

Umberto SAETTI

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Nationality: Italian, **Immigration Status:** Permanent US Resident / Green Card Holder

EDUCATION

Georgia Institute of Technology

Atlanta, GA

- **Postdoctoral Fellow** in School of Aerospace Engineering
Advisor: Jon Rogers

August 2019 – May 2021

Pennsylvania State University

University Park, PA

- **Ph.D.** Aerospace Engineering (*Flight Dynamics and Controls*)
Minor: Computational Science

August 2016 – August 2019

Dissertation Title: “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”
Committee: Joe Horn (Chair), Ed Smith, J.V.R. Prasad, Constantino Lagoa, Stephanie Stockar

- **M.S.** Electrical Engineering (*Control Systems*)

August 2017 – August 2019

Thesis Title: “*Dynamic Inversion and Explicit Model Following Flight Control Laws for Quadrotors*”
Advisor: Constantino Lagoa

- **M.S.** Aerospace Engineering (*Flight Dynamics and Control*)

August 2014 – August 2016

Thesis Title: “*Rotorcraft Simulations with Coupled Flight Dynamics, Free Wake, and Acoustics*”
Advisors: Joe Horn (Advisor), Kenneth Brentner (Co-Advisor)

Polytechnic University of Milan

Milan, Italy

- **B.S.** Aerospace Engineering
Advisor: Marco Borri

September 2010 – July 2014

RESEARCH EXPERIENCE

University of Maryland

College Park, MD

Assistant Professor, Department of Aerospace Engineering

August 2022- Present

Auburn University

Auburn, AL

Assistant Professor, Department of Aerospace Engineering

June 2021- July 2022

Georgia Tech School of Aerospace Engineering

Atlanta, GA

Postdoctoral Fellow, Advisors: Jon Rogers

August 2019 – May 2021

- Project Title: “***Probabilistic Methods for Advanced Regime Recognition Verification and Validation***”
 - Developed a methodology to perform rotorcraft regime recognition based on motion primitives
 - Applied the methodology to SH-60 Seahawk flight-test data
 - Reported completed tasks to NAVAIR
- Project Title: “***Explicit Uncertainty Quantification for Probabilistic Handling Qualities Assessment***”
 - Extended the Koopman operator to propagate model parametric uncertainty to handling qualities
 - Applied the methodology to small-scale UAS and full-scale rotorcraft
- Project Title: “***Harmonic Balance Trim Solution Method for Periodically-Forced Flight Vehicles***”
 - Developed a numerical scheme for determining the solution of nonlinear time-periodic systems
 - Applied the methodology to study the stability of flapping-wing MAVs
 - Used the method to assess the vibratory loads on flapping-tail concept airplanes and helicopters

- Project Title: “*Flare Control Law using Tau Theory and Dynamic Inversion for Autonomous Helicopter Autorotation*”
 - Developed advanced trajectory generation and flight control laws for autonomous autorotation
 - Performed research as part of the Georgia Tech Vertical Lift Research Center of Excellence (VLRCOE)

NASA Ames, U.S. Army Aviation Development Directorate (ADD)

Moffett Field, CA

Visiting Scholar, Advisors: Mark Tischler, Tom Berger

December 2018

- Project Title: “*Identification of Linear Time-Periodic Systems from Rotorcraft Flight Test Data*”
 - Developed a methodology to identify linear time-periodic systems from rotorcraft flight test data
 - Implemented the methodology in CIFER, extending software capabilities
 - Successfully applied the methodology to RASCAL JUH-60 flight test data

Penn State Vertical Lift Research Center of Excellence (VLRCOE)

University Park, PA

Ph.D. Candidate, Graduate Research Assistant

August 2016 – August 2019

- Project Title: “*Load Alleviation Control Design Using High Order Dynamic Models*”
 - Developed load alleviation flight control laws for conventional and compound rotorcraft
 - Integrated flight control laws in real-time piloted simulations
 - Assessed the impact of load alleviation control on rotorcraft handling qualities
 - Reported completed tasks to the U.S. Army ADD
- Project Title: “*Design of Dynamic Inversion and Explicit Model Following Control Laws for Quadrotor Inner and Outer Loops*”
 - Performed system identification and advanced flight control design on quadrotor UAS Reported completed tasks to the U.S. Army ADD
- Project Title: “*Performance and Design Optimization of the F-Helix eVTOL Concept*”
 - Performed basic configuration analysis and optimization
 - Studied the aeromechanical stability of the rotor system Developed a mathematical model of the aircraft in MATLAB/Simulink
 - Synthesized and integrated a partial authority Stability and Control Augmentation System (SCAS)

