Special Topic Sessions   Environment

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I - Introduction

The discussion reflected a vast array of potential research issues and concerns including:

- Aviation and Health Effects (Tools that Communicate Effects)
- Metrics and Measurement
- Bio Fuel Development
- New Advances in Airframe/Engine Technology
- Operator Concerns
- Continuing Efficiency Gains in the ATM system

Overall it is difficult to separate out a purely ATM effect on the environment and the conversation among the participants reflected that. The majority of the comments and research items identified above involve issues that are beyond Air Traffic Management. How these broader research areas may link to ATM is discussed below. ATM has always been moving towards a more efficient system and there are strong links between maintaining high safety levels and making the system more efficient.

Environmental discussion kicked off with a discussion of tradeoffs and concerns. These include community noise, energy, air quality, water quality, and global climate. Solution sets for environmental problems in our industry are many, however there are trade-offs that cannot be ignored. In the John Wayne case shown with noise abatement procedures, the noise was decreased however the emissions were increased, and without communication the average citizen will only sense noise decrease. This brings the point of how critical it is to know, understand, and communicate trade-offs.

II – Session Summary

Aviation, Health Effects, and Communication

Many comments reflected the need for tools to adequately communicate health effects and potential tradeoffs on noise and emissions. The Amsterdam experience indicated that even with large investment in tools there are limits to what can be achieved. The US already has a very large R&D investment in a tool that communicates effects and assesses tradeoffs. A critical question is how we make these transparent to the community.

Metrics and Measurement

Although CDA may reduce both noise and emissions, it reduces capacity. This is an example of the tradeoffs that exist between safety, efficiency/capacity, and environment, where turning one "knob" turns them all. It is unclear how different emissions are valued at their different rates, and therefore they cannot be equated. Conversion factors are needed to equate safety, efficiency, and environment. One way could be to monetize every single parameter because this is the way policy is made.

Governing of trade-offs should be at a very high level, with clear transparency to communities, where a common metric equating a decibel of noise to a ton of emissions, for example. Focus perhaps should be on the broader population, not just those communities who voice themselves – who may actually be a really small amount of people. But this brings up the question about how different emissions are valued related to how different people value them. For example, would surrounding airport communities act differently if they knew the difference in costs between the incremental premature deaths from aviation emissions versus the incremental costs of sleep disturbance from aviation noise?

We need to equate the various environmental impacts with a common denominator, so that a potential environmental credit or tax would take the whole system into account rather than just one slice of the pie. A common metric should be in place in order to evaluate and consider market based measures. It is noted that there are some noise taxes already in practice. These harmonized metrics could also help understand whether altitudes we need to fly at have different effects, what would be the cost of flying at lower stratosphere vs. upper troposphere? This could relate to the concept of air space charges. While there is debate over charging within the aviation sector for environmental impacts, it is discussed that it would be interesting to do emissions trading within sectors: for example, the coal sector is really inefficient while the ATM sector is very efficient.

Since there are radiative impacts of emissions in different atmospheric levels, this could lead to more expensive or less expensive airspace. Common metrics could support the validation of technologies and tools and also support the understanding of different airspace charges. Decision-making under extreme uncertainty depends wholly on the correct assumptions, and choosing the right metrics can help harmonize assumptions. A research issue that could assist with this is collaboration between climate scientists and ATM.

Biofuel Development

There were some comments that biofuels may be important for aviation in moving aviation towards carbon neutrality. Success will depend on bio fuels becoming more widespread and perhaps ultimately in what potential regulation on aviation might look like. Drop-in biofuels have operational concerns, with new equipment with unique operational characteristics, and there is uncertainty on how do they fit into the system. However not much was discussed on what the Air Traffic Management research issues would be beyond accommodating new aircraft technology.

New Advances in Airframe/Engine Technology

The transportation system will be modified by new aircraft, new fuels, etc which will impact operations, capacities, and the system as a whole. There is continued research in airframe and engine technology. ATM issues may include forward looking studies at how new airframe/engines will perform in future. NASA may be heavily invested in this already.

