Air Transportation's Global Impact

Prof. John-Paul Clarke
Georgia Institute of Technology

Air transportation is a key strategic asset in the development of countries and regions. As has been shown in numerous studies, air transportation has significant direct, indirect, and enabling impacts on economies. Furthermore, with the increasing use of air cargo as a means of transporting goods that were once transported by ship, many argue that the air transportation system is quickly becoming the backbone of the global economy. Thus, improvements to the air transportation infrastructure and in the operations of the air transportation system are essential for continued economic growth.

The economic impact of air transportation must, however, be balanced with its environmental impact. This need for balance is evidenced by the growth in the number of complaints about aircraft noise and gaseous emissions, the strong opposition to airport expansion in the form of legal action by community and environmental groups, and the growing pressure in the national and international arenas for air transportation to better manage its local and global environmental impacts. The net result is that the environmental impact of air transportation is seen by many in the aviation community to be the most significant constraint to the growth of aviation.

Much of the concern regarding the current and future relationship between aviation and the environment is based on the observation that increases in demand for air travel have not been matched by increases in capacity, despite the advent of new technologies for air traffic management. This has resulted in increased delays throughout the global air transportation system. In response to these delays, air traffic controllers must either hold aircraft on the ground (at the gate or in taxi queues), have aircraft cruise at speeds that are further from their optimum cruise speed, hold aircraft in “stacks” near their destination, or vector aircraft at low altitudes. The associated environmental impact (noise and gaseous emissions) and economic inefficiencies (fuel burn and time) provide ample motivation for infrastructure improvements and changes in the way aircraft are operated.

In this presentation, the economic and environment impacts of air transportation will be illustrated through both quantitative and qualitative analyses. This will be followed by a review of ongoing research designed to enable greater volumes of traffic while simultaneously limiting the environmental impact of air transportation and the impact of delays on airline operations. As will be shown, the projected increases in demand can be accommodated and balanced with environmental constraints through the use of continuous descent arrivals to reduce noise, emissions, fuel burn, and flight time; the optimization of airport surface and en route traffic flows to reduce emissions, fuel burn, and flight time; and the implementation of robust airline schedules to reduce passenger disruptions.