Penn State Vertical Lift Research Center of Excellence (VLRCOE)

University Park, PA

M.S. Candidate, Graduate Research Assistant

January 2015 – August 2016

- Project Title: “*Rotorcraft Noise Abatement Operating Conditions Modeling*”
 - Advanced Dynamic Inversion control laws for a Bell 430
 - Developed helicopter simulations with coupled flight dynamics, free wake, and acoustics
 - Designed a noise abatement tool for customers’ use
 - Reported results to the Federal Aviation Administration (FAA) through the Aviation Sustainability Center of Excellence (ASCENT)

Milan Polytechnic Skyward Experimental Rocketry

Milan, Italy

Flight Dynamics & Control Lead

April 2012 – July 2014

- Project Title: “*Modeling and Simulation of the Rocksanne I-X Missile*”
 - Determined the stability and control derivatives (Missile DATCOM)
 - Developed 6 DoF nonlinear simulations for stability analysis
 - Incorporated Monte Carlo Dispersions for trajectory and landing point prediction analysis
 - Launched the first successful university designed Italian rocket in November, 2013

INDUSTRY EXPERIENCE

MathWorks, Inc.

Software Engineer Intern

Milan, Italy

April 2013 – July 2014

- Project Title: “*Aeronautical Systems - Guidance and Control*”
 - Developed and lectured a project-based short course in collaboration with Polytechnic University of Milan and Skyward Experimental Rocketry
 - Developed software to interface MATLAB/Simulink with Arduino
 - Integrated simple flight control laws on a small-scale airship
 - Managed data acquisition from sensors to increase product capability

AWARDS

- **Office of Naval Research (ONR) Young Investigator Program (YIP) Award**, Jan 2022.
- **Barnes McCormick Memorial Scholarship**, Vertical Flight Foundation, May 2019.
Awarded for outstanding research as a Ph.D. Candidate in the vertical flight field.

PUBLICATIONS (Manuscript under Review *, Manuscript in Preparation **)

Journal Papers

1. *Saetti U., Bugday B., Horn J. F., and Brentner, K. S., “*Linearized Models of the Coupled Flight Dynamics and Acoustics for Real-Time Noise Prediction.*” (under review, Journal of the American Helicopter Society)
2. *Saetti U., “*Real-Time Simulation of a Shipborne Rotor via Linearized State-Space Free-Vortex Wake Models.*” (under review, Journal of Aircraft)
3. Saetti U., and Horn J. F., “*Implementation and Linearization of State-Space Free-Vortex Wake Models for Rotary- and Flapping-Wing Vehicles.*”, Journal of the American Helicopter Society, Article in Advance, DOI: 10.4050/JAHS.68.042004.
4. Saetti U., and Horn J. F., “*Linear Time-Invariant Approximations of Nonlinear Time-Periodic Systems.*” Journal of the American Helicopter Society, Vol. 68, No. 3, Oct 2022. DOI: <https://doi.org/10.4050/JAHS.68.012006>.
5. Saetti U., and Rogers, J.D., “*Harmonic Decomposition Models of Flapping-Wing Flight for Stability Analysis and Control Design.*” Journal of Guidance, Control, and Dynamics, Article in Advance, Mar 2022. DOI: 10.2514/1.G006447.
6. Saetti U., Enciu, J., and Horn J.F., “*Flight Dynamics and Control of an eVTOL Concept Aircraft with a Propeller-Driven Rotor.*” Journal of the American Helicopter Society, Article in Advance, Mar 2022. DOI: 10.4050/JAHS.67.032012.
7. Saetti U., Lovera M., “*Time-Periodic and High-Order Time-Invariant Linearized Models of Rotorcraft: A Survey.*” Journal of the American Helicopter Society, Vol. 67, No. 1, Jan 2022, DOI: 10.4050/JAHS.67.012008.
8. Musso D., Saetti U., and Rogers J. D., “*Probabilistic Fatigue Damage Estimation for Rotorcraft Life-Limited Components.*” Journal of Aircraft, Article in Advance, Sep 2021. DOI: 10.2514/1.C036561.
9. Saetti U., Rogers, J.D., “*Motion Primitive Approach to Rotorcraft Regime Recognition.*” Journal of the American Helicopter Society, Vol. 66, No. 4, Oct 2021, DOI: 10.4050/JAHS.66.042006.
10. Saetti U., Rogers, J.D., “*Revisited Harmonic Balance Trim Solution Method for Periodically-Forced Aerospace Vehicles.*” Journal of Guidance, Control, and Dynamics, Vol. 44, No. 5, May 2021, DOI: 10.2514/1.G004406.
11. Saetti U., Horn J.F., Berger T., and Tischler M. B., “*Handling-Qualities Perspective on Load Alleviation Control.*” Journal of Guidance, Control, and Dynamics, Vol. 43, No. 10, Oct 2020, pp. 1792-1804, DOI: 10.2514/1.G004965.

