

Charles Robert O'Neill

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U.S. Citizen

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Education:

Ph.D., Mechanical and Aerospace Engineering, Oklahoma State University, 2011

M.S., Mechanical Engineering, Oklahoma State University, 2003

B.S., Aerospace Engineering, Oklahoma State University, 2001

Pilot, Private Pilot, ASEL (Part 61)

Pilot, Unmanned Aerial Systems & Drones (Part 107)

General Class, FCC Amateur Radio License (KB1WOL)

Expertise:

Aviation (manned & unmanned), Aerodynamics, Flight dynamics & control, Flight Test Engineering, Aircraft Systems, Systems integration, Radar & RF systems, Antennas & Arrays, Prototyping, Machine Shop & Fabrication, Computational Fluid Dynamics & Grid generation, CATIA, Project management.

Professional Experience:

EH Group, Director of Research, 2020–present

- R&D: <https://www.ehgroupinc.com/>

Remote Sensing Center, University of Alabama, Research Engineer, 2018–2020

- Founding member of a 3-person engineering team to initiate and sustain a \$7M/yr center in less than 2 years. Center management team & lead for the aerospace area. <https://rsc.ua.edu/>
- Designed and delivered RF remote sensing systems to Greenland, Antarctica, and US for domestic and international collaborators (Denmark, Germany, Japan, Norway, and Korea).
- Led the aerospace & mechanical design, development, and delivery of major R&D projects:
 - Ultra-wideband (2-18 GHz) snow radar integrated and operated on a DHC-6 Twin Otter in West-Central Colorado in 2019 and 2020. Developed, constructed, and integrated RF systems, optical/IR systems, aircraft radomes, and radar system hardware. Developed and fielded a Flight Director software/hardware system integrating a fused GPS/INU with a Microsoft Surface tablet display for providing pilots with real-time high-resolution aerial survey-line navigation and spatial orientation. In the field, I spearheaded the aircraft-radar installation and led a 6-8 member flight team (2 pilots, 2-3 radar operators, 2-3 aerospace PNT & optical/IR systems) as the mission director in the aircraft. Point of contact for interactions with pilots, engineers, A&P mechanics, and support staff.
 - Prototyped a VHF MIMO radar system for integration on a CTLS light sport aircraft. Developed a low profile and lightweight 170-450 MHz antenna array and the associated pylon & structure. Evaluated the aircraft performance and S&C impact on flight operations. Integrated PCBs with structures for RFI mitigation and thermal control of RF equipment.

- Developed and operated large (16m cross and 8m T) Mills Cross UHF radar arrays and dual-polarized ultra-wideband arrays for ice layer sensing in North-Central Greenland (EastGRIP) in 2018 and 2019. Designed, using CATIA, and led the construction of a set of 20 composite foam and fiberglass 2m by 1m panels with ± 1 mm tolerance in antenna elements and reflector planes. Designed the support hardware and RF splitters & cabling both internal and external to the panels. Selected design configurations using analytical and numerical (i.e. ANSYS) tools for static and dynamic simulations.
- Developed an L-band RF system for ice layer and bed measurements in EastGRIP in 2019 for an NSF EAGER project. Built and operated the 16 element Yagi radar system in the field. This project accomplished the first known civilian measurement of the Polar ice bed and ice layers in the L-band. Designed, built, and shipped an upgraded patch array in 3 weeks for an Antarctic deployment in Nov – Dec 2019.
- Developed a rugged ultra wideband snow accumulation radar for an Antarctic traverse and ~1200 km survey in the 2018 season. Developed the hardware to robustly mount a pair of Vivaldi arrays and associated power dividers on a tracked survey vehicle. The international team during the development was spread across 4 continents. Led the effort to characterize and optimize the RF performance of the system prior to delivery.
- Proposal development: NOAA, NSF, DOE, Cooperative Institutes, UCAR, ONR, etc.

