8th SESAR Innovation Days

Hosted by the University of Salzburg
Welcome and opening

Vicerector Ferreira-Briza,
University of Salzburg

#SIDS2018
Welcome and opening

Elisabeth Landrichter,
Director General, Austrian Civil Aviation Authority

#SIDS2018
Keynote

Filip Cornelis,
Director Aviation, DG MOVE, European Commission

#SIDS2018
SESAR Innovation Days
Salzburg – 4 Dec. 2018

Key role of exploratory research in ATM
Permanent need for ATM exploratory research

- Significant effort to be preserved
- No immediate practical application
- Accept to consider possible dead-ends
- Great potential to shape future of ATM
- Feed innovation pipeline

- Innovate to meet ATM challenges
Knowledge transfer is key

- Use innovations from other sectors
- Enable Out-of-the-box thinking
- Inspire new researchers with ATM challenges
- From Fundamental to Industrial Research
- Connect Universities with R&D and Industry
- Grow ATM skilled researchers workforce

- ENGAGE ATM knowledge network
ATM Challenges today

- Many challenges of different nature:
  - Increasing Airspace capacity
  - Minimizing Aviation environmental footprint
  - Flight efficiency
  - Cost efficiency
  - Training for new generation military jets (J35)
  - Allowing new entrants (drones, balloons, gliders, …)

- Need for new innovative ideas
Data sciences as a key enabler

- Many new promising technologies:
  - Big Data / Data driven techniques
  - Machine Learning
  - Artificial Intelligence

- Well adapted to ATM sector:
  - Massive data bases already available
  - Flight plans, Airspace, Met, Incidents, etc…
  - Rather repetitive activity with lots of variables

- Master ATM complexity
ATM Economics as critical enabler

- Incentivising changes
- Eg: Aviation/Electricity/Telecom
- Performance & Charging regulation as 1st step
- More developments considered:
  - Inclusion of delays, flight efficiency, environment?
  - Different levels of services for ATFM?
  - Network Manager as capacity broker?

- Explore new business models
Thank you for your attention!

Questions?
Keynote

Florian Guillermet,
Executive Director, SESAR JU

#SIDS2018
GROWING COMMUNITY OF SESAR JU STAKEHOLDERS & BENEFICIARIES

26 EU Member States participating

SESAR 2020 projects: blended academic & industrial expertise

Types of beneficiaries (Sept. 2018)

- Higher Education: 61%
- Research: 17%
- Public: 6%
- Private companies: 8%
- SMEs: 8%

26 EU Member States participating

EU Member States with SESAR 2020 funding
Third-countries with SESAR 2020 funding (also incl. Israel, Australia, United States, Canada...)

SESAR INNOVATION DAYS 2018 | 3-6 December 2018, Salzburg
DELIVERING TIMELY SOLUTIONS:
SMART, GREEN, INTEGRATED

- 63 SESAR Solutions
- 40+ already under deployment across Europe
- Disseminated through EU aviation standards
- Clear associated benefits and deployment timeline
**SESAR INNOVATION DAYS 2018 | 3-6 December 2018, Salzburg**

**PJ01 – Enhanced Arrivals & Departures**
- Enhanced Arrivals & Departures

**PJ02 – Increased Runway and Airport Throughput**
- MOTO
- ENVISION

**PJ03a – Integrated Surface Management**
- OptiFrame

**PJ03b – Airport Safety Nets**
- ADAPT

**PJ04 – Total Airport Management**
- COTTON

**PJ05 – Remote Tower for Multiple Airport**
- PARTAKE

**PJ06 – Trajectory Based Free Routing**
- SALSA

**PJ07 – Optimised Airspace Users Operations**
- R-WAKE

**PJ08 – Advanced Airspace Management**
- EMPHASIS (PJ11)

**PJ09 – Advanced DCB**
- NAVISAS

**PJ10 – Separation Management en-route & TMA**
- GATEMAN

**PJ11 – Enhanced Air & Ground Safety Nets**
- SAPIENT

**PJ12 – CNS**
- DREAMS

**PJ13 – SWIM Infrastructures**
- TERRA

**PJ14 – Common Services**
- SECOPS

**PJ15 – 4D Trajectory Management**
- GEOSAFE

**PJ16 – CWP/HMI**
- VUTURA

**PJ17 – SWIM Infrastructures**
- SAFIR

**PJ18 – 4D Trajectory Management**
- DOMUS

**PJ19 – Content Validation**
- DIODE

**PJ20 – Master Plan Maintenance**
- EURODRONE

**PJ21 – CNS**
- EUINDRONE

**PJ22 – Validation, Verification & Demo Infrastructure**
- Audio (GAP) (PJ28)

**PJ23 – CNS**
- Engage
SESAR 2020 EXPLORATORY RESEARCH CALLS

H2020 open calls: not limited to SJU Members

- **ER-1 (€20,6)**
  ATM excellent science & outreach and ATM applications oriented research