12. **Saetti U.**, and Horn J.F. “*Load Alleviation Flight Control Design Using High Order Dynamic Models*,” Journal of the American Helicopter Society, Vol. 65, No. 3, May 2020, DOI: 10.4050/JAHS.65.032009.
13. **Saetti U.**, Horn J.F., Lakhmani, S., Lagoa C., and Berger, T. “*Dynamic Inversion and Explicit Model Following Flight Control Laws for Quadrotor UAS*,” Journal of the American Helicopter Society, Vol. 65, No. 3, May 2020, DOI: 10.4050/JAHS.65.032006.
14. **Saetti U.**, Horn J.F., Berger T., Lopez M., and Tischler M. B., “*Identification of Linear Time-Periodic Systems from Rotorcraft Flight Test Data*,” Journal of Guidance, Control, and Dynamics, Vol. 42, No. 10, Jun 2019, pp. 2288-2296, DOI: 10.2514/1.G004406.

Conference Papers

1. Morcos M. T., **Saetti U.**, Godfroy-Cooper M., “*Crossover Model for Full-Body Haptics and Spatial Audio Cueing*,” 79th Annual Forum of the Vertical Flight Society, West Palm Beach, FL, May 16-18, 2023.
2. Morcos M. T., **Saetti U.**, Godfroy-Cooper M., Bachelder E. N., Miller J. D., “*Crossover Model for Full-Body Haptics and Spatial Audio Cueing*,” 79th Annual Forum of the Vertical Flight Society, West Palm Beach, FL, May 16-18, 2023.
3. **Saetti U.**, Amato F. D., and Belluomini L., “*Development and Validation of a Generic Tiltrotor Simulation Model for Flight Dynamics and Control, Aeromechanics, and Aeroacoustics Analyses*,” 79th Annual Forum of the Vertical Flight Society, West Palm Beach, FL, May 16-18, 2023.
4. Bugday B., and **Saetti U.**, “*Dynamic Systems Approach to Rotorcraft Noise Abatement*,” 79th Annual Forum of the Vertical Flight Society, West Palm Beach, FL, May 16-18, 2023.
5. **Saetti U.**, Manjhi A. K., and Horn J. F., “*Implementation and Linearization of a State-Space Free Wake Model with a Near-Wake Vortex Lattice Model*,” 79th Annual Forum of the Vertical Flight Society, West Palm Beach, FL, May 16-18, 2023.
6. **Saetti U.**, and Sharan, N., “*Harmonic Decomposition Models of Periodically-Forced Fluid Flows*,” AIAA Aviation Forum, Chicago, IL, Jun 27 - Jul 1, 2022.
7. **Saetti U.**, “*Linearization of a Rotor Simulation with a State-Space Free-Vortex Wake Model in a Shipboard Environment*,” AIAA Aviation Forum, Chicago, IL, Jun 27 - Jul 1, 2022.
8. **Saetti U.**, and Horn J. F., “*Implementation and Linearization of a State-Space Free-Vortex Wake Model for Flapping-Wing Flight*,” 78th Annual Forum of the Vertical Flight Society, Fort Worth, TX, May 10-12, 2022.
9. **Saetti U.**, and Horn J. F., “*Implementation and Linearization of a Rotor Simulation with a State-Space Free-Vortex Wake Model*,” 78th Annual Forum of the Vertical Flight Society, Fort Worth, TX, May 10-12, 2022.
10. Hayajnh, M. A., **Saetti U.**, and Prasad, J. V. R., “*Identification of High-Order Linear Time-Invariant Models from Periodic Nonlinear System Responses*,” Transformative Vertical Flight 2022 Meeting, San Jose, CA, Jan 25-27, 2022.
11. **Saetti U.**, and Horn J. F., “*Flight Simulation and Control Using the Julia Language*,” AIAA SciTech Forum, San Diego, CA, Jan 3-7, 2022.
12. **Saetti U.**, and Rogers J. D., “*Dynamic-Inversion Based Flare Control Law for Autonomous Helicopter Autorotation*,” AIAA SciTech Forum, San Diego, CA, Jan 3-7, 2022.
13. Horn J. F., Scaramal M., and **Saetti U.**, “*Load Alleviation Control using Dynamic Inversion with Direct Load Feedback*,” Vertical Flight Society 77th Annual Forum, Virtual, May 10-14, 2021.
14. **Saetti U.**, Rogers J. D., “*Linear Time-Invariant Models of the Dynamics of Flapping-Wing Flight*,” Vertical Flight Society 77th Annual Forum, Virtual, May 10-14, 2021.
15. **Saetti U.**, Horn J. F., and Brentner, K. S., “*High-Order Linear Time-Invariant Models of Rotorcraft Flight Dynamics, Vibrations, and Acoustics*,” Vertical Flight Society 77th Annual Forum, Virtual, May 10-14, 2021.
16. **Saetti U.**, and Rogers J. D., “*A Motion Primitive Prospective on Rotorcraft Regime Recognition*,” Vertical Flight Society 76th Annual Forum, Virginia Beach, VA, Oct 6-8, 2020.
17. **Saetti U.**, and Rogers J. D., “*Explicit Uncertainty Quantification for Probabilistic Handling Qualities*

