



Seminar Series of the



AFRL/VA and AFOSR

**Collaborative Center of Control Science (CCCS)**

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## **Flight Dynamics, Control, and Flight Guidance Issues For Airbreathing Hypersonic Vehicles**

Dr. David K. Schmidt  
University of Colorado, Colorado Springs

10:30am, October 24, in Room 260 DL  
Dept. Electrical Engineering, The Ohio State University

**Abstract:** The presentation will highlight the unique flight dynamic characteristics of a generic class of air vehicles - airbreathing, hypersonic vehicles similar to the X-30 (NASP) and the Hyper-X research vehicle. And the focus will high be on the implications of these characteristics in regards to guidance and control system design for these vehicles. The class of vehicle considered typically involves airbreathing SCRAMjet propulsion, with perhaps single-stage-to-orbit capability. This discussion will focus on the critical hypersonic powered phase of flight, and a prototypical mission of orbit insertion. Critical flight-dynamic issues arise due to the significant dynamic interactions between the airframe and propulsion systems, plus the hypersonic speed regime introduces interesting issues as well. Discussed is the need to develop feedback systems for several multivariable, unstable, non-minimum phase plants with significant input-output cross-coupling. The presentation will highlight results from a multi-year research program that identified the need to develop a new class of vehicle-dynamic model, contributed to the development of such models, sought to identify critical issues in flight dynamics and control, and put forth several baseline feedback systems to facilitate further study of this class of vehicle. Key to this program was the emphasis on problem definition and understanding the requirements, rather than new algorithm development, for example.

**Brief Biography:** Dr. Schmidt is Director of the Flight Dynamics and Control Laboratory, Dean of the Graduate School, and Sr. Faculty Associate for Research a the University of Colorado, Colorado Springs. He received the PhD degree from Purdue Univ., is a Fellow of the AIAA, and has published over 200 technical papers.