AAE SPECIAL SEMINAR

From Concept to Launch: Designing a Hypersonic Flight Experiment

THURSDAY, MARCH 26, 2026
ARMS B071 12:30PM-1:20PM

BRAD WHEATON

Principal Professional Staff

Johns Hopkins Applied Physics Laboratory

Abstract

For many decades, suborbital "sounding" rockets have been used to provide access to the upper atmosphere at relatively low cost for experiments in fields such as atmospheric science, astronomy, and microgravity research. These unguided research rockets are also attractive for their ability to obtain unique experimental data for phenomena important to the field of hypersonics (vehicles that fly at Mach number greater than five).

This seminar will explore how sounding-rocket flight experiments are conceived, designed, and executed to study hypersonic phenomena, with an emphasis on the practical engineering challenges involved. Recent sounding-rocket programs will be introduced, followed by an in-depth case study of the Boundary Layer Transition 1B (BOLT-1B) experiment. Launched successfully in 2024, BOLT-1B collected over 400 measurements of aerodynamic heating on a complex geometry at speeds up to Mach 7.2.

Using BOLT-1B as a real-world example, the talk will highlight the key design decisions and preflight analyses required to plan a successful flight experiment, along with lessons learned from a flight anomaly on the predecessor mission, BOLT-1A. The seminar will walk through a 24-month effort to fabricate and instrument the payload and provide insight into the process of integrating the experiment with the rocket and executing a successful launch.

Biography

Dr. Bradley M. Wheaton is a Principal Professional Staff member within the Force Projection Sector of the Johns Hopkins Applied Physics Laboratory (APL). He currently serves as the Group Chief Scientist of the Vehicle Design and Technologies Group responsible for science and technology initiatives for a wide range of applications, including hypersonics. Dr. Wheaton is an aerospace engineer specializing in hypersonic aerothermodynamics and fluid dynamics, focusing on advancing the prediction of aerothermal effects on hypersonic vehicles through a unified approach combining simulations with ground and flight experimentation. Dr. Wheaton has served since 2017 as the Principal Investigator of the Boundary Layer Transition (BOLT) flight experiment program, leading an international team across government, academia, and industry to design and conduct two hypersonic flight test experiments.

He has also led numerous other projects and initiatives at the laboratory, prioritizing internal and external collaborations. Before joining APL in 2013, Dr. Wheaton performed experimental research on boundary-layer transition as a graduate research assistant at the Purdue University Mach-6 Quiet Tunnel. As the nation's largest University Affiliated Research Center, APL performs research and development on behalf of the United States Government. The Laboratory has more than 9,000 staff members who are making critical contributions to a wide variety of nationally and globally significant technical and scientific challenges.

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