Aerospace Engr' and Mechanics Dept., University of Alabama, Assistant Professor, 2014–2018

- Instructor for core aerospace engineering undergraduate courses
- Developed & resurrected graduate courses in aircraft systems & aerodynamics areas
- Advisor and committee member for graduate students
- 2017 AIAA Outstanding Faculty Member Award
- Advisor for TuskaUAV (unmanned) and Crimson Aviators (manned) aircraft student clubs

Cessna Aircraft, Wichita, KS, Aerospace Engineer, Rapid Prototyping Department, 2012–2013

- Aerodynamic design and analysis of a high performance twin-engine jet aircraft in a rapid prototyping environment (<https://scorpion.txtav.com/>). One of 6 aerodynamics engineers. Daily interactions and analysis with multiple groups: pilots, loads, mission-systems, management, weight, stress, propulsion, ECS, etc.
- Whole aircraft turbulent and inviscid CFD analysis for S&C, loads, and performance estimates in a time critical environment. Accepted to become the CFD lead within the aerodynamics group within 12 months. Experienced with FUN3D, NSU3D, ICEM, and Pointwise.
- Low and High Speed wind tunnel tests. Reduction and analysis of wind-tunnel data for S&C, loads, and CFD validation. Developed aircraft & pylon/store configurations and geometries for wind tunnel testing. Member of the on-site team for wind-tunnel testing.
- Daily rapid ball-park estimates and consulting of aerodynamics/physics/mathematics in a design and prototype environment. Recognized as a source of rapid solutions and yes/no decisions.

Computational Aero-Servo-Elasticity Laboratory (CASERLab), Stillwater, OK

Research Fellow, 2004–2011 and Research Assistant, 2001–2004; Advisor: Dr. Andy Arena

- Development, analysis, operation, and visualization of unsteady computational fluid dynamics (CFD) for aeroelastic (flutter) simulations.
- System identification of unsteady aerodynamics for aero-structural flutter predictions
- Supported STARS aeroelasticity group at NASA Dryden Research Center. Aeroelasticity/flutter analysis of the F-18, Hyper-X, and various other systems.
- Validated and verified CFD based simulations with analytical and experimental models.
- Stability and control analysis of 4 UAV aircraft and one civil aviation aircraft.

Civilian Aircraft Operations, Design and Construction

- Unmanned Aerial Vehicles, 2001–present
 - Built and operated UAV/UAS aircraft, multirotors, and sailplanes
 - Developed and directed a fast-response disaster response UAS team with deployments in FL and AL for hurricane, tornado, and drought surveys.
 - Designed and built a multiple-payload electrically powered composite unmanned aircraft (10 ft span, 35 lb gross weight, 16 lb payload, 5 lb NiCd batteries, 200 ft takeoff distance) which won the international 2001 AIAA Design-Build-Fly UAV competition. (<http://tiny.cc/Shamu2001>)
 - Advised and reviewed 30+ UAV designs from 2002 to present
- Experimental Aircraft: Kitfox IV-1200 N194C, 1994–2000
 - Constructed a tube and fabric experimental kit aircraft
 - Integrated an experimental flat 4 engine with a reduction drive into the airframe including substantial design changes to the fuel and electrical systems.
 - Conducted system testing and evaluations. Learned critical lessons in aircraft R&D.
- Civil Aviation, 1992–present
 - Piloted and maintained various civil aviation aircraft
 - Conducted flight test and written evaluation of a C-172RG with a test pilot (May 2001)

Academic Courses Developed and Taught:

- Aerodynamics I <http://tiny.cc/AerodynamicsI>
- Aerospace Structures <http://tiny.cc/Aerostructures>
- Flight Dynamics & Control I <http://tiny.cc/FlightDynamicsControl>
- Aircraft Prototyping Studio
- Rocket Reentry Research
- Aerospace Radar Integration
- Flight Test Engineering <https://charles-oneill.com/blog/flight-test-engineering-course-ua/>
- Integrated Aircraft Research
- Aircraft Performance Characterization
- Airfoil and Wing Theory <http://tiny.cc/WingAirfoilTheory>
- Aircraft Systems <http://tiny.cc/AircraftSystems>
- Partial Differential Equations <https://charles-oneill.com/blog/ges-554-partial-differential-equations/>

Selected Publications:

