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Book of Abstracts
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Controller Support for Time-Based Surface Management

presented by Andreas Hasselberg, DLR (andreas.hasselberg@dlr.de) and Isabel Metz, DLR (isabel.metz@dlr.de)

This paper reports first results from a workshop to assess the feasibility of a new method of tool-supported time-based surface management. Using high-fidelity human-in-the-loop simulations, ground controllers had to manage traffic in adherence to time-based surface trajectories while being supported by a surface management system prototype and a departure management system prototype. Controller feedback was gathered and compared to a baseline with standard operational procedures and without any decision support system. It was found that a considerable amount of comments were favourable to the presented concept of time-based surface management and the surface management system’s prototype human-machine-interface. Especially the presentation of planned routes was appreciated. However, a higher stability and reliability of optimized surface management plans, higher safety margins and less replanning at short notice were requested. Furthermore, possibilities to set additional remarks at the aircraft’s label and a more intuitive display of advisories were desired.

Optimizing AMAN-SMAN-DMAN at Hamburg and Arlanda airport

presented by Carlo Mannino, SINTEF (carlo.mannino@sintef.no)

Air Traffic Management tries to provide efficient and safe movement of airplanes at and near the airports, a complex task normally divided into Arrival, Surface and a Departure Management Problem. These problems are all tightly connected and should be seen and solved as one. Generally the airports handle them independently, which prevents the needed perspective to ensure good global solutions are made. In this paper we present an integrated approach to the overall problem along with an optimization algorithm that heuristically decomposes the problem so routing, sequencing, and conflicts resolution are carried out in subsequent stages. Our approach has been validated in experiments on Hamburg airport, where we showed remarkable improvements in punctuality and taxi times compared to the expert controllers. Here we also describe new extensions to our model for our upcoming Arlanda airport experiment and interesting future paths to take.

Results from SESAR Exercise at Hamburg Airport: Detection of Conflicting ATC Clearances

presented by Karsten Straube, DLR (Karsten.Straube@dlr.de)

One of the most serious safety concerns in air traffic control are runway incursions. A runway incursion is defined by International Civil Aviation Organization (ICAO) as “any occurrences at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft” [1]. Traditional Advanced Surface Movement Guidance and Control Systems (A-SMGCS) level 2 safety systems detect runway incursions and potential collisions. The subsequent alerts to controllers often require immediate reaction. A new, additional safety net for tower runway controllers was developed to provide longer reaction times for certain kinds of imminent runway incursions. This new safety net detects if controllers give a clearance to an aircraft or vehicle contradictory to another clearance already given to another mobile. The new safety net concept, developed in context of SESAR, was tested in a shadow mode validation exercise at the operational environment of Hamburg Airport (Germany). Operational feasibility was tested in order to clarify if operational requirements in terms of usability are fulfilled. At the same time operational improvements regarding safety were studied e.g. if the new safety net detects all defined conflicts. A data logging was made to measure reaction time of the developed Conflicting Air Traffic Control Clearances (CATC), system in interaction with the Electronic Flight Strips (EFS) system.
In Search of Positive Emergent Behaviour in Trajectory Based Operations  
*presented by Henk Blom, NLR (blom@nlr.nl)*

Thanks to decades of evolutionary developments, within conventional air traffic control, the collaboration between the planning controller and the tactical controller has been optimized. Under the forthcoming paradigm shift to Trajectory Based Operations (TBO), there is need for a novel optimization of the collaboration of these two layers. Through agent based modelling and simulation it has recently been shown how these two layers can collaborate remarkably well under very high en-route traffic demand within an airborne self separation TBO concept. The aim of this paper is to make a further study of the collaborative behaviour between the layers of this airborne self separation TBO concept, as a preparation to optimizing the collaboration between similar layers in SESAR’s TBO concept.

The Reasonable Effectiveness of Data in ATM  
*presented by Massimiliano Zanin, Innaxis (mz@innaxis.org)*

Data Science has recently emerged as a fundamental paradigm for understanding the characteristics and dynamics of many real systems, enabling innovative approaches in such different scientific fields as astronomy or sociology. In spite of this success, far less attention has been devoted to the analysis of historical data in air transport and ATM, mainly due to the difficulties inherent the study of private and heterogeneous data sets. In this contribution, a simple case study is proposed, aimed at demonstrating the advantages of using such approach, especially in terms of novel knowledge that can be extracted even from basic analyses. Two different techniques are here compared, both aimed at assessing traffic densities: a classical one based on sectors, and a novel one based on multiple concentric circles. Results indicate that the latter yields more knowledge about the system, specifically about the appearance of safety-related events. More generally, this test case confirms the importance of going beyond human-based analysis, in order to listening to the data.

