



Human Factors and Systems Safety Thinking Conference

Automation and Human factors Integration

2-4 October 2019
Hotel Puerta América, Madrid

SUPPORTING EUROPEAN AVIATION IN PARTNERSHIP WITH:



Human Factors and Systems Safety Thinking Conference

Automation and Human factors Integration

FOREWORD

Following the success of our Dublin (2013) Conference – From Safety-I to Safety-II, Lisbon (2014) Conference on System Safety “Looking at Implementation Challenges of Safety II from Theory to Practice”, Barcelona (2015) Conference - “Understanding Normal Work”, Brussels (2017) Conference -“People in Control”, we are pleased to announce that with the support of our colleagues from ENAIRE, this year we will be organising the by now Biennial System Thinking and HF Conference in Madrid under the headline: “Automation and Human Factors Integration” – lessons from within and from outside industries. Our deepest appreciation to the ENAIRE Top Leadership and Safety & HF Team without whom this event would not be possible as well DFS, co-chair of SHP-SG, for a most exciting agenda.

The increasing automation in aviation and especially in Air Traffic Control is changing the interaction between man and machine. Innovations in technology are increasing at an enormous pace and automation is constantly evolving. Changes in the use of new technologies as well as influences of technology on our behaviour can be observed in everyday life.

The gap between the disciplines of human factors and systems engineering with new technology is widening because of rapid and steady technological development and progress. This gap needs to be closed in order to form a team from human and technology, where working methods are better coordinated and interconnected. For this, it is necessary to deal with the technical development as well as with models of cognition.

We all would probably agree that air traffic management will remain a human-centred industry for some years to come. People at the sharp end remain in control and are making safety and business-critical decisions.

Technology can support these decisions and in the near future will develop from a solely information delivery system towards a decision support system for the operator.

In order to achieve the desired positive effects of the technology, close interaction with the future user and the usage concepts is required. One-sided optimisations are not effective. User-centred engineering following the basic principles has proven its worth in achieving the goals.

This conference will explore the issues of human-machine interactions in complex safety-critical technology from different perspectives and experiences. It will integrate talks, panels and group discussion and will offer time and space for networking outside the official programme.

Day one provides insights from ENAIRE about setting up a key Human Factors department. Santi Cortés, the Safety, Security, Quality and Environment Manager, will

The gap between the disciplines of human factors and systems engineering with new technology is widening because of rapid and steady technological development and progress.

Madrid - Aerial view



brief on how and why the HF team was born in ENAIRE. A pilot perspective will follow it on new technology, the consequences of it and the experiences with it. Capt. Antonio Chialastri and Capt. Sebastian Allgaier are two experienced pilots who will give us insight in their daily routine with new automation in the cockpit. The day will finish with a discussion and conclusion session, followed by a welcome networking cocktail kindly sponsored by ENAIRE at the Hotel Puerta América Sky bar.

Day two looks from different angles of automation. Professor Annette Kluge from Ruhr University Bochum will talk about temporal coordination in operations and whether augmented reality can support it. Marcus Mäder from Technical University of Munich will illustrate how acoustics in a control room could be measured and better understood to support operational needs. André Perott from DFS will present the results of a three-year joint project of DFS and EUROCONTROL NM on Human factors Integration and the principles for designing new systems. Zjelka Pozgaj and Michael Poiger will show examples how Frequentis applies HF principles in control room design. Peter Hendrickx from MUAC will challenge everyone with a future thinking about the possible path to full automation of ATM. The day two will conclude with a panel on automation where we will debate with all the speakers of the day approaches on how to integrate the human factors.

Day three, the final one, will continue with the Human factors and automation aspects but also bringing lessons from other industries. Nippin Anand's, Master Mariner and Founder of Novellus Solutions Limited, presentation will aim at offering a systematic analysis of the events leading up to, during and post-accident of the passenger ship Costa Concordia, which capsized off the island of Giglio in Italy in 2012 resulting in 32 fatalities. Neil May of NATS (UK) will share the first experiences of human factors from the remote Tower operations while Guadalupe Cortés Obrero, Human Performance Manager at ENAIRE, will complete the presentations by bringing a thought-provoking insight in Human factors - with all the technological revolution, are we still being human centric at all? The conference will close with a final panel (with speakers of the day and Carlos Cavero Martín Ballesteros – President of APROCTA, Raquel M. Martínez Arnáiz – Safety manager of FerroNATS and Capt. Carlos Salas & Juan Carlos Lozano from COPAC) debating what lessons to bring forward and what steps we should take in Human Factors and bring it to the attention of the industry.

