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Papers & Analysis

The session on ATM performance measurement and management saw five papers with quite a wide range of topics being presented. The one thing they all had in common however is that by making ATM performance measurable it creates a better understanding and better communication between those parties that are involved in (continuously) improving that performance. This is true when it comes to current day operations but also when addressing any future concept still under development.

Paper 73, Measurement of the quality of Traffic Orientation Schemes regarding flight plan efficiency, presented by Hartmut Fricke, TU Dresden.

This European paper, resulting from collaboration between the Technical University of Dresden and Lufthansa Systems, was inspired by the increasing pressure to optimise efficiency of air transport. In a novel approach it studies the so-called Traffic Orientation Schemes (TOS) for the level of inefficiency they impose. The underlying study has particularly addressed the impact of the European TOS, as described in the Route Availability Document (RAD), on efficiency of flights. On the basis of a sample of flights between a set of European airports, and using the airline's flight plan scheduling software, a first analysis is presented of the additional cost incurred due to the flight planning restrictions described in the RAD. Overall the imposed inefficiency may have appeared relatively low compared to common assumptions, and there were some interesting differences between traffic from different airports. This work is still in its early stages as it could be extended to other TOS, and go into more details, in order to identify more specifically which elements of a TOS could be improved to minimise inefficiencies.

Paper 17, Modelling flight delays and cancellations at the national, regional and airport levels in the United States, presented by Banavar Shridar, NASA Ames.

The principal performance metrics being studied in this paper using a number of mathematical models are variants of the Weather Impacted Traffic Index (grid WITI, E-WITI and NWX). The refinements of this index of the amount of traffic impacted by weather have been developed over the past few years and have also been presented at previous ATM seminars. In this paper analyses are performed at three levels of the NAS of the quality of the WITI index as a measure of delay generated by weather phenomena using two types of linear regression models and a neural network model. All models indicate a fairly good correlation between the various Weather indices and traffic delays and cancellations, with the neural network models consistently performing slightly better. Seasonal variations generally indicate a better predictive capability in the summer months, whereas for a small number of airports the predictive performance is reduced, probably due to other traffic complexity factors that impact traffic also on good weather days. Discussions following the presentation indicated that the availability and predictive capability of the various WITI indices support the understanding between the FAA and the meteorological information provider in trying to improve the quality of the forecasts for ATM purposes.

Paper 115, US/Europe comparison of ATM-related operational performance, presented by John Gulding, FAA.

For some 10 years EUROCONTROL and the FAA have now been working on trying to compare ATM performance in both contexts and to understand the underlying differences that contribute to different overall performance. At the last ATM seminar a similar paper was presented aiming at comparing cost efficiency performance between the FAA and European ANSPs. This time this joint EUROCONTROL/FAA paper addresses general operational performance. The challenge in this kind of comparison is always to compare like with like. The paper indicates that while certain system characteristics are quite similar (e.g. size of geographical area, number of controllers employed) the performance of the systems is quite different. At the basis of these performance differences appear to be different approaches to in particular flow management and departure management. In the US flow management is particularly applied when airports get saturated and it is effectuated by applying Miles-in-Trail (MIT) constraints extending over many sectors and even centres. Ground delay of departing traffic is rather an exception. With airline performance being published in terms of on-time leaving the gate rather than taking off, and in the absence of departure management driven by flow constraints, there is at many busy US airports a regular rush to get off the gate and then to queue towards the departure runway. This behaviour can be observed in the paper when looking at the US statistics for taxi-out delays and departure on-time performance. In Europe, where one of the CFMU's main roles is to keep traffic on the ground when necessary to protect en-route sectors from overloading, flights usually only leave the gate once they can proceed without too much delay to the runway for take-off. While on-time departure performance may hence be lower in Europe than in the US, taxi-out delays are also much lower and more

predictable. In terms of en-route efficiency the US system appears to achieve better performance when assessing the 'direct route extension' as a metric. The 'behaviour' of aircraft operators also appears to contribute to different observed performance between the US and Europe. A clear example is the increase in scheduled flight times in the US in an apparent move to maintain on-time performance with increasing (departure) delay variability in the system. At the same time aircraft size has shown a downward trend in favour of schedule frequency. The New York airports appear to be an important factor in US ATM performance. While the paper starts to address the difference in ATM performance between the US and Europe, it does not yet manage to identify fully which operational characteristics are at the true root of a significant difference in operational throughput (US +80% flight hours controlled with same number of controllers) between both systems.

Paper 121, Validation of Runway Capacity Models, presented by Amy Kim, University of California, Berkeley.

This fourth paper of the session, a result of PhD work of a student at UCB, addresses two specific US airport capacity models, 'Airport Capacity Model (ACM)' and 'Runway Simulator (rS)' and aims to validate their capability to accurately predict airport capacity (actually airport throughput) for two example airports (LAX and SFO). The application of a number of advanced mathematical/econometrical models to significant amounts of data appears to be an important driver for this PhD work. The analysis for the two airports show that generally the 'rS' model does a better job at predicting airport throughput than the ACM model, while both models have a tendency to over-predict higher throughput values. The general applicability of the applied validation method, its dependency on particular data only available in the US context, and the possibility for generalisation of results for two airports so far, leave some questions open as to whether this approach can indeed become a standard for airport capacity model validation.

Paper 102, Management of ATM performance in operational concept development and validation: a case study, presented by Jelmer J. Scholte, NLR.

As indicated in the introduction to this report, the possibility to make ATM performance tangible allows it to be used in processes of improvement. Another area where understanding ATM performance is very important is in the development and validation of new concepts. The final paper for the session presents this aspect of ATM performance measurement and management. Using the case of developing safe runway crossing procedures at Amsterdam Airport Schiphol the team from the National Aerospace Laboratory NLR and ATC The Netherlands present in their paper how results of safety validations were used in a series of development iterations of a new concept for taxing traffic to cross an active runway. The main point that the paper makes is that validation of a new concept (whether it is from a safety perspective or for another KPA) needs to give insight into how the observed performance is generated and, if that performance is considered insufficient, how it can possibly be improved. Most of the time 'validation' exercises are actually 'invalidating' a new concept, leading to its adaptation until, hopefully, it ultimately can be validated to meet the requirements

General Aspects

Overall the ATM Performance measurement and management session was well attended with between 40 and 60 participants at any time. The presentations generally led to a good number of questions and were followed by discussions during the breaks.

It is 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 address the understanding of ATM performance and how that understanding can 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.