

AAE FALL COLLOQUIUM SERIES

Supercells to Supersonics: Aerospace Engineering for Atmospheric Research

**MONDAY OCTOBER 27TH, 2025
2:30PM-3:20PM RHPH 172**



DR. BRIAN M. ARGROW

Distinguished Professor, Ann and H.J. Smead Department of
Aerospace Engineering Sciences

Director, Integrated Remote In Situ Sensing Program (IRISS)
University of Colorado Boulder

Abstract:

Who do atmospheric scientists call when they need measurements in inaccessible locations, with a specific cadence, and in environments too dangerous for humans? Aerospace Engineers, of course. Since 2003, the Research & Engineering Center for Unmanned Vehicles (RECUV) has been integrating command, communications, computer, control (C4; order intended) technologies into uncrewed aircraft systems (UAS). In 2004 RECUV students and faculty developed and deployed the Airborne UAS and Ground Network (AUGNet) to create a small UAS-based mobile communications testbed for the U.S. Air Force Big Safari Program. We simultaneously engaged with FAA to overcome regulatory challenges for the first in-situ measurements from a small UAS in thunderstorms in 2009, and the first measurements in a tornadic supercell thunderstorm in 2010. Created in 2015, the Integrated Remote & In Situ Sensing program (IRISS) is enabling multiple-UAS operations for in-situ data measurements on scales complementing the most advanced remote and in-situ assets, including static and mobile radars, mesonets, and in coordination with a NOAA hurricane hunter aircraft redirected for supercell research. In 2019, IRISS deployed the RAAVEN UAS (featured in the 2024 movie Twisters) into supercell storms while simultaneously launching stratospheric balloons carrying fine-wire instruments for in-situ turbulence measurements in the stratosphere near the supercells for the AFOSR Hypersonic Flight in the Turbulent Stratosphere (HYFLITS) project. These balloon-borne instruments were again deployed in 2021 and 2022 for stratospheric measurements supporting USAF hypersonic flight tests, respectively in Sweden and the U.S.

This talk focuses on the collaborative engineering-science research and regulatory challenges overcome to technologies enabling small UAS and high-altitude balloons to carry sensors into dynamic atmospheric environments inaccessible to crewed aircraft. Current research in sensor fusion for small UAS to improve state estimation and enhance fault tolerance in conditions that degrade or disable sensors will be discussed, including results from recent field campaigns. The talk concludes with a prospective on the research challenges for atmospheric measurements with uncrewed aeronautical systems from supercells to supersonics.

Biography

Brian Argrow is Distinguished Professor and Glenn Murphy Endowed Chair in the Ann and H.J. Smead Department of Aerospace Engineering Sciences. He is founding Director of the Integrated Remote & In-Situ Sensing Program (IRISS) and founding Director (emeritus) of the Research and Engineering Center for Unmanned Vehicles (RECUV). His research covers the design and field deployment of small UAS, aero-gasdynamics, and hypersonics. He is a member of the National Academy of Engineering and Fellow of the American Institute of Aeronautics and Astronautics. He received the Department of the Air Force Exemplary Civilian Service Award for service on the Air Force Scientific Advisory Board.