- Assessment*,” Vertical Flight Society 76th Annual Forum, Virginia Beach, VA, Oct 6-8, 2020.
18. **Saetti U.**, Enciu, J. and Horn J.F., “*Flight Dynamics and Control of an eVTOL with a Propeller-Driven Rotor*,” Vertical Flight Society 76th Annual Forum, Virginia Beach, VA, Oct 6-8, 2020.
 19. **Saetti U.**, and Rogers J. D., “*A probabilistic Approach to Pilot/Vehicle System Performance and Perceived Rotorcraft Handling Qualities*,” Vertical Flight Society Rotorcraft Handling Qualities Technical Meeting, Huntsville, AL, Feb 18-19, 2020.
 20. **Saetti U.**, Horn J. F., Berger T., and Tischler M. B., “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*,” Vertical Flight Society 75th Annual Forum, Philadelphia, PA, May 13-16, 2019.
 21. **Saetti U.**, Enciu, J., and Horn J.F., “*Performance and Design Optimization of the F-Helix eVTOL Concept*,” Vertical Flight Society 75th Annual Forum, Philadelphia, PA, May 13-16, 2019.
 22. **Saetti U.**, Horn J. F., Lakhmani, S., Lagoa C., and Berger, T., “*Design of Dynamic Inversion and Explicit Model Following Control Laws for Quadrotor Inner and Outer Loops*,” American Helicopter Society 74th Annual Forum, Phoenix, AZ, May 14-17, 2018.
 23. **Saetti U.**, and Horn J. F., “*Load Alleviation Control Design Using Harmonic Decomposition Models, Rotor State Feedback, and Redundant Control Effectors*,” American Helicopter Society 74th Annual Forum, Phoenix, AZ, May 14-17, 2018.
 24. **Saetti U.**, and Horn J. F., “*Use of Harmonic Decomposition Models in Rotorcraft Control Design with Alleviation of Vibratory Loads*,” 43rd European Rotorcraft Forum, Milan, Italy, Sep 12-15, 2017.
 25. **Saetti U.**, Villafana W., Wachspress D., Brentner K. S., and Horn J. F. “*Rotorcraft Simulations with Coupled Flight Dynamics, Free Wake, and Acoustics*,” American Helicopter Society 72nd Annual Forum, West Palm Beach, FL, May 16-19, 2016.
 26. Li Y., **Saetti U.**, Sharma K., Wachspress D., Horn J. F., and Brentner K. S., “*Tools for Development and Analysis of Rotorcraft Noise Abatement*,” American Helicopter Society Sustainability 2015, Montreal, Canada, Sep 22-24, 2015.