The event will be relevant to ATM managers, ergonomists, engineers, safety specialists, HF experts, support staff and front-line operators.

OVERVIEW

2 October 2019

13.00	Registration starts
14.00	Welcome & Opening Workshop <i>SHP-SG co-chairs Mr Tony Licu, Head of EUROCONTROL NOM/SAF & Mr Jörg Leonhardt, Head of Human Factor in Safety Management, DFS Mr Ángel Luis Arias, ENAIRE CEO Mrs Isabel Maestre Moreno, AESA Director Mr Raúl Medina, DGAC – Director General of Civil Aviation</i>
14.30	What it takes to build a Human Factor centre of Excellence – An ANSP view “Why, Why now and How an HF Department was born in ENAIRE” <i>Mr Santiago Cortés Burns – ENAIRE Head of the Safety, Security, Quality and Environment Division</i>
14:50	A Pilot View day to day in the flight deck “Automation in aviation: a threat or a resource?” <i>Capt. Antonio Chialastri, Human Factors Expert, Writer and Thinker - STASA/Italy</i>
15:35	Coffee Break
16:05	A Pilot View day to day in the flight deck cont'd “When the airline industry was at the crossroads of resilience and compliance - and took the wrong turn.” <i>Capt. Sebastian Allgaier - ATQP/EBT Manager - Type Rating Examiner B737</i>
16:50	Q&A <i>With Santi Cortés, Antonio Chialastri and Sebastian Allgaier, Wrap of the Day and Conclusions</i>
17:15	End of Day 1
18:00	Welcome Drink ENAIRE

3 October 2019 AM

09:30	Human Factors science in practice “Raising task state awareness in teams by means of Augmented Reality” <i>Prof. Dr. Dipl.-Psych. Annette Kluge, Ruhr University Bochum, Germany</i>
10:30	Coffee Break
11.00	Human Factors science in practice “Principles for an advanced integration of Human Factors and Ergonomics in Air Traffic Control workplace design” <i>Dr André Perrott -Senior Expert Ergonomics & Human Factors DFS</i>
11:45	Human Factors science in practice “Assessing the quality of a workplace environment by means of analyzing speech intelligibility” <i>Mr Marcus Mäder, Dipl.-Ing., Research Associate Technical University Munich</i>
12.30	Lunch

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14.00	Human Factors science in practice "Human Centric or Machine Centric ATM ? – How ATM can evolve in the future" <i>Mr Peter Hendrickx – Head of MUAC Operational Systems and Mr Adam Tisza – Automation Expert – EUROCONTROL Maastricht UACC</i>
14:45	Human Factors science in practice aware® Toolbox - Safety related human design in an automated environment <i>Mrs Zejka Pozgaj and Mr Michael Poiger – Frequentis</i>
15.30	Coffee Break
16.00	Panel - Human Factors science in practice - Automation and HF integration challenges (ANSPs, Pilots, Manufacturers, Academia) <i>(with speakers of the day Annette Kluge, André Perott, Marcus Mäder, Peter Hendrickx, Zejka Pozgaj Michael Poiger)</i>
17.00	Wrap up and Conclusions of Day 2
17.15	End of Day 2

4 October 2019

09.00	Learning from Accidents - The Costa Concordia Case <i>Mr Nippin Anand - PhD. Master Mariner - Principal Specialist, Safety Management System and Human Factors</i>
10.40	Coffee Break
11.10	First Experience from Remote Tower Operations at NATS A game shifter or same routine? <i>Mr Neil May – Head of Human Factors – UK NATS</i>
11.55	"Are we Human after all?" <i>Mrs Guadalupe Cortés Obrero, Human Performance Manager - ENAIRE</i>
12.35	Final Panel – what lessons and what next? <i>(with speakers of the day Dr Nippin Anand, Mrs Guadalupe Cortés Obrero, Mr Neil May and with invited experts – Mr Carlos Caverio Martín Ballesteros – President APROCTA, Capts. Carlos Salas & Juan Carlos Lozano - COPAC and Mrs Raquel M Martínez Arnáiz – Safety Manager - FerroNATS)</i>
13.35	Wrap up Conclusions of the Conference
13.45	Closure of the event Lunch and departure