1. Li, L. et al., Ground-Based Ultra Wideband Dual-Polarized Radar Sounding of Greenland Ice Sheets, IGARSS, 2020.
2. Yan, J. B., J. Nunn, P. Gogineni, C. O'Neill, C. Simpson, R. Taylor, D. Steinhage, D. Dahl-Jensen, H. Miller, O. Eisen. UHF Radar Sounding of Polar Ice Sheets, *IEEE Geosciences and Remote Sensing Letters*, 2019.
3. Fujita, et al., International studies of ice sheet and bedrock at Dome Fuji, East Antarctica, *EGU, The Quest for Oldest Ice*, Vienna, Austria, 2019.
4. Lu, B., Y. Zhang, C. Zheng, C. Green, C. O'Neill, H. Sun, J. Qian, Comparison of time nonlocal transport models for characterizing non-Fickian transport, *Water*, 2018.
5. F. Niu, Z. O'Neill, and C. O'Neill, Data-Driven Based Estimation of HVAC Energy Consumption with an Improved Fourier Series Decomposition in a University Dormitory, *Building Simulation: An International Journal*, 2018.
6. Yan, J., C. R. O'Neill, et al., Surface-Based Radars for Mapping Layers in the Bottom 10% of Ice, Oldest Ice Workshop, Davos, Switzerland, 2018.
7. Yan, S., C. O'Neill, L. Li, J. Nunn, C. Simpson, R. Taylor, P. Gogineni, UWB Radars for Ice and Snow Measurements, APMC 2018.
8. Zhou, S., Z. O'Neill, and C. O'Neill, A review of leakage detection methods for district heating networks, *Applied Thermal Engineering*, Vol 137, 567-574, 2018.
9. S. Gogineni, Y.B Yan, C. O'Neill, R. Sood, O. Eisen, B. Tobias, A. Humbert, D. Steinhage, G. Eagles, D. Braaten and I. Joughin, Radar Instrumentation of long-range and high-altitude aircraft for scientific research and operational applications on Antarctica, Airborne Geodesy and Geophysics with Focus on Polar Applications, Dresden, April 2017.
10. Eisen, O., Gogineni, P., Yan, S., O'Neill, C. Operating ice-penetrating radars on GVs in Antarctica to improve climate and sea level change characteristics: ANTHALO as a multinational approach, First HALO Symposium, DLR, Oberpfaffenhofen, 14 - 16 March 2017.
11. O'Neill, Z. D., A. Henry¹ and C. R. O'Neill. 2017. Development of A Hardware-in-the-loop Framework with Modelica for Energy Efficient Buildings. 2017 ASHRAE Annual Meeting. Las Vegas, NV. January 28–February 1, 2017
12. Simpson, C. R.; O'Neill, C. R., CubeSat Network for Orbital Debris Tracking and Prediction, 2016 CODER Workshop, College Park, MD, November 2016.
13. C. O'Neill and Z. O'Neill. Field Investigations of Nanoscale Particle Dispersion and Deposition Emitted from 3D Printers in Ventilated Spaces. *2016 ASHRAE Annual Meeting*. St. Louis, MO. June 25–29, 2016.
14. L. Song and C. O'Neill, A High-Order Symmetric Interior Penalty Discontinuous Galerkin Scheme to Simulate Vortex Dominated Incompressible Fluid Flow, *AIMS Mathematics*, 1(1): 43-63, April 2016.
15. Z. O'Neill and C. O'Neill, Development of a Probabilistic Model for Estimating Building Energy Performance, *Applied Energy*. 164 (2016) 650-658. dx.doi.org/10.1016/j.apenergy.2015.12.015
16. C. O'Neill, Mathematics Preparation and Performance in Graduate Level Engineering Courses with Distance and Local Students, *ASEE Southeast Section Conference*, 2016.
17. N. Moffitt, C. O'Neill, C. Pinkerman, A. Hassett and A. Arena, Comparison of Methods for Implementing Well-Posed Boundary Conditions in Galerkin CFD Solvers, *51st AIAA ASM*, TX, Jan 2013.
18. C. O'Neill and A. Arena, Time-Domain Training Signals Comparison for Computational Fluid Dynamics Based Aerodynamic Identification, *Journal of Aircraft*, Mar-Apr 2005.

19. T. Cowan, C. O'Neill and A. Arena, Application of the Transpiration Boundary Condition to CFD Solutions in a Non-Inertial Reference Frame, *Journal of Aircraft*, Sep-Oct 2004.
20. C. O'Neill and A. Arena, Aircraft Flight Dynamics with a Non-Inertial CFD Code, *43rd AIAA ASM*, Reno, NV, 2004.
21. C. O'Neill and A. Arena, Comparison of Time-Domain Training Signals for CFD Based Aerodynamic Identification, *42nd AIAA ASM*, Reno, NV, 2004.
22. AIAA Design-Build-Fly: OSU Orange/Shamu, Invited Presentation, *19th AIAA Applied Aerodynamics Conference*, Anaheim, CA, June 2001.