RESEARCH FUNDING

Awarded (total w/o cost share: \$ 1.11M; w/ cost share: \$ 1.41M)

1. PI: J. F. Horn
Co-PI: **U. Saetti**
Project Title: “*Performance and Design Optimization of the F-Helix eVTOL Concept*”
Sponsor: Vinati S.R.L.
Budget: \$ 63,000
Dates: 11/1/2018 – 10/31/2019
2. PI: **U. Saetti**
Co-PIs: J. F. Horn, K. S. Brentner
Project Title: “*State-Variable Implementation and Linearization of Simulations with Multi-Disciplinary Aeromechanics*”
Source of Support: Pennsylvania State University
Prime Sponsor: Department of the Army
Program: Vertical Lift Research Center of Excellence (VLRCOE)
Budget: \$ 9,890
Dates: 01/2022 – 07/2026
Status: Awarded
3. PI: **U. Saetti**
Co-PIs: J. F. Horn, K. S. Brentner

Project Title: “*State-Variable Implementation and Linearization of Simulations with Multi-Disciplinary Aeromechanics*”

Source of Support: Department of the Army

Program: Vertical Lift Research Center of Excellence (VLRCOE)

Budget: \$ 461,143 (plus UMD Cost Share \$299,743)

Dates: 10/2022 – 9/2026

Status: Awarded

4. PI: **U. Saetti**

Project Title: “*Linearized High-Fidelity Aeromechanics for Extended Reality Simulation and Control of Shipboard Interactions*”

Source of Support: Office of Naval Research (ONR)

Program: Young Investigators Program (YIP)

Budget: \$ 510,000

Dates: 04/2022 – 04/2025

Status: Awarded

5. PI: **U. Saetti**

Co-PI: R. Celi

Project Title: “*Interactional Aerodynamics Modeling and Flight Control Design of Multi-Rotor Unmanned Aircraft Systems*”

Source of Support: San Jose State University

Prime Sponsor: NASA

Program: Joint Tactical Aerial ReSupply Vehicle (JTARV) System Integration Lab

Budget: \$ 133,000

Dates: 09/2022 – 08/2023

Status: Awarded

Pending

1. PI: **U. Saetti**

Project Title: “*Haptics for Advanced Perception and Tactile Information Cueing (HAPTIC)*”

Source of Support: Systems Technology, Inc.

Prime Sponsor: DoD-DARPA SBIR

Budget: \$ 45,000

Dates: 10/2022 – 07/2023

Status: Pending

2. PI: H. Chao

Co-PI: **U. Saetti**, L. Cornman, Z. Zheng, H. Wu, R. Barret-Gonzalez, Z. J. Wang, H. Fang, X. Hu, S. G. Hagerott, W. Anemaat

Project Title: “*Predictable Safety for UAS/UAM Operations in Dynamic and Complex Wind Fields*”

Source of Support: University of Kansas

Prime Sponsor: NASA

Budget: \$ 400,000

Dates: 08/2023 – 07/2026

Status: Pending

3. PI: **U. Saetti**

Project Title: “*Dynamic Systems Framework for Reduced-Order Modeling and Control of Multi-Domain Nonlinear Time-Periodic Systems*”

Source of Support: National Science Foundation (NSF)
 Program: Dynamics, Control, and System Diagnostics (DCSD)
 Budget: \$ 387,143
 Dates: 08/2023 – 07/2026

Status: Pending

4. PI: I. Chopra

Co-PI: **U. Saetti**

Project Title: *“Blade Tip Propeller-Driven Autogiro Basic Aeromechanics Characterization”*

Source of Support: Office of Naval Research (ONR)

Budget: \$ 601,916

Dates: 02/2023 – 01/2026

Status: Pending

5. PI: **U. Saetti**

Co-PI: J. Baeder

Project Title: *“Development and Validation of a Method of Compliance for Avoidance of Hazardous Vortex Ring State (VRS) Conditions in a Powered-lift Aircraft”*

Source of Support: AgustaWestland Philadelphia Corporation

Prime Sponsor: Federal Aviation Administration (FAA)

Budget: \$ 150,000

Dates: 02/2023 – 01/2024

Status: Pending

6. PI: **U. Saetti**

Project Title: *“Evaluation of Crew Workload Reduction Features to Mitigate Top Risks Identified by US Helicopter Safety Team (USHST)”*

Source of Support: AgustaWestland Philadelphia Corporation

Prime Sponsor: Federal Aviation Administration (FAA)