SPEAKER BIOS

2 October 2019

Mr Santiago Cortés Burns – ENAIRE Head of the Safety, Security, Quality and Environment Division

Santi is an Aeronautical Engineer from the Polytechnic University of Madrid, completing the final project at the University of Manchester. He joined Aena, in the Air Navigation area, in 2006, to work in the international arena, being responsible for several joint activities with EUROCONTROL and the European Commission. He previously worked at Ineco in the management of participation in European programmes and SESAR. Since 2013, he has been responsible for the improvement of the integrated management system of the public entity, including the areas of Safety, Security, Quality and Environment, and currently is Head of the Safety, Quality and Environment Division of ENAIRE.

Santi will briefly introduce the “raison d’être” of the newly born department in ENAIRE. In the light of myriads of regulations impacting staff, new technologies, production pressure, to maintain a human centric approach and have the buy in of the personnel – a bold decision fully supported by ENAIRE CEO – has led to the birth of a new and enthusiastic team to deal with human factors.

Capt. Antonio Chialastri

Cpt. Antonio Chialastri is an experienced pilot and author. He started flying in 1987 as a cadet pilot at the Alitalia Flight Academy and then went on to fly many aircraft types achieving a distinguished pilot career including type rating instructor. On a parallel track, he studied at La Sapienza University in Rome, getting a degree in Philosophy, then a Master of Art in Bioethics. He holds a degree in epistemology and he kept on studying the philosophy of complexity. Having gathered a collection of studies on human factors, Antonio decided to publish them to help young pilots to understand the importance of such a critical topic. Alas, it was too big to be a single book and too little to be shared in more volumes. So, the best thing was to split that single book in four books covering different topics, dedicating one year to each volume. The result was the publication of the first book on safety models and human error, the second about human performances and limitations, while the third was about the teamwork and training, with the fourth and final volume addressing human-machine interaction. This marathon was completed in 2015. The logic of the sequence was laid out to reflect the accident curve along the years, treating different kind of causes: loss of control caused by flying skills and lack of automation, Controlled Flight Into Terrain, loss of control induced by a flawed human-machine interaction. After the Germanwings accident, in March 2015, together with a group of colleagues he investigated why a pilot could think to carry on such a terrible act. The result was a book published in 2016 and a year later was translated in English with the title “After Germanwings – The life of an airline pilot”.

Antonio’s presentation will start from the short analysis about the last accidents that happened in Indonesia and Ethiopia, involving two B-737 Max 8. Behind these accidents, there is a series of contributions dating back to mid-Eighties. In fact, economic factors were huge forces leading the industry towards more efficiency. The balance between production and protection tilted on the first side, with almost nobody counteracting on the latter, is bringing long term effects of such “technological revolution”. The presentation will highlight how and why pilots have difficulties in managing the last generation of aircraft.

Capt. Sebastian Allgaier - ATQP/EBT Manager - Type Rating Examiner B737

Sebastian started his flying career 1992 as First Officer B737 at Lufthansa, was furloughed due to the economic crises following the First Gulf War and joined TUIfly, then Hapag-Lloyd. He was flying on the A310 longhaul when he joined the CRM trainer team in 1997. After three years he took responsibility for all of the human factor training in TUIfly for the next ten years. After becoming captain and trainer on B737 he introduced a grading system for CRM in checks. At that time Jörg and Sebastian launched a unique joint CRM/TRM training for pilots and controllers for DFS and TUIfly. The cooperation between DFS and TUIfly continued beyond this when a learning lab for resilience/performance variability and other parts of SAFETY II was set up with Eric Hollnagel, David Woods and Sidney Dekker as lecturers. With this, Sebastian introduced ATQP - a performance based training system - as one of the first under EASA. His key interest since then is how to bring concepts of SAFETY II into practical training for pilots - to make them resistant to unknown/unpredictable threats. Sebastian is 50 years old, married and lives south of Munich.