Modelling of Automation Degradation: a Case Study  
*presented by Alberto Pasquini, Deep Blue (alberto.pasquini@dblue.it)*

This paper presents a modelling approach that has been developed within the SPAD project for analysing consequences of automation degradation in large socio-technical systems. This modelling approach involves two different notations: FRAM [6] and HAMSTERS [2], [8]. In previous work [7] we have proposed a synergistic approach integrating these two views for describing the evolution of system performances under automation degradation. The focus of the paper is on how the outcome of the models can be integrated to analyse system behaviour. After describing the principles of such integration we exemplify it by using a standalone ATM simulator, and analysing the possible degradations of a system for managing unmanned aircraft (RPAS).

Agent-based Modelling for Analysis of Resilience in ATM  
*presented by Sybert Stroeve, NLR (stroeve@nlr.nl)*

The ability of the sociotechnical ATM system to adjust its functioning to changes and disturbances, and thereby sustain required operations is a key asset, in which human operators play crucial roles. Previously, we have shown that agent-based modelling can effectively support analysis of the safety implications of the behaviour of interacting human operators and technical systems in their effort to deal with disturbances in ATM. In this paper we provide an overview of a library of model constructs for agent-based modelling in ATM and we show the integration of these model constructs. We show that the library of model constructs can effectively model a large set of hazards in ATM and we discuss ways towards effective use of these models for the analysis of safety-focused resilience.
Resilience Engineering in Air Traffic Management: Increasing Resilience through Safety Assessment in SESAR

*presented by Rogier Woltjer, Swedish Defence Research Agency (rogier.woltjer@foi.se)*

This paper describes the approach taken to develop resilience engineering guidance for safety assessment of functional changes in air traffic management (ATM). It summarizes the process of deriving resilience principles for ATM, originating from resilience engineering concepts and transposed into ATC operations. These principles are the foundation for a method incorporating resilience engineering into safety assessment methodology (specifically the SESAR Safety Reference Material), and for providing guidance for various ATM design processes. The methodology was validated via a test case on the i4D/CTA concept. Operational examples from the application of the developed guidance to the i4D/CTA concept are provided. Initial evaluation of the guidance suggests that it 1) surfaces new issues not addressed explicitly in safety assessments or project discussions; 2) is less formal and more qualitative than traditional methods and brings the discussions of these issues closer to operational practice; and 3) provides a vocabulary and documentation means of project discussions on resilience not currently documented. The guidance thus seems to facilitate an interweaving and systemic integration of operational, management, safety, and human performance aspects, while enriching the description and assessment of emergent properties and functional changes in ATM.

Aircraft Trajectory Prediction in Random Atmosphere

*presented by Christophe Baehr, Météo-France/CNRS (christophe.baehr@meteo.fr)*

We are interested in aircraft trajectories seen as stochastic processes. These processes evolve in an unknown atmospheric random environment. As several aircraft parameters are unknown such as true airspeed (TAS) and wind, we have to estimate them. To this end, we suggest to use ensemble weather forecasts, which give different scenarios for the atmosphere, with a system of trajectory predictions. In this way using the air-traffic data, we evaluate the likelihood of each element and we construct a random weather environment organized by the element weight. To get this result, we use sequential Monte Carlo methods (SMC) in the special context of random environment. The algorithm called island particle filter allow to estimate both the likelihood of the meteorological forecasts and the aircraft parameters.

