AVIATION 2020 Forum, Reno, NV, June 15-19, 2020, AIAA-2020-3097

15. Chakraborty, I. and Comer, A., ***"A Simulation-Based Aircraft-Centric Assessment of the Circular/Endless Runway Concept,"*** AIAA SCITECH 2020 Forum, Orlando, FL, January 6-10, 2020, AIAA-2020-1401

16. Chakraborty, I., Ahuja, V., Comer, A., and Mulekar, O., ***"Development of a Modeling, Flight Simulation, and Control Analysis Capability for Novel Vehicle Configurations,"*** AIAA AVIATION 2019 Forum, Dallas, TX, June 17-21, 2019, AIAA-2019-3112