During the end of the 2000's the promising idea of resilience came up as a safety culture concept which would be able to overcome flaws in the then existing accident models -linear, root cause searching, etc. HF-Experts and Training Managers main concerns were at that time focused on how to train pilots and ATCOs in resilient behaviour or how to get operators at the sharp end "act resilient" as well as integrating the concept in the overall safety philosophy of the organisation. At the same time regulators and authorities found themselves unable in keeping up with the new concepts like ATQP, EBT & SAFETY II because of lack of resources (mainly staff and mandate). Their key solution was to delegate responsibility for high quality training to the operators themselves - those parties who basically know best what their weaknesses and strengths are - however with the requirement for a thorough documentation of what they are doing and why. Furthermore this documentation had to be according to a fixed questionnaire resulting in a ping-pong game of audits and rectifying findings - compliance to those questionnaires became more important than doing/training the right stuff.

An impressive, yet frightening example of the collective drift of the industry away from new safety concepts can be seen in the backgrounds of the B737 MAX disaster. Instead of applying resilience and SAFETY II in the design process of the aircraft and in the training of pilots, all the information point to the fact that governmental compliance matches better with linear accident models like swiss cheese slices than with higher concepts like complexity and resilience. This presentation tries to put pieces of the puzzle together to draw an allover picture of where the industry has gone and should have gone.

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Prof. Dr. Dipl.-Psych. Annette Kluge, Ruhr University Bochum, Germany

Annette Kluge is a Full Professor for Work, Organisational and Business Psychology at the Ruhr University Bochum, Germany. She obtained her Diploma in Work and Organisational Psychology at the Technical University Aachen and her doctorate in ergonomics and vocational training at the University of Kassel, Germany in 1994. Her expertise is in Human Factors and Ergonomics, training science, skill acquisition and retention by means of dynamic job aids (AR/VR/MR), safety management and organisational learning from errors and organisational forgetting.

Temporal coordination, an important aspect of team work, has three aspects: 1) the correct sequencing of joint action, 2) the correct timing, and 3) the adaptation of dynamic effects as variables in the teams' context, which may change dynamically in terms of their own state. Challenges of temporal coordination include errors in timing and problems of synchronisation, errors that are founded in an inadequate task state awareness (TSA). In her presentation Annette will present the results on the impact of a coordination artifact that builds on augmented reality (AR) in order to raise task state awareness. The central research question is: Can AR technologies support temporal aspects of scripted coordination by increasing the task state awareness (TSA) of spatially dispersed teams in a production context, in combination with visual attention guidance including the individual task?

The research contributes to a better understanding of the temporal coordination needs of spatially dispersed teams and provide work psychology-related and HCI-related guidelines for the development of AR-based coordination artifacts based on the combination of interdisciplinary research relevant for future use in "Industrie 4.0".

Dr André Perott -Senior Expert Ergonomics & Human Factors DFS

Dr. André Perott has a degree in Mechanical Engineering and Business Administration. He worked three years as a research associate at the University of Technology in Darmstadt and graduated with a strong focus on workplace design in Air Traffic Control. Since 2011, he is working at DFS as a Senior Expert for Ergonomics and Human Factors and consulted numerous design projects within and outside of DFS.

Current ATM system design projects are complex undertakings. Due to an increasing amount of automation and technology in Air Traffic Control (ATC), the interaction design in socio-technical systems becomes more and more important. Although Human Factors and Ergonomics (HF/E) claims to be design driven and strives for an active role in ATC system design, HF/E is often treated as something separate and is usually not well integrated in the overall design process. In his presentation, André discusses several reasons for this and deduces related challenges. Afterwards, high level principles are introduced, that may help to overcome the previously described challenges.

Mr Marcus Mäder, Dipl.-Ing., Research Associate Technical University Munich

Marcus Maeder studied mechanical engineering at the Technical University of Dresden, Germany. After joining the group of Prof. Steffen Marburg in 2011 at the Bundeswehr University Munich, Marcus gained much interest in the field of vibro-acoustics where he intensively worked on experimental investigations of mechanical structures and acoustic problems and their modeling using numerical methods. In 2015, the whole group around Steffen Marburg moved to the Technical University of Munich where the chair of vibro-acoustics of vehicles and machines was established. Being in charge of setting up the new laboratory, Marcus continues to work in the theoretical and experimental field of vibro-acoustics. His main research is focused on aero-acoustics, experimental investigation of mechanical and acoustic systems, system optimisation and identification as well as psycho acoustics and ethical aspects of engineering.