Modelling and Evaluation of Automated Arrival Management Considering Air Traffic Demands

*presented by Michael Schultz, TU Dresden (schultz@ifl.tu-dresden.de)*

This paper describes the major results of the UTOPIA project. UTOPIA is part of the SESAR Work Package E program, which is addressing long-term and innovative research for the Single European Sky. One of the greatest challenges that the future ATM system will need to face in the next decades is the integration of new airspace users and the continuous increase in delegating capacity and safety critical traffic management functions to automated systems. The accommodation of these new airspace users, which will have to coexist with conventional users, a widely reorganized airspace and the increased level of automation will necessarily need a paradigm shift with regard to the trajectory management functions. The objective of the UTOPIA project is to provide a better understanding of essential trajectory management functions to efficiently manage heterogeneous traffic considering the increasing presence of autonomous ATM systems. In particular, UTOPIA focuses on data models, synchronization requirements and algorithms needed to ensure the safe management of merging traffic in an extended terminal maneuvering area, executed by an autonomous arrival management function acting as separator. The converging flows of traffic that will be studied comprise heterogeneous airborne systems, in particular, advanced and legacy flight management systems, representing airspace users with different synchronization capabilities.
The Defragmentation of the Air Navigation Services Infrastructure: Legal Challenges of Virtualisation

presented by Francis Schubert, skyguide (francis.schubert@skyguide.ch)

The defragmentation of the European ANS system is leading to a fundamental change of the model for service provision. In particular, open architecture systems are slowly leading to a virtualisation of the technical infrastructure. While this development will improve the performance of the European ANS system, it also raises a number of legal issues, genuine or perceived, that will need to be addressed.

The Effect of Strategic Conformance on Acceptance of Automated Advice: Concluding the MUFASA Project

presented by Carl Westin, CHPR (Carl@chpr.nl)

Whereas there has been a great deal of empirical and theoretical work into ATM automation in relation to reliability and traffic complexity, much less has been done in the area of similarities and differences between human-machine interaction and human-human interaction. Paradoxically, this could in the future become the most critical issue of all, as mismatches between human and machine could threaten acceptance of advanced automation. Through a series of human-in-the-loop simulations, the work described in this paper examined the interacting effects of air traffic complexity and strategic conformance, i.e., the fit between human and machine strategies, on automation acceptance in a conflict detection and resolution task. An experiment with 16 professional air traffic controllers showed that strategic conformance is a potentially important construct in human-automation interaction. Conformal resolution advisories were more accepted, led to higher controller agreement, and also reduced response time to proposed automated advisories. The results also indicated, however, that participants disagreed with conformal advisories in close to one quarter of the time. This might be evidence of “dispositional” automation bias, a reluctance to use automation under any circumstance.

Experimental Evaluation of a Joint Cognitive System for 4D Trajectory Management

presented by Rolf Klomp, TU Delft (R.E.Klomp@tudelft.nl)

Effective joint human-automation coordination is essential in order to support the central role of the human operator in foreseen future trajectory-based air traffic operations. The SESAR WP-E project C-SHARE aims to achieve this by taking a Cognitive Systems Engineering approach, based upon accomplishing joint human and automation cognition through a shared representation of 4D-trajectory management. In foregoing research, a work domain model and a joint human-machine interface has been developed to support the human operator in the task of en-route 4D trajectory re-planning. This paper presents the findings of two experiments that aimed to determine the effect of both the initial level of traffic orderliness (i.e., structured versus unstructured traffic) and the scale of perturbations acting upon the airspace (e.g., number of conflicts and restricted areas) on the overall effectiveness of such a system. The findings of the experimental evaluation show that the C-SHARE approach to joint human-automation coordination in perturbation management is promising. Further, the experiment subjects accepted the tool and found it supportive for the task at hand, resulting in a manageable degree of workload during all experiment scenarios.

Automated Speech Recognition in Controller Communications applied to Workload Measurement

presented by José Manuel Cordero, CRIDA (jmcordero@e-crida.aena.es)

This paper is focused on the description of an Automated Speech Recognition system in Air Traffic Control environment and its application in the automated measurement of controller workload for demand and capacity balance purposes. For years there have been several
attempts to properly apply Automated Speech Recognition technologies in the ATC domain, but the results obtained have been quite frequently not positive enough. AENA, the Spanish Air Navigation Service Provider, started a project with the objective to develop a prototype able to recognize voice communications from the controller to the pilot and integrate it on a Real-Time Simulator, closing the loop by generating the answers from the pseudopilots. After several iterations and testing many different technological and commercial Speech Recognition solutions (most of which proved to be inefficient for ATC communications), an ad-hoc system able to successfully recognize the content of the controller communication has been developed, being able to automatically transcribe it and determine the associated controller event. This system is currently obtaining high recognition rates, which have allowed its integration with real ATC communications for automated controller voice events recognition, that are later used for automated controller workload measurement. This innovative application of Speech Recognition systems to the ATC operation voice communications will be described in this paper.

