

## **Session Reports - Summary**

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### **Introduction**

This is the summary of the session reports of the Eighth USA/Europe ATM R&D Seminar, which was held in June/July 2009 in Napa, CA, USA.

The seminar was the eighth in a series which started 1997 in Saclay, France, and has since been held alternately on each side of the Atlantic. From 40 invited papers and 60 delegates at Saclay, the seminar has grown to its current size of between 65 and 70 refereed papers (out of some 140 submitted) and around 200 delegates. The objective of these seminars has remained the same since the outset: to create and reinforce working and personal relationships between leading experts and researchers in ATM R&D. This should then allow sharing of results, development of consensus on major issues, recommendations on implementation and the direction of future research.

As already for the Barcelona seminar, the common frame for the sessions in this seminar was given by the multi-billion ATM R&D programmes on both sides of the Atlantic, NextGen and SESAR. These programmes envisage for 2020 and beyond a substantial change in the ATM system which should lead to improvements in safety, efficiency, capacity and environmental sustainability – improvements which still require a non-negligible amount of research before becoming operational reality.

The first seven seminars saw at the last day (amongst the best paper awards and final speeches) the presentations of the rapporteurs explaining what happened in their sessions. This allowed each participant, who could see due to the three-track-organisation only one third of the presentations, to understand what happened in the other tracks. This procedure, which became over the years somewhat tedious, was replaced for this conference by four Special Topic Sessions and it was decided to publish the Session Reports after the conference on this seminar web-site.

In the following you will find

- some high-level recommendations as to the future of the seminar itself and the USA-European ATM R&D agendas (note that the list is by no means exhaustive);
- the seminar proceedings which give a brief introduction to each session and try to highlight some interesting and relevant research initiatives, and,
- some information on the four special topic sessions and the survey results.

### **General Recommendations**

Over the years, the seminar has confirmed its role as the important conference on ATM research. It is an international event, with more and more participants from outside Europe and USA, and FAA and EUROCONTROL should make all efforts to maintain and further develop this conference.

Structure and content were generally well appreciated by attendees. There are however issues, sometimes recurring, which the programme committee of ATM2011 should consider. A non-exhaustive list of general recommendations follows below, for more detailed and theme-related recommendations readers are invited to refer to the various session reports.

- A recurrent issue is the absence of important stakeholders such as airlines and airports (industrial participation has become better over the years). This situation, by the way not particular to this conference, should be reflected when preparing the invitations to the next event.
- The definition of session themes needs careful consideration. It could be questioned for example if “finance & policy” has more relevance for SESAR/NextGen than “air-ground integration” or “advanced controller tools” which were missing in the Napa seminar.
- With the advances of SESAR and NextGen and the imperative that both concepts of operations should “fit”, more US/EU co-written papers on critical issues should be solicited.
- There is an increasing problem with long-term and innovative research papers (see e.g. the Innovative ATM Concepts’ or the Airport session report). Research organisations should be encouraged (through the committee members) to provoke more out-of-the-box thinking.
- Research on security seems to be, in terms of received papers, still marginal.

- Safety research needs to take more and more interactions between humans (in different functions and locations) and systems into account and should therefore invite explicitly papers which discuss multi-disciplinary approaches towards safety.
- The relative “exclusive” nature of the event, a recurring issue, should be re-considered.
- Finally, the the web as communication tool should be improved.

## **Proceedings**

The following paragraphs present an introduction to the Session Reports. Their intention is to list the main conclusions of the reports and thus to encourage the reader to study the full report. They are particularly important for authors who prepare a paper for the next seminar and who should fully understand the content of the session in question, its highlights and the rapporteurs’ recommendations. The full reports are available on these pages !

**Dynamic Airspace and Capacity Management:** The four papers presented results which can be used for sector planning and dynamic airspace usage. There is a lot of progress in this field, in particular in the US where airspace management seems to play a more important role than in Europe. The overall impression is that the field of dynamic airspace usage is now maturing to a level where it can be applied in developing tools for airspace design and sector planning.