Budget: \$ 150,000

Dates: 02/2023 – 01/2024

Status: Pending

White Paper Submissions

1. PI: **I. U. Saetti**

Project Title: *“Multimodal Perception Modeling for Full-Body Haptics and Spatial Audio Cueing: Enabling Emergent Pilot-Vehicle Performance”*

Source of Support: Naval Air Warfare Center Aircraft Division (NAWCAD)

Budget: \$ 160,000

Status: Pending

2. PI: **I. U. Saetti**

Co-PI: C. Ivler

Project Title: *“Spatial Discordance in Manned-Unmanned Teaming”*

Source of Support: Naval Air Warfare Center Aircraft Division (NAWCAD)

Budget: \$ 160,000

Status: Pending

3. PI: **I. U. Saetti**

Project Title: *“Multimodal Pilot Modeling for Extended Reality Simulation and Control of Manned-Unmanned Teaming”*

Source of Support: Lockheed Martin
 Budget: \$ 150,000
 Status: Pending

TEACHING EXPERIENCE

Polytechnic University of Turin

- Flight Dynamics and Control of Vertical Lift Vehicles (short course): Course Instructor (June 2023).

University of Maryland

- ENAE 635 – Helicopter Stability and Control: Course Instructor (Spring 2023).

Auburn University

- AERO 3230 – Dynamics of Flight: Course Instructor (Spring 2022).
- AERO 4970/7970 – Rotorcraft Aeromechanics: Course Instructor (Fall 2021).

Georgia Institute of Technology

- AE 4531 – Aircraft Flight Dynamics: Guest Lecturer (Spring 2020), Course Instructor (Spring 2021).
- AE 4071 – Rotorcraft Aeromechanics: Course Instructor (Spring 2020).

Pennsylvania State University

- AERSP 518 - Dynamics and Control of Aerospace Vehicles: Guest Lecturer (Spring 2018).

Polytechnic University of Milan

- Theoretical Mechanics: Guest Lecturer (Fall 2014).
- Developed and lectured for the joint MathWorks, Inc. and Skyward Experimental Rocketry project-based short course “*Aeronautical Systems - Guidance and Control*” (Fall 2014).

PRESENTATIONS / TALKS

Media Appearances

- “Newton. Un volo sul futuro”, Italian National Television (RAI), Rome & Virtual, Dec 13, 2022.
<https://www.raiplay.it/video/2022/12/Newton---pt19-Un-volo-nel-futuro-d6e4642e-e767-4c1e-9137-ad0aea24b66d.html>

Guest Lectures

- “Extended Reality Simulation and Control of Rotorcraft”, Technical University of Munich, Munich, Germany, April 17, 2023.
- “Extended Reality Simulation and Control of Rotorcraft”, German Aerospace Center (DLR), Braunschweig, Germany, April 12, 2023.
- “Pushing the Boundaries of Modeling, Simulation, and Control of Rotorcraft”, Vertical Flight Society, Philadelphia Chapter, Virtual, August 31, 2022.
- “Linearized High-Fidelity Aeromechanics for Stability, Control, and Extended Reality Simulation of Rotorcraft,” Dipartimento di Ingegneria Meccanica e Aerospaziale, Politecnico di Torino, May 24, 2022.
- “*Stability, Control, and Extended Reality Simulation of Time-Periodic Aerospace Systems*”, Department of Aerospace Engineering, University of Maryland, College Park, MD, March 10, 2022.
- “*Networked Flight Simulation and Control Lab*”, Department of Aerospace Engineering, Auburn University, Auburn, AL, April 9, 2021.