Supporting Arrival Management Decisions by Visualising Uncertainty

presented by Maarten Tielrooij, TU Delft (m.tielrooij@tudelft.nl)

To balance the flow of inbound aircraft and the capacity at airports, more and more Air Navigation Service Provider (ANSP) use Arrival Manager (AMAN) systems. These provide decision support to sequence managers in planning inbound flights to optimize capacity, flight efficiency, and predictability. However, few systems support the planner in taking all aspects of the AMAN process into account. Secondly, all AMANs are based on predictions of an aircraft’s arrival time. Due to various disturbances, the error of these predictions grows larger with the prediction horizon. With increasing horizon, the quality of the system support therefore decreases. This paper proposes and tests a number of enhancements on the commonly used timeline diagram that provides support at multiple levels of abstraction and takes into account the uncertainty of the arrival time, allowing controllers to make the uncertainty a parameter in their decision making process.

Understanding the safety-relevance of visual cue perception at a Surface Manager HMI

presented by Lothar Meyer, TU Dresden (meyer@ifl.tu-dresden.de)

Current procedures in Air Traffic Management are characterized by activities of all involved operators to obtain information required for the decision making. In particular, pilots and ATCOs decisions depend on reliable information, which, in case of failed information perception, have the highest degrees of severity. Besides voice communication, activities to perceive visual information are regarded as most critical to the provision of a reliable and authentic picture of the air traffic. Focusing on the migration from today’s concept of operations to higher levels of automation e.g. through the use of virtual control tower and A-SMGCS applications, the activities of operators visual information perception differ from proven patterns. Accordingly, the systematic identification of visual cues for safe decisions is needed for evaluation purposes of safety critical Air Navigation Systems. The availability of knowledge on required visual information is considered as pivotal to assess novel strategies and philosophies of HMI design as well as to conclude on the compliance on the Accepted Level of Safety. This paper follows a novel approach to analyze risks of design-related visual cue perception by the use of Human-In-The-Loop Simulations. It hence offers a predictive empirical approach to risk analysis for system evaluation in the system design phase. This proof-of-concept study evaluates the proposed approach at the example of a novel A-SMGCS Surface Manager HMI and the probability of runway incursion. A conclusion on the most risk-inducing visual cues could be exemplarily obtained by the use of open and closed-end questionnaires and novices acting as test persons. The contribution of eye tracking data analysis is also tackled.
Airport Slot Allocation: Performance of the Current System and Options for Reform

presented by Andrea Ranieri, ALG (aranieri@alg-global.com)

ACCESS (www.access-sesar.eu) is a research project within SESAR WPE which addresses demand and capacity management at congested airports, focusing on market-based mechanisms for the strategic allocation of airport capacity. Market mechanisms are expected to provide the right incentives for a more efficient use of the available capacity, but they also raise a number of concerns, from the potentially negative impact on airline operating costs to market failures. There is therefore a need for a comprehensive assessment of different market designs. In this paper we introduce some considerations about the conditions to be met by a performance framework to allow a sound comparative evaluation of different slot allocation mechanisms, we outline a preliminary proposal for a set of performance areas and indicators, and discuss the potential impact of different possible reforms of the slot allocation system.

A GIS-based Tool for the Estimation of Impacts of Volcanic Ash Dispersal on European Air Traffic

presented by Chiara Scaini, Barcelona Supercomputing Center (chiara.scaini@bsc.es)

Impacts of volcanic ash on air traffic have been reconsidered in the aftermath of the 2010 eruption of Eyjafjallajökull volcano (Iceland), which caused great impacts to the European air traffic network. We present a GIS-based methodology to estimate the impacts of tephra dispersal from explosive volcanic eruptions aimed at improving air traffic management in case of ash-contaminated airspace. We use the 2010 Eyjafjallajökull eruption as a case study with two main objectives: to introduce the methodology and to perform a posteriori analysis of the 2010 aviation breakdown. Modelling results of atmospheric tephra dispersal over Europe build upon a reanalysis dataset of meteorological and volcanological parameters. Given that there is still no consensus on thresholds of ash concentration that is critical for flight safety, the methodology takes into account several ash concentration values. Results are hourly tables and maps containing information on potentially affected airports and routes at different Flight Levels (FLs). This allows estimating impacts at a high temporal frequency. We also compute daily accumulated impacts for each FL. We compare our results with the 2010 impacts. Furthermore, advantages and disadvantages of this methodology are discussed and compared with similar existing tools. Finally, we underline possible improvements of the methodology and describe further work.