**Environment Impacts in ATM Design and Operation:** Two of the four papers were on modelling analyses that quantified ATM environmental performance metrics. Key messages from these analyses underlined that aviation environmental consequences for noise, air quality pollutants, and greenhouse gases are interdependent and that mitigation of environmental consequences pose a challenge as ATM improvements are implemented under both NextGen and SESAR programs.

The remaining two papers focused on FAA’s Aviation Environmental Design Tool (AEDT). FAA’s approach to modelling 4-D aircraft performance and simultaneously deriving noise, emissions and fuel burn implications will be critical to quantify the environmental performance of future ATM scenarios.

**Continuous Descent Approaches:** New in these seminar series, this session, quite narrow in scope, saw six presentations on this timely subject. Three papers discussed directly CDA-related issues such as an analysis of CDA benefits and impacts, Controlled time of arrival (CTA) management for dual threshold operations and CDA, and, a human-in-the-loop experiment of an airborne spacing concept supporting CDA. A fourth paper presented analyses and results of CTA flight trials, and, the last two papers dealt with the feasibility and benefits of a CDTI-based separation procedure for single runway arrivals and departures, and, flight-deck based merging and spacing during en-route descent. (Note that there is no session report available.)

**Separation:** Four papers addressed topics such as air/ground operations under ground-based automated separation assurance, the estimation of separation buffers to cope with wind-prediction errors, how changes in contributing factors (aerodynamic, human, risk etc) could affect current separation minima standards, and, the development of a new wake turbulence re-categorization. It is worth noting that the two US, one European and one mixed paper presented methods and results which are applicable both under NextGen and SESAR.

**Trajectory and Queue Management:** The Trajectory and Queue Management theme was also new for this conference. Clearly, the management of trajectories and queues is directly relevant to trajectory-based operations, a core element to both NextGen and SESAR concepts of operation. In general, the five papers in these sessions discussed the ability to identify, mitigate, quantify, and predict trajectory errors. In addition, trajectory flexibility and the application of queue management were explored.

The research in this field, essential element for SESAR and NextGen concepts of operations, seems to progress rapidly and to reach maturity. An issue, shared by researchers on both sides of the Atlantic, remains nevertheless the incorporation of weather phenomena when measuring and predicting trajectories. Access to more data from more organizations, including airlines, would assist in obtaining more reliable results.

**Network and Strategic Flow Optimisation:** This session had eight papers with a range of timeframes from the nearer-term through the far. All the papers have a heavy emphasis on trajectories and the use of trajectories for network management and strategic flow. Trajectories are used to establish overall plans based on aggregate demand to the management of the flow within the network by establishing individual flight trajectories that meet a strategic goal. All but one paper focused on strategic flow. Of the other 7 papers all but one dealt with the mechanics of establishing the model of the flow and the allocation of flights to the flow.

What is interesting is the shift almost entirely to airspace. The traditional ground delay program papers from the US do not appear here as the more interesting research questions become management of demand to capacity in the air. There is of course still a split on emphasis. The US papers' emphasis is on the off-nominal constraints while the European focus is on daily operations and en-route capacity across the airspace. Still it is clear that much of this research can be applied to either situation.

**Weather:** The six papers in this session covered a wide range of different subjects, two of them were concerned with en-route and four with terminal weather. Equally wide-ranging were the "customers" for these papers, reaching from strategic traffic flow planners to pilots. Also, while covering different topics, the papers outline a succession of different steps leading to developments of working decision support tools.

Finally, there is still a predominance of US papers in this field (five out of six papers came from the US), which can be explained through the stronger impact of convective weather on air traffic and on ATM. But weather research is also undertaken in Europe and other parts of the world and the recommendations in the session report provide some ideas to attract these researchers to the conference.

**Innovative ATM Concepts:** This theme was introduced for the Santa Fe conference (as New Concepts) and continued under the current title from the Baltimore conference onwards. It always suffered a bit from the fact that papers were placed under this theme because there was no other place for them, and, Napa was, with two papers, no exception to that dilemma. Three of the other four papers dealt with innovative research whilst the fourth presented a new approach to security.

