

School of Aeronautics and Astronautics

The AAE Fall 2011 Colloquium Series

Modeling and Simulation of the Impact of Air Traffic Operations on the Environment

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Air traffic affects the environment locally, regionally and globally. Recently, there is increased urgency to understand and mitigate the impact of air traffic on climate. Greenhouse gases, nitrogen oxides, and contrails generated by air traffic affect the climate in different and uncertain ways. Understanding the changes requires a hierarchy of models to deal with multiple disciplines, time scales ranging from few minutes to few hundred years and uncertainties in modeling parameters affecting both science and policy. The models described in this paper are useful to evaluate alternate operational decisions at the national level. The modeling approach is built on the simulation and optimization techniques developed for the design of efficient traffic flow management strategies in the presence of uncertainties. The air traffic flow simulation is augmented by models that simulate aircraft fuel flow, emissions and contrails. The integrated capability enables the evaluation of different traffic flow management concepts based on congestion, capacity, efficiency and emissions. The impact of various decisions on climate can be evaluated by converting CO2 emissions, non-CO2 emissions and contrails through the use of radioactive forcing functions. Alternatively, the optimization results from the simulation can be used as inputs to global climate modeling tools like the FAA's Aviation Environmental Portfolio Management Tool for Impacts.

Bio

Abstract

Banavar Sridhar received the B.E. degree in electrical engineering from the Indian Institute of Science, Bangalore, India and the M.S. and Ph.D. in electrical engineering from the University of Connecticut. He is the NASA Senior Scientist for Air Transportation Systems. His research interests are in the application of modeling and optimization techniques to aerospace systems. He led the development of traffic flow management software, Future ATM Concepts Evaluation Tool (FACET), which received the NASA Invention of the Year Award in 2010 and the AIAA Engineering Software Award in 2009. He is a Fellow of the IEEE and the AIAA.

An informal coffee & cookie reception will be held prior to the lecture at 2:30 p.m. in the AAE/ARMS undergraduate lounge (directly in front of ARMS 3rd floor elevators).