School of Aeronautics and Astronautics

SYMPOSIUM

The 2014 Research Symposium Series

* Free Pizza *

Monday, April 28, 2014

4:30 pm in ARMS 1021

Investigation of an Air Connectivity Index for the US Domestic Air Transportation Network

Lauren Bowers

In this presentation, we discuss the results of measuring the air connectivity of the United States air transportation network. Researchers at the World Bank developed the original Air Connectivity Index (ACI) to measure the connectivity of the global air transportation network. The current work demonstrates that the ACI is also applicable to the US air transportation network, capturing the relevant aspects of connectivity and correlating with econometric variables, but also presenting new challenges for correct implementation. We will discuss how the ACI was applied at different levels of granularity (state, metropolitan, and airport) and how a time series of the ACI was conducted at the metropolitan and airport levels. We also examine statistical models to predict ACI at the airport and metropolitan levels using facility and econometric variables. We consider what the ACI reveals about the United States air transportation network and how the index can be used by policy makers.

Destructive Instability

Chris Fugger

"The development of next generation gas turbine technologies is driven significantly by the need to be compliant with stringent regulations on pollutant emissions into the atmosphere such as nitric oxides and carbon monoxide. This drives engine manufacturers to investigate novel combustor concepts to produce less pollutants. Inadvertently, recent designs are found to be extremely susceptible to an acoustic phenomena thermoacoustic combustion instability, whereby the engines acoustic field couples with the combustion energy release to produce large scale unsteady fluid motions resulting in reduced power output, decreased operating range and increased engine wear.

One design approach to mitigate these instabilities and minimize pollutant generation is to spatially stage the combustion process using a set of fuel jets. My research involves the generation of high fidelity experimental data in a representative scaled down engine configuration for comparison with concurrently run Large Eddy Simulations to assess the predictive capability of state of the art computational models. Four simultaneous high speed measurements are performed on the reacting fuel jet for comparison with simulation results: (1) 100 kHz pressure measurements, (2) 5-10 kHz flame chemiluminescence, (3) 5-10 kHz 2D planar particle image velocimetry and (4) 5-10 kHz 2D planar OH-planar laser induced fluorescence."

PURDUE UNIVERSITY