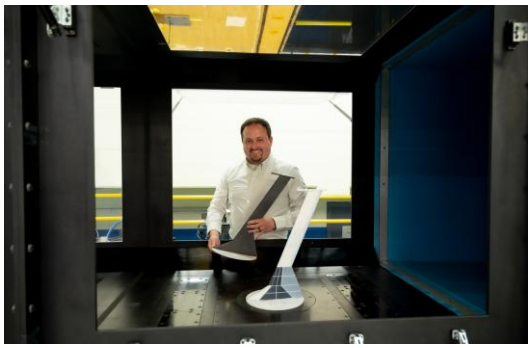
AIAA
DAYTON-CINCINNATI SECTION

Lunch 'n' Learn
6 November 2026
Reservoir Computing via Fluid-Structure Interaction
Guest Speaker: Dr. Alexander Pankonien, Air Force Research Laboratory (AFRL)



Abstract: Fluid-structure interactions have traditionally been avoided or mitigated in aircraft design. However, advances in data-driven modeling have provided a path for understanding and potentially controlling these phenomena. Using inherently unstable dynamic structures in design could create a new class of rapidly adaptable mission systems with low size, weight, and power. Similar to the transformation of desirable static margin in aircraft from stable to unstable with the development of modern control systems, localized dynamic effects can be detected and controlled with sparse sensing techniques. Our work shows how information theory metrics and machine-learned autoencoders can provide new objectives functions and models with interesting connections to traditional energy-based metrics and approaches. Coupling these metrics with novel sensing approaches, such as reservoir computing which combines sensing and computing via nonlinear dynamics inherent to the system, further emphasizes that the transduction burden for performing real-time, control-oriented measurements should be feasible in reality as well. As practical examples, a number of relevant benchmark unsteady fluid and fluid-structure interaction problems are presented, with example cases of how these phenomena could affect novel AFRL air vehicle and weapon designs.

Biography: Dr. Alexander Pankonien is a research engineer at the Air Force Research Lab. His interests have largely been on shape-changing aircraft, that is "morphing", and the technologies necessary to challenge our assumptions about what an aircraft can do in flight. His research has included novel materials including piezoelectrics for shape control at Texas A&M University and the University of Michigan, aeroelastic wind tunnel models for benchmark new morphing ideas at AFRL, and more recently novel structures for low-SWAP assessment of vehicle state. He has served as the technical committee chair in adaptive structures for both the ASME and AIAA technical societies and continues to enjoy mentoring younger researchers in the area.

Time: *11:45 am*

Location:
China Garden Buffet
112 Woodman Dr.
Dayton, OH 45431

Lunch:
You will be able to purchase the buffet