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- “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, School of Mechanical and Aerospace Engineering, Oklahoma State University, Stillwater, OK, January 5, 2021.
 - “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, Department of Aerospace Engineering, Auburn University, Auburn, AL, December 8, 2020.
 - “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, Department of Mechanical and Aerospace Engineering, Carleton University, Ottawa, Canada, November 24, 2020.
 - “*Methods in the Stability Analysis and Control of Periodically-Forced Aerospace Vehicles*”, Department of Aerospace Engineering, Pennsylvania State University, University Park, PA, November 19, 2020.
 - “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, Department of Mechanical Engineering, University of South Carolina, Columbia, SC, November 6, 2020.
 - “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, Department of Mechanical and Aerospace Engineering, North Carolina State University, Raleigh, NC, October 28, 2020.
 - “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, Department of Mechanical and Aerospace Engineering, University of California, Irvine, CA, March 12, 2020.
 - “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, Department of Aerospace Engineering, Embry-Riddle Aeronautical University, Daytona Beach, FL, October 24, 2019.
 - “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, Network for Innovative Rotorcraft Safety (NITROS), Department of Aerospace Engineering, Polytechnic University of Milan (broadcasted live to Delft University of Technology, University of Liverpool, and University of Glasgow), Milan, Italy, July 1, 2019.
 - “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, School of Aerospace Engineering, Georgia Institute of Technology, Atlanta, GA, April 17, 2019.
 - “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*”, AIAA Penn State Chapter, Department of Aerospace Engineering, Pennsylvania State University, University Park, PA, April 11, 2019.
 - “*Identification of Linear Time-Periodic Systems from Flight Test Data*”, U.S. Army Aviation Development Directorate (ADD), NASA Ames Research Center, Moffett Field, CA, December 10, 2018.
 - “*Skyward Experimental Rocketry: The Tsiolkovsky Rocket Equation*”, Theoretical Mechanics Class, Department of Aerospace Engineering, Polytechnic University of Milan, Milan, Italy, November 12, 2013.
 - “*Skyward Experimental Rocketry: A students’ Way to Space*”, Department of Aerospace Engineering, Polytechnic University of Milan, Italy, October 18, 2012.

Conference Presentations

- “*Harmonic Decomposition Models of Periodically-Forced Fluid Flows*,” AIAA Aviation Forum, Chicago, IL, Jun 27 - Jul 1, 2022.
- “*Linearization of a Rotor Simulation with a State-Space Free-Vortex Wake Model in a Shipboard Environment*,” AIAA Aviation Forum, Chicago, IL, Jun 27 - Jul 1, 2022.
- “*Implementation and Linearization of a State-Space Free-Vortex Wake Model for Flapping-Wing Flight*,” 78th Annual Forum of the Vertical Flight Society, Fort Worth, TX, May 10-12, 2022.
- “*Implementation and Linearization of a Rotor Simulation with a State-Space Free-Vortex Wake Model*,” 78th Annual Forum of the Vertical Flight Society, Fort Worth, TX, May 10-12, 2022.
- “*Flight Simulation and Control Using the Julia Language*”, AIAA SciTech Forum, San Diego, CA, Jan 3-7, 2022.
- “*Dynamic-Inversion Based Flare Control Law for Autonomous Helicopter Autorotation*”, AIAA SciTech Forum, San Diego, CA, Jan 3-7, 2022.

- “*Linear Time-Invariant Models of the Dynamics of Flapping-Wing Flight*,” Vertical Flight Society 77th Annual Forum, Virtual, May 10-14, 2021.
- “*High-Order Linear Time-Invariant Models of Rotorcraft Flight Dynamics, Vibrations, and Acoustics*,” Vertical Flight Society 77th Annual Forum, Virtual, May 10-14, 2021.
- “*A Motion Primitive Prospective on Rotorcraft Regime Recognition*,” Vertical Flight Society 76th Annual Forum, Virginia Beach, VA, Oct 6-8, 2020.
- “*Explicit Uncertainty Quantification for Probabilistic Handling Qualities Assessment*,” Vertical Flight Society 76th Annual Forum, Virginia Beach, VA, Oct 6-8, 2020.
- “*A probabilistic Approach to Pilot/Vehicle System Performance and Perceived Rotorcraft Handling Qualities*,” Vertical Flight Society Rotorcraft Handling Qualities Technical Meeting, Huntsville, AL, Feb 18-19, 2020.
- “*Load Alleviation Control Design Using High Order Dynamic Models*,” Vertical Lift Research Center of Excellence (VLRCOE) Annual Review, University Park, PA, November 19, 2019.
- “*Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads*,” Vertical Flight Society 75th Annual Forum, Philadelphia, PA, May 15, 2019.
- “*Performance and Design Optimization of the F-Helix eVTOL Concept*,” Vertical Flight Society 75th Annual Forum, Philadelphia, PA, May 15, 2019.
- “*Load Alleviation Control Design Using High Order Dynamic Models*,” Vertical Lift Research Center of Excellence (VLRCOE) Annual Review, University Park, PA, November 6, 2018.
- “*Design of Dynamic Inversion and Explicit Model Following Control Laws for Quadrotor Inner and Outer Loops*,” American Helicopter Society 74th Annual Forum, Phoenix, AZ, May 15, 2018.
- “*Load Alleviation Control Design Using Harmonic Decomposition Models, Rotor State Feedback, and Redundant Control Effectors*,” American Helicopter Society 74th Annual Forum, Phoenix, May 14, AZ, 2018.
- “*Load Alleviation Control Design Using High Order Dynamic Models*,” Vertical Lift Research Center of Excellence (VLRCOE) Annual Review, University Park, PA, November 14, 2017.
- “*Use of Harmonic Decomposition Models in Rotorcraft Control Design with Alleviation of Vibratory Loads*,” 43rd European Rotorcraft Forum, Milan, Italy, September 12, 2017.
- “*Rotorcraft Simulations with Coupled Flight Dynamics, Free Wake, and Acoustics*” American Helicopter Society 72nd Annual Forum, West Palm Beach, FL, May 17, 2016.