When designing workplace environments, both the technical aspects and requirements of the workplace as well as inter-personal concerns of the employees are of decisive importance in order to establish a functioning working environment. Special care must be taken when security and safety related issues come into play. The communication quality within these environments plays a significant role in order to ensure safety. Since communication quality depends on objective quality measures as well as subjective perception of the communication partners, conflicts of interest can arise due to the antagonism between disturbing noise and desired speech intelligibility. When assessing such situations, the speech transmission index (STI) and the privacy range are important parameters. Influenced by the reverberation time and the signal-to-noise ratio, calculating the speech intelligibility is a powerful tool for analysing demanding workplace environments. This work presents the determination of a STI mapping based on computer simulations using ray tracing methods as well as calculating the sound energy density distribution in room acoustics. The experimentally validated models can be utilised to optimise the workplace configuration to meet technical requirements as well as social concerns of employees.

***Mr Peter Hendrickx – Head of MUAC Operational Systems and Mr Adam Tisza – Automation Expert –
EUROCONTROL Maastricht UACC***

Peter Hendrickx has been working in Maastricht UAC since 2000, holding different positions in both the Engineering and Operational Departments. Currently, he is leading the MUAC Operational Systems (MOSYS) Team in Operations. With his Team, he develops the Concept of Operations of the future. Focus is on both ATFCM and ATC, and Automation has recently been added as a transversal topic. The MOSYS Team sets the User requirements in close cooperation with the ATCOs and OPS Room supervisory Staff. User requirements are translated in system requirements which are the input to the engineering department or industry for implementation. The Team follows up the development, leading to validation prior to implementation. Peter graduated from the Royal Military Academy with a degree in Telecommunications and served as an officer in the Belgian Air Force prior to joining EUROCONTROL Maastricht.

Adam B. Tisza studied Applied Cognitive Psychology at Leiden University (and partially at TU Delft), with a strong focus on human–machine interaction in highly automated (or ‘automatable’) environments. After gaining experience at NLR and LVNL, Adam joined the MOSYS Team at MUAC as Automation Expert. Adam is responsible for the development and management of the corporate automation strategy as well as for putting it into practice in the form of requirements analysis, mock-up design, and usability testing. Adam is keen on brainstorming with both controllers and system developers about better solutions, which allow the operational users to perform meaningful tasks supported by highly automated systems.

In the past, the evolution of MUAC’s Concept of Operations was mainly driven by technological changes allowing a reduction in the ATCO workload, and as such creating capacity in an efficient way. Recently, MUAC decided to go for a more systematic approach placing automation prominently on the scene. MUAC developed an Automation Strategy including a Vision and ambitious Objectives leading to a number of current and future studies and projects. These activities all focus on how high levels of automation can be achieved while the role of the operational users remains appropriate for them. The presentation of Peter and Adam will provide an insight into the MUAC Automation Vision and Objectives, and give an overview of the status and ideas of the activities initiated for this purpose.

Mrs Željka Požgaj and Mr Michael Poiger – Frequentis

Ing. Michael Poiger is an accredited Expert for Human Performance and data visualisation in the field of Control Rooms in safety critical environment and in 2001, he started as User Interface Designer at Frequentis AG. In the following years he became responsible for the TAPtools Product Management in the area of iCWP (integrated Controller Working Position) with the focus on visualisation of ATM data, Human Factors and Service Oriented Architecture. With the international experience he gained in Frequentis Australasia, Michael was in charge for the timely execution of various projects in the area of Human Performance, Visualisation and Service Oriented architecture within SESAR. Today he is managing the UX / HP processes and applicable methods within Frequentis.