- **ER-2 (€ 9M)**
  Remotely-piloted aircraft systems (RPAS) in very low-level (VLL) drone operations

- **ER-3 (€ 10M)**
  Transversal activities, including knowledge transfer networks (KTN) and ATM applications oriented topics

- **ER-4 (€ 38+M)**
  ATM excellent science & outreach and ATM applications oriented research

#SIDS2018
FEEDING THE INNOVATION PIPELINE

Overview
• 28 ER1-projects, from 2016-2018
• 80 academic and industry partners from European Union and EU Associated Countries (Switzerland, Norway, Iceland, Serbia, Israel, Turkey).

ATM excellence & outreach
• Automation, robotics and autonomy
• Complexity, data science and information management
• Environment and meteorology for ATM
• Economics, legal and regulation

ATM application-oriented research
• High-performing airport operations
• Advanced air traffic services
• Enabling aviation infrastructure
• ATM operations, architecture, performance and validation
GROWING RECOGNITION FOR EXPLORATORY RESEARCH RESULTS

[RESULT IN BRIEF] Better winter weather forecasts for airports
EU-funded researchers developed up to the minute probabilistic forecasts for winter weather that enable air traffic and airport operators to make their operations more efficient and to mitigate risks.
Programme: H2020-RI.3.4.7.1
Record Number: 239886
Last updated on: 2018-10-05
Available languages: DE, EN, ES, FR, IT, PL

[RESULT IN BRIEF] Speech recognition technology for air traffic controllers
The popularity of air transport continues to grow, placing an even greater workload on air traffic controllers (ATCOs). Their predicament can be improved through an automatic speech recognition system closely integrated with an arrival manager developed by EU and SESAR funded...
Programme: H2020-RI.3.4.7.1
Record Number: 239630
Last updated on: 2018-09-24
Available languages: DE, EN, ES, FR, IT, PL

[RESULT IN BRIEF] Air traffic management for the future
An automated system developed by EU-funded scientists can help air traffic control coordinate departures and reduce the probability of conflicts without reducing air space capacity, while preserving airline preferences.
Programme: H2020-RI.3.4.7.1
Record Number: 239575
Last updated on: 2018-09-17
Available languages: DE, EN, ES, FR, IT, PL

SESAR INNOVATION DAYS 2018 3-6 December 2018, Salzburg
Multimodality Easy check-in Easy access to information On time arrival Multimodality

Easy guidance

Passenger

Multimodality Easy access to information A passenger-centric airport Personalised services On time arrival Multimodality

Linked flight

Aviation 4.0

Free baggage journey

Multimodality

Easy check-in

U-space/Urban air mobility

Fully Dynamic Airspace

AI powered aviation operations

Next generation links

Autonomous and diverse vehicles

Advanced analytics

Single pilot operations

Virtual centres

Internet of Things for aviation

Digital assistant

Infrastructure as a service

Multiple & Large airports

Enhanced visual systems

Next generation links

All weather operations

SESAR INNOVATION DAYS 2018 | 3-6 December 2018, Salzburg
SJU SCIENTIFIC COMMITTEE

• SJU Scientific Committee has been working hard
• Progressing thinking on key issues
• Supporting SESAR policy and guidance
• A number of focus areas addressed by small Task Forces
• Dedicated Innovation Pipeline Task Force to help streamline the innovation pipeline
• Helping us define the future
Engage KTN
Thematic challenges update; SIDs look ahead

Andrew Cook, Paula López, Tatjana Bolić, Dirk Schaefer

8th SESAR Innovation Days
Salzburg, 03-07 December 2018
Overview

- Introduction to Engage
  - four thematic challenges
- Teaser slides on each challenge
  - know who to come and talk to
- Next steps for the challenges
  - funding opportunities and support
- Look ahead
  - more from Engage coming up
  - SESAR Innovation Days programme
Introduction to Engage
the SESAR Knowledge Transfer Network

engagektn.com
twitter.com/EngageKTN
Industry partners

Advanced Logistics Group (ALG)
AGIFORS - Airline Group of the International Federation of Operational Research Societies
Air Traffic Controllers European Unions Coordination (ATCEUC)
Air Baltic
Airport Regions Conference (ARC)
American Airlines
ANE CR
Analog:
Association for the Scientific Development of ATM in Europe (ASDA)
Autoridade Nacional de Aviação Civil (ANAC)
Barcelona Supercomputing Center (BSC)
Belcontrol
Boeing Research and Technology Europe (BREET-Europe)
Bundesamt für Flugsicherung (BAF)
Civil Aviation Authority (CAA)
COOPANS Consortium
Department for Transport (UK)
Direction des Services de la Navigation Aérienne (DSNA)
DIREKCIJA civilnog vazduhoplovstva Republike Srbije (DDV)
European Meteorological Services Network (EUMETSAT)
European Passengers’ Federation (EFP)
Executive Airlines
Ferrovial Agromás
Flyair
FlightGlobal
Flughafen München / Munich Airport
Geek Srl
Helios
HENA - High Endurance Multipurpose Aerial Vehicles
Honeywell Aerospace
HungaroControl
Icelandair
IFSTTAR - Institut Français des Sciences et Technologies des Transports, de l’Aéroport et des Réseaux INFORM - Institut für Operations Research and Management GmbH
International Air Transport Association (IATA)
International Federation of Air Traffic Controllers’ Associations (PICTCA)
Irish Aviation Authority (IAA)
LFV - Luftfartsverket
London Luton Airport
Lufthansa Systems
Manchester Airport
NATS
Navair
Network Manager - nominated by the European Commission
NEXTOR II Consortium - University of California, Berkeley and University of Maryland
PACE Aerospace Engineering & Information Technology
Pegasus Airlines
QinetiQ Ltd
Raytheon UK
Sabre Airlie Solutions
Schiphol - Dutch International Airports
Thomas Cook Airlines
TÜBİTAK - The Scientific and Technological Research Council of Turkey
Turkish Airlines

(+ ...)
Introduction to Engage
Key features and objectives (2018-2021)

• Better integrate more applied/industrial & exploratory research (two-way process)
  • mutual benefit, integrated into the fabric, funded; interdisciplinary
• Education and training: future ATM skilled workforce
  • “develop new talent with a deep knowledge of the future ATM scientific research needs ... stimulating the next generation of ATM staff”
  • PhD and post-graduate thesis Call
  • 3 summer schools; ATC training courses; lecture progs
  • SESAR Innovation Days
• Knowledge hub (wiki) as a ‘go-to’ source, single point of entry for ATM knowledge
  • popular demand: improved search functionality; consolidated repository
• Not only larger concepts, but sum of large number of support actions
  • multiple grants; ‘light touch’
Engage Thematic Challenges

At the core of the KTN is the definition of various thematic challenges: new ideas suggested by the research community, not already included within the scope of an existing SESAR project. They are developed along with the ATM concepts roadmap and complementarily with some of the network’s PhDs and theses.
Call for catalyst fund proposals open until **15 February 2019** (more later); consortium **ineligible**
Thematic challenges and workshops
Workshop planning and dissemination

• **Objectives**
  • mature the state of the art for each challenge (short- and longer-term)
  • identify barriers and possible solutions
  • provide opportunity for proponents to further develop ideas
  • inform the final stages of the SESAR ER4 Call

• **Workshop design**
  • brief presentations summarising state of the art
  • invited industry and interdisciplinary experts
  • extended, in-depth discussions (facilitated, break-outs)

• **Dissemination**
  • SESAR e-news, Engage website, other networks, targeted campaigns, etc.
  • SJU, ANSPs, airlines, EUROCONTROL, PRU, NM, associations, academia (incl. interdisciplinary fields), SMEs
Thematic challenges and workshops

Workshop discussion sessions

• **Invited the participants to suggest:**
  - what **specific follow-up research** is likely to be useful to **mature the state of the art** (incl. flagging what may be addressed by catalyst funding)
  - what **measures of success** could be used to assess progress of challenge:
    - **short-term:** wholly within catalyst-funded project
    - **longer-term:** outside/beyond such a project *(could be identified within it)*
  - what are **likely barriers** to prevent progress towards maturing challenge – how might we overcome them?

• **listening mode:** to refine (dynamic) challenge texts, maintained on the Engage website
Teaser slides on each challenge
Teaser slides on each challenge
Know who to come and talk to

#1. CNS vulnerability and security
Paula López
Innaxis

#2. Data-driven trajectory prediction
Dirk Schaefer
EUROCONTROL

#3. Efficient use of MET data
Tatjana Bolić
University of Trieste

#4