The security theme was present in the calls for papers since 2003 but only 6 years later (and for the first time) one security paper was accepted and presented – how to encourage stronger submissions ?

The three remaining papers with a longer term horizon for implementation re-enforce the trend to the near-term which can be observed since some seminars. Whilst positive on one hand – research makes its way to implementation – it indicates that not enough effort/budget is spent for the longer term, ie the time after SEASR and NextGen.

**Finance and Policy:** New as a stand-alone theme, three papers were presented in this session. Despite the fact that they were only marginally relevant for SESAR and NextGen, submission of more papers on this subject should be encouraged for future seminars to reflect the importance of topics including fee structures and charging policies, the use of market mechanisms to influence user behavior, resource allocation policies (e.g. how to prioritize access to various system resources) and the relationship between access policies and system behavior.

**Innovative Methods for Safety Assessment:** The three papers of this session addressed research questions of high relevance for NextGen and SESAR. They included a macroscopic approach towards safety assessment, the need to assess the many possible alternatives in the NextGen/SESAR ConOps, and, the need to adapt established aircraft behaviour models for use within recent and future NextGen/SESAR safety analyses. For future seminars, the critical link to safety analysis is to take human factors, organisational aspects and emergent behaviour well into account.

**Human Factors:** The human factors theme is well established since the very beginning of this conference series and a first session with this title appeared in the 2000 seminar in Napoli. The seven papers showed advancements compared to the ATM 2007 Seminar in terms of broader scope and clearer path for transition of research to implementation. They reported advancement of human factors in system safety and safety climate, in methods for assessing human factors benefits including use of operational demonstrations, and effective use of methods for cognitive modeling and human-in-the-loop simulation.

Significant achievements were shown in furthering attention to safety culture and organization climate. An issue shared by European and U.S. human factors communities involves building the human factors business case to justify investment in human factors research and system development.

**ATM Performance Measurement and Management:** The session on ATM performance measurement and management saw five papers with quite a wide range of topics being presented. It was interesting to note that, probably contrary to most of the other sessions, none of the papers directly addressed a new concept to enhance future operations. Instead, they addressed the understanding of ATM performance and how that understanding could be used to work on future improvements.

While the overall maturity in understanding ATM performance delivery appears to be slowly increasing, it is also clear that the link between the observable external performance of the ATM system and its internal processes is still rather weak. The better we are able to relate the way ATM works to the performance it delivers, the better we will be able to manage and improve that performance to our needs.

**Integrated Airport / Airside Operations:** In the airport session 7 papers were presented. The overall impression of the presented topics was that sometimes niches are (successfully) investigated and that no substantial progress is made anymore on the core issues. On the other hand the scope of the airport topic is becoming wider, what is good because the integration of all different results from the previous research have to be tied together. Maybe the next seminar should give a technical airport R&D architecture overview in the call for papers and ask for results concerning a set of most wanted topics. On the other hand free innovative research seems to be lacking, neither in the airport track nor in the innovation track there were any breakthrough results presented.

### **Special Topic Sessions**

An innovative element of the Napa seminar was the introduction of four Special Topic Sessions which replaced the session reports given by the rapporteurs and which were held in parallel on the last day.

They were introduced to allow a more intensive discussion with all participants on four quite important topics, important for a common understanding of state-of-the-art and the progress respectively research needed.

The themes of these sessions were:

- Trajectory Based Operations (there is unfortunately no report available)
- Environment
- Human Factors and Safety
- Airport Management (a list of research issues is available)

The reports are available on these pages.

### **Survey Results**

As usual, a questionnaire was distributed after the seminar with six questions on the organisation and five on the technical content. There was feedback from some 40% of the participants (69 answers).

In general, the seminar nearly fully met the expectations of the participants, some (or in one case full) disagreement with organisational or technical issues was never higher than 6% (four answers). The areas where the "full agreement" was less than 50% were the session themes (36%), the technical content (43%) and the special topic sessions (39%).

The detailed results are available on these pages.