Dipl.-Ing. Željka Požgaj, a Human Factors & Safety Expert, has been with Frequentis AG and Safety Management Department since November 2006. Her work focuses specifically on human-technology interaction issues and their impact on an overall operational performance. She holds a master's degree (Dipl.-Ing.) in Architecture & Interior Design from Vienna University of Technology (TU Wien) and was trained in the field of System Safety and User Experience (UX) Design at Frequentis AG. She has a strong background in anthropometry, ergonomics and cognitive neurosciences as well as a long work experience in application of human factors in workplace design.

Based on the necessary demand to increase operational capacity and to reduce costs, automation is seen as one of the key factors to improve the situation. But does a proposed automation solution complement human abilities, mitigate human limitations, and meet human needs? The understanding how humans can be most safely and efficiently integrated with the technology was not always timely and properly translated into ATM projects, equipment design, training, policies, or procedures causing lack of desired enhancement of human performance. Safety-related design comprises all aspects of day-to-day, human-human and human-machine interaction and communication, supporting the business process mapping. It identifies the necessary system landscape and builds improved 'Joint System', whereby the user expectations of how interface design should look, feel, function and respond, are considered. This presentation gives insights about "aware" methods to address the human aspects necessary to be understood in the context of the overall business process to reach the defined operational goals.

4 October 2019

Mr Nippin Anand - PhD. Master Mariner - Principal Specialist, Safety Management System and Human Factors

Dr Nippin Anand is the founder of Novellus Solutions Limited and is based in Aberdeen, Scotland. Nippin is a Principal Specialist in Safety Management System and Human Factors, a former master mariner at sea, and a social scientist with specific interests in cultural anthropology, storytelling, accident investigations and public safety. His research interests include organisational learning and accountability. He holds a PhD in social sciences, a master's degree in economics and business, and a diploma in research methods.

On 13th January 2012, the passenger ship Costa Concordia collided with rocks and capsized off the Island of Giglio in Italy resulting in a loss of 32 lives. Drawing on first-hand (video) interviews with the captain and an extensive research in accidents, we have created a documentary style narrative of this case. Nippin presentation is aimed at offering a systematic analysis of the events leading up to, during and post-accident. The presentation is divided in two sessions. The first session illustrates some underlying problems with our current approach to crew (bridge) resource management and will focus on team dynamics in safety critical operations. The second session will shed light on how and why organisational plans (i.e. emergency response and contingency manuals) are a serious disconnect from the ability to recover from failures.

Mr Neil May – Head of Human Factors – UK NATS

Neil May is the Head of Human Performance for NATS where he manages a team of 27 Human Factors specialists who lead excellence in human performance by setting the standard, measuring performance and facilitating change. He has many years of experience of Air Traffic Control having previously worked in operations, engineering, manpower planning and analytics within NATS.

Air Traffic Control at London City airport will be moving to a remote, digital tower operation in 2020. The new operation will be some 80 km away from the airport, located within the Area Control Centre at Swanwick. It will provide controllers with additional tools to manage traffic at the airport safely and efficiently. Neil will outline the differences between the on-site and remote tower operations highlighting the changes in technology that will be available to controllers. He will also talk about the change management aspects from a people perspective which are key to achieving the expected benefits from the new technology.

Mrs Guadalupe Cortés Obrero, Human Performance Manager - ENAIRE

Guadalupe Cortés is an air traffic controller with more than 20 years of experience in the aviation business. She holds a Degree in Linguistics, a Masters in Air Transport Management and an MSc in Human Factors in Aviation. Guadalupe is an accredited Human Factors Specialist by the European Association for Aviation Psychology and has collaborated with EUROCONTROL in several projects regarding human factors in air navigation. She is also co-founder of the Spanish Professional Air Traffic Controller Association (APROCTA), and has been a member of the IFATCA Professional and Legal Committee. Since 2018, she is responsible for integrating Human Factors from a transversal and comprehensive perspective within ENAIRE.

Guadalupe's presentation will introduce the approach of the human brain as a natural mode of automation, as a source full of potential that will surely have an impact on future conceptualisation of technical development. Scientific research is constantly presenting new challenges on this area of knowledge. Are we aware that the human brain is in fact the most natural and perfectly well designed "machine"? Are we ready to think out of the box? Are we human after all?

ADDITIONAL INFORMATION

CONTACT

Should you like to discuss this event further, please do not hesitate to contact:

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