

Executive Summary

Air Transportation System - Alternative Futures for Air Transportation from a System Perspective

Results of a Workshop

held at FOI, the Swedish Defence Research Agency, Stockholm, on 31 May - 1 June 2005



A workshop on the subject of alternative futures for air transportation from a system perspective was held at the Swedish Defence Research Agency - FOI, Sweden, on May 31st – June 1st 2005. The purpose of this workshop was to present and discuss - from various and complementary perspectives - the roles, interests and views on the development of aviation of the scientific and aviation communities' key stakeholders. This included perspectives on technological, economical, environmental and operational issues as well as 'bottlenecks' in, and constraints on, the system. The purpose of the workshop was also to have a gap analysis carried out by experts. One of the challenges to be taken up by AERONET III being to bring people together to discuss the plans/visions, to identify potential gaps and to agree on actions, on research activities to overcome these gaps.

One of the goals of the air transportation environmental system work-package is to add to the AERONET III project plus-value in terms of overall understanding and synthesis of technology development and research already done in the assessment of the environmental impact of air traffic. It is also to carry out a gap-analysis that will allow the identification of likely scenario activities (alternatives and forecasts) for the air transportation system (airports, aircraft, airlines, ATM, technologies) and the impact of constraints (safety measures, political restrictions, economy, demand, supply and environmental) on air transportation. Potential 'trade-offs' might be considered where different environmental issues may cause conflicts in terms of technological development and economical impacts.

The participants to the Workshop, not systematically member of the AERONET community, represented a wide range of expertise: atmospheric science, airline operations, air traffic management, airframe and aero-engine manufacturing, research. The workshop topics were addressed in four sessions covering: 'Important drivers for the future of aviation', 'Important trends in aviation: technology and demand', 'Actual discussed solutions to reduce emissions' and 'Aviation long term scenarios and visions'. Breakout sessions in smaller groups were held to carry out a gap analysis between the scenarios, forecasts and inverse modelling and to agree on actions, on research activities to overcome these gaps.

In plenary, the participants to the workshop concluded that:

- The air transportation of the future might be radically different from what we know:
 - Rapid development of simple cheap aircraft (low acquisition, use and maintaining costs). The idea is that modern aircraft are cleaner aircraft. By increasing the pace at

which modern aircraft are developed and introduced, the average world fleet age decreases drastically and the global impact of the aircraft on the environment decreases as well.

- During the last 15 years, the business model has changed drastically (from monopolistic national airlines to low cost companies, for instance). It is obvious that new trends in travelling will appear and that actual business models will have to adapt. One typical example for this actual trend is to incite passengers to shop onboard the aircraft.
- The nature of freight transportation may need to be rethought as well. Specialized aircraft (and not refurbished existing airplanes) may need to be designed especially for freight, using specific technologies. In addition there might be a chance to introduce liquid hydrogen as an environment-friendly alternative fuel on special freight airports, enabling the system to get experience with new infrastructure.
- The airport of the future will probably need to be redefined. Actual airports are very conservative in their designs. Considering the potential new business model, the environmental regulations and the wishes of the consumers, airports will have to be redesigned and drastic changes will be necessary.
- The change of the actual system based on travels between large hubs, to a system based on travels from point to point, should be investigated with focus on the effects for environment and requirements for new aircraft.
- Regulation effects especially on emissions and economics should be assessed first by a defined modelling process. There is clearly a need for developing a European (vs. US) set of tools and methods to compare the different impacts of measures;
- Social sciences and external drivers of aviation need to be addressed more systematically. The analysis of the behaviour of customers, of trends and needs in the future need indeed to be analyzed thoroughly and be included in the studies dealing with future air transportation;
- Holistic airports' constraints: beside capacity limits caused by the number of runways or operational procedures there are other constraints, which become more and more relevant, such as environmental caps or expansion limits because of civil protests. While actual studies in this research area are dealing with single airports or global demand, an overview of all airport constraints and their future effects on capacity, emissions etc. is not available;
- A better understanding of the quantitative effects of air transportation on the atmosphere (especially on the creation of cirrus) is necessary.