It is asserted that there are different aircraft types, both currently in existence and coming on line that could reduce emissions and noise. It is also discussed that it is possible to further reduce emissions today if different aircraft types were matched to different routes where such types have the lowest comparative emissions. There are many institutional boundaries for such a suggestion; however, it is argued that it is still technically possible.

Operator Issues

If there is a emissions cap, then airlines can get fined for breaking of noise abatement, but they argue it's ATC's procedures (due to cap) that is causing it. How do we reconcile this? Operators worry that with trading schemes and greater capacity, operators may have to pay to play and then get hit with the trading scheme. Who has the responsibility to incentivize airlines, beyond the cost of fuel? From an ANSP point of view, do charges for flying through airspace need to be looked at? Again the metrics that harmonize safety, efficiency, and environment are needed. Is the cockpit potentially the nexus for future technical and operational metrics to support aviation environmental policy decisions?

Continuing Efficiency Gains in the ATM System

As more NextGen technology is deployed there will be continued advances in efficiency that will have corresponding reductions on CO_2 and other emissions. As the system grows in complexity and there is more information on operator intent and aircraft performance built into the ATM systems, there is the potential for performance measures that reflect greater gains in efficiency. However it will be difficult to call these purely ATM as the success in efficiency will also depend on items external to ATM.

There is a discussion about the rise of air transportation in India and China. The only figure that improved with traffic growth so far is safety. Even though some aircraft alone may show benefits, these benefits are destroyed by the growth of the air traffic system. In ATM, research should take all these things into account, look for options, create scenarios and see what would happen.

Policy, efficiency, and technology measures are all affecting impacts, and they should be looked at as a whole. Is there something in aviation that could be done different, that would radically change the

environmental impact? Say with respect to markets? For example, cell phones bloomed in some markets where landlines never took ground.

Some research needs are to work on total ATM system planning, ATM and streamlining changes to the airspace and how a new operational procedure affects the whole airspace. In addition to airspace redesign itself is the need for a parallel effort on planning how to use the redesigned system well. Structural components need to change to take full advantage of the operational improvements

The impact of investment in operational improvements may be significantly larger and quicker to implement, for example CDA has been quoted to provide orders of magnitude in savings, while propulsion improvements could be 10+ years and airframe improvements could be 20+ years down the road. It is asserted that we need to redesign the airspace if we want to improve operations. CDA is just one key component, but there are many other components where environment could be an element in the redesign process. If we cannot redesign due to the slow political process, a question is what we could do to influence it. We have to figure out how to get moving forward.

It could be a research need to show that things like redesigned airspace will save emissions and be safer. It is the job of research to show this and then communicate to policy makers.

III – Remaining Unknowns / Things Undone

What was not communicated in this forum that would have made things more effective is the degree to which the above issues are being researched at present and their perception on possible gaps in the research. It may be that governments are already investing large amounts in the items listed above. What would be effective is an EU/US report out on what has been <u>useful</u> for aviation and perhaps what might require research more specific to ATM. What is needed is not necessarily more R&D, but more effective R&D. Need additional discussion as to whether to characterize the John Wayne Deep cutback as an ATM procedure or simply as a policy decision that affects a broader ATM system.

IV – Suggestions for Two Years from now

- The room may be better organized in a horseshoe for the environmental session. This could facilitate discussion.

- It is difficult to make the link between the broad array of research and what is ATM in 90 minutes. This session gave a good introductory overview and might have been part 1 of the overall seminar. After an initial group discussion on the broad context of environmental research and issues that occurs internationally, the group could then focus on the issues that appear most directly related to ATM.

- The general feel of comments are to avoid stove-piped paradigms, we must be comprehensive for environmental effects. An idea for this event for next time would be to have the financial and environmental pulled together, say one after the other. That may be a way to integrate environment with the monetized efforts currently underway today.