AFFILIATIONS

- Vertical Flight Society (VFS)
- American Institute of Aeronautics and Astronautics (AIAA)

SERVICE

Professional

- Associate Editor, **Journal of the American Helicopter Society (JAHS)**
- Handling Qualities Technical Committee 2022 Session Chair, **Vertical Flight Society (VFS)**
- Handling Qualities Technical Committee Member, **Vertical Flight Society (VFS)**
- Reviewer, **Military Operational Medicine Research Program (MOMRP) AVL-1 Panel**
- Reviewer, **Journal of Guidance, Control, and Dynamics (JGCD)**
- Reviewer, **Journal of the American Helicopter Society (JAHS)**
- Reviewer, **Journal of Optimization Theory and Applications (JOTA)**
- Reviewer, **International Journal of Aerospace Engineering**
- Reviewer, **Aerospace Science and Technology**
- Reviewer, **Council of European Aerospace Societies (CEAS) Aeronautical Journal**

- Reviewer, **IEEE International Conference on Robotics and Automation (ICRA)**

Department

- Member, ENAE Dynamics, Control, and Autonomy Committee 2022/2023

RESEACRH SUPERVISION

Graduate/Undergraduate Students

Michael Morcos (MS 2024), Batin Bugday (PhD 2027), Hussien Hafez (PhD 2026), Dogyu Jun (BS 2023, MS 2025), Ben Ganelin (BS 2024)

MS/PhD Committees

- Doctoral Committee Member, “*Artificial Intelligence Applications for Drones Navigation in GPS-denied or degraded Environments*”, Ph.D. Thesis, Simone Godio, Politecnico di Torino, February 2023.
- Doctoral Committee Member, “*On the Role of the Number of Rotor Blades for Helicopter Vibrations*”, Ph.D. Thesis, Alexander Steinwandel, University of Stuttgart, March 2023.
- Outside Examiner, “*Model identification and inversion-based control for multi-rotor UAVs*”, M.S. Thesis, Daniele Migliore, Politecnico di Milano, September 2019.

RELEVANT SKILLS

Software: C, C++, MATLAB/Simulink, Fortran, Julia, FLIGHTLAB, CIFER, CONDUIT

Language: Italian (native speaker), English (full professional proficiency), Spanish (beginner)

RELEVANT COURSE WORK

- **Controls:** Linear Systems, Nonlinear Control, Robust Control, Adaptive Control, Digital Control
- **Estimation:** Linear and Nonlinear Estimation, Kalman Filtering
- **Flight Dynamics and Control:** Aircraft Stability and Control, Rotorcraft Stability and Control, Spacecraft Dynamics, Dynamics and Control of Aerospace Vehicles
- **Dynamics:** Structural Dynamics and Vibrations, Rotorcraft Dynamics, Aerospace Systems Dynamics
- **Aerodynamics:** Rotorcraft Aerodynamics, Introduction to CFD, Foundations of Fluid Mechanics
- **Mathematics:** Foundations of Engineering System Analysis, Theoretical Mechanics
- **Computer Science:** Advanced Computer Programming
- **Experimental Methods:** Advanced Experimental Methods
- **Other:** Orbital Mechanics, Aerospace Propulsion, Aerospace Systems, Road Vehicle Dynamics

INVOLVEMENT

Penn State American Helicopter Society

President

Penn State Club Tennis

Travel Team Capitan

Milan Polytechnic Varsity Tennis

Team Captain

University Park, PA

May 2018 – May 2019

University Park, PA

August 2018 – May 2019

Milan, Italy

September 2011 – July 2014