An Agent Based Model of Air Traffic Management

presented by Fabrizio Lillo, Scuola Normale Superiore di Pisa (fabrizio.lillo@sns.it)

The WP-E ELSA project aims at developing an empirically grounded agent based model that describes some of the stylized facts observed in the Air Traffic Management of the European airspace. The model itself has two main parts: (i) The strategic layer, focused on the interaction between the Network Manager and the Airline Operators and (ii) the tactical layer, focused on aircraft and controllers behaviour in Air Traffic Control (ATC) sectors. The preliminary results for the strategic layer show that when we have a mixing of re-routing and shifting companies, the overall satisfaction can even increase together with the number of flights, which is an effect not observed when only one type of companies is present. The preliminary results for the tactical layer indicate that when shocks in the system are confined in small areas, the interplay between the re-routing and change of flight level strategies may even lead to trajectory modifications that give smaller average delays as long as the number of shocks increases.

New Perspectives for Air Transport Performance

presented by Andrew Cook, University of Westminster (cookaj@westminster.ac.uk)

The average delays of flights and passengers are not the same. The air transport industry is lacking passenger-centric metrics; its reporting is flight-centric. We report on the first
European network simulation model with explicit passenger itineraries and full delay cost estimations. Trade-offs in performance are assessed using passenger-centric and flight-centric metrics, under a range of novel flight and passenger prioritisation scenarios. The need for passenger-centric metrics is established. Delay propagation is characterised under the scenarios using, inter alia, Granger causality techniques.

Preparing for an Unmanned Future in SESAR: Real-time Simulation of RPAS Missions

presented by Marc Pérez-Batlle, UPC (mpbatlle@ac.upc.edu)

The insertion of RPAS in non-segregated IFR airspace has a number of well defined research gaps that need to be addressed in order to progress forward with the integration. Especially in the ATM domain, the lack of flight experience for RPAS maintains the myth that they will impose an increased burden to ATCo, thus reducing the operational safety and airspace capacity.

The ISIS+ simulation infrastructure will allow the real time simulation of IFR operations by coupling a highly capable RPAS simulation system together with one of Eurocontrols ATC simulation environment called eDEP. Complex RPAS missions will be carried out under historic or forecast traffic obtained from Eurocontrols DDR2 database. Real ATC controllers can monitor the sectors of interest, while RPAS pilots can operate the simulated RPAS, and experienced pilots can operate the surrounding simulated IFR traffic. In all cases, voice communications, transponder and ADS-B, data-link, satellite induced latency, etc; can be reproduced as close to reality as possible. Overall ISIS+ will facilitate the reproduction of a variety of RPAS operational scenarios, assess its interaction with traffic controllers and surrounding traffic, and evaluate is any significant ATCo workload increase or capacity reductions occur for each selected concept of operation.


presented by Giordano Pola, University of L’Aquila (giordano.pola@univaq.it)

Detecting safety critical situations that may arise in the evolution of Air Traffic Management (ATM) systems is of primary importance in the analysis of their behaviour. The inherent complexity of ATM systems, typically involving a large number of agents, makes this analysis prohibitive today. Compositionality has been an effective way of tackling this problem. We present a compositional framework to accurately describe the behaviour of the agents operating in ATM scenarios and of their interaction. We then expose some results that reduce the computational effort required in detecting safety critical situations. Benefits from the use of this approach are illustrated on a future Terminal Manoeuvring Area operation design.

On Runway Capacity and Wake Vortex Safe Separation Distance (SSD)

presented by Luis Campos, Lisbon University (luis.campos@istl.ulis.pt)

The capacity of ATM is limited by the runway availability at airports. The number of take-off and landings from the same runway is limited by wake vortex separation distances. Currently the safe separation distances (SSD) are established by empirical rules using as sole criterion the classification of the leading and following aircraft into three weight categories “light”, “medium” and “heavy”. The Boeing B757 has been the subject of an exception to the rules increasing the separation distance on the basis of flight incidents; the Airbus A380 has been subject of an extended separation distance for “super heavy” aircraft as a safety precaution. The purpose of the present paper is to obtain a formula for wake vortex separation distances that involves a number of assumptions and simplifications, but does include more parameters rather than just the weight of the leading and following aircraft. The predicted SSD for pairs of typical light (Citation 500), medium (B737-300) and heavy (B747-400) aircraft are comparable to the ICAO minimum separation rules, suggesting that the latter are moderately conservative on the safe side. The special case of B757-200 is considered justifying the increased separation. In the case...
of A380-100, the special “ultra-heavy” rules appear to be excessively conservative highlighting the need for a more scientific approach to the subject, especially in cases where a long experience from the past is not available.

Changes in Aviation Organisations: Perspective and Retrospective Assessment for a Medium Size Airline

*presented by Carlo Cacciabue, KITE Solutions (carlo.cacciabue@gmail.com)*

This paper describes a methodology for the practical and straightforward implementation of risk assessment processes to be implemented as part of SMS and able to tackle real problems. The general features of a tool for risk assessment are identified. Then the actual flow chart of the methodology is presented and the stepwise procedure is discussed. Finally, three specific practical applications are presented that show how the methodology may be implemented in response to specific needs of an organisation.

Downscaling as a Way to Predict Hazardous Conditions for Aviation Activities

*presented by Adil Rasheed, SINTEF (adil.rasheed@sintef.no)*

The article starts with a brief description of the multiscale numerical terrain-induced turbulence prediction system developed and implemented at 20 Norwegian airports located in hilly areas. The brief description is followed by a quantitative description of the computational demand and robustness of the model. In the following section, results from the numerical model is compared against synoptic data obtained from airports and Flight Data Recorder (FDR) of some aircrafts. Finally, a strategy to communicate the predictions of the numerical tool to the Air Traffic Management in real time is explained. The tool has been approved by the Norwegian Civil Aviation Authority (NCAA) and has been fully operational since 1st July 2009.

Intelligent Modelling of the Air Transport Network: Impact of Innovative Prioritisation Strategies on Delay Patterns

*presented by Andrés Arranz, ISDEFE (aarranz@isdefe.es)*

The SESAR WP-E project NEWO (emerging NEtwork-Wide Effects of inventive Operational approaches in ATM) has explored network-wide performance and delay propagation phenomena in the Air Transport Network linked to specific flight prioritisation strategies. To this end, NEWO has used innovative modelling and simulation techniques by means of a tool conceived for analysing multi-component systems with complex interactions. The tool used, ATM-NEMMO, exploits a mesoscopic approach where probabilistic methods account for Air Transport Network microscopic details without losing the macroscopic and strategic view of the system. This has allowed producing an in-depth analysis of network wide delay performance in different reference scenarios. This paper outlines the methodology that has constituted the basis for analysing network wide impact of flight prioritisation criteria as well as the analysis of the overall research results, combining both the simulation outputs and the feedback from Stakeholders.

Classification and Argumentation Maps as Support Tools for Liability Assessment in ATM

*presented by Giuseppe Contissa, European University Institute (Giuseppe.Contissa@EUI.eu)*

In this paper we present an application of argument maps for assessing the liability impact of ATM systems. Such application has been recently developed within the ALIAS Project (Addressing the Liability Impact of Automated Systems). Such maps are used for presenting legal concepts and norms to lawyers and non lawyers (engineers, software developers, human factors specialists and other technical personnel), within the cooperative design and assessment of new technologies for ATM.
Collaborative Learning & Serious Game Development

*presented by Siobhan Corrigan, Trinity College Dublin (siobhan.corrigan@tcd.ie) and Anneloes Maij, NLR (Anneloes.Maij@nlr.nl)*

This paper presents the overall Learning, Training and Mentoring Framework as developed as part of the MASCA project. The key focus of the framework is on the establishment of a collaborative learning framework and an integrated learning package that focuses on supporting continuous performance improvement and learning (competency and capability at all levels) and ensuring that this overall learning is fully aligned to the strategic blueprint of the organization. One of the key outputs of the Learning, Training and Mentoring Framework was the development of a Serious Game called Skyboard. The development of Skyboard was based upon a training needs analysis and an iterative development and implementation approach at a large airfield. The research found that Skyboard was an effective means of enhancing communication, collaboration and decision making across intra-organizational agencies which had to collaborate in order to implement a cross-Agency change initiative. This paper includes an overview of the supporting learning theory that has emerged from the MASCA project.

A Case Study in Resilience and Disruption Management by Airline Operations Control

*presented by Soufiane Bouarfa, TU Delft (s.bouarfa@tudelft.nl)*

The resilience of the current air transportation system is implicitly tested around the globe on a regular basis. Each day of operation, the system is perturbed by disturbances of different nature ranging from severe weather conditions, through airport congestion, up to an aircraft mechanical failure. In most of these cases, humans operating at the sharp edge assure efficient and safe air transportation amidst various uncertainties and disturbances. Motivated by the need to understand such a human-invoked resilience, this paper explores a multi-agent systems approach to model part of the socio-technical air transportation system. The focus is on Airline Operations Control (AOC) where decision-making by the human operators facilitate disruption recovery. In particular, the paper integrates advances in research on coordination to understand its nature in AOC.
List of Posters

1. ERAINT – Evaluation of the RPAS-ATM Interaction in Non-segregated Airspace
   - Enric Pastor
   - enric@ac.upc.edu

2. Correlation Analysis between TMA Entry Points and Delay
   - Fulya Aybek
   - faybek@anadolu.edu.tr

3. An Analytical Model for Capacity Calculation in Single Runway System
   - Serkan Bayar
   - serkanbayar@anadolu.edu.tr

4. Amplify ATM Teamwork with Automation
   - Billy Josefsson
   - billy.josefsson@lfv.se

5. ACF - Airport Capacity Forecast
   - Henk Hesselink
   - Henk.Hesselink@nlr.nl

6. The Endless Runway
   - Henk Hesselink
   - Henk.Hesselink@nlr.nl

7. RobustATM – Robust optimization of ATM planning processes by modelling of uncertainty impact
   - Manu Kapolke
   - manu.kapolke@fau.de

8. AEROGAME
   - Dennis Nieuwenhuisen
   - Dennis.Nieuwenhuisen@nrl.nl

9. ACCCHANGE
   - Martina Ragosta
   - martina.ragosta@tmleuven.be

10. A multi-modelS based approach for the analysis and modelling of usable and resilient partly autonomous interactive systems
    - Dimitris Kolovos
    - dimitris.kolovos@york.ac.uk

11. Demo: The COMPASS Early Safety Warning System
    - Nataliya Mogles
    - n.m.mogles@vu.nl

12. Agent-Based Simulation of Complex Aviation Incidents by Integrating Different Cognitive Agent Models
    - Sara Silvagni
    - sara.silvagni@dblue.it

13. SPAD Demonstrator
    - Riccardo Herranz
    - ricardo.herranz@nommon.es

14. SATURN
    - Lorenzo Castelli
    - castelli@units.it

15. Data-driven Modelling of Network-Wide Extension of the Tree of Reactionary Delays in ECAC Area
    - Guena Itxebarria
    - itxebarria@isdefe.es

16. Resilience potential and early warnings for Air Traffic Management in case of system degradation through Enterprise Architecture (SCALEs)
    - Paola Tomasello
    - paola.tomasetto@dblue.it

17. ALIAS II: extending the research on liability aspects of automated technologies
    - Andrew Cook
    - cookaj@westminster.ac.uk

18. ComplexityCosts
    - Jacob Cheung
    - jacob.cheung@metoffice.gov.uk

19. IMET - Investigating optimal approach for future trajectory prediction (TP) systems to use METeoreological uncertainty information
    - Fabio Massacci
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21. CASSIOPEIA
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22. MoTa: Modern Taxiing
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24. A Particle Filter-based tool for UAS Collision Detection
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25. Sharing of Authority in Failure/Emergency Condition for Resilience of Air Traffic Management
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26. ProGA
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28. ATM Innovative RPAS Integration for Coastguard Applications’ (AIRICA)
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29. Simulating ATM as a multi-layered system: the tactical and the strategic layers
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30. Air Traffic Controllers’ Objective Workload Measurement and Management System
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31. The 6th Sense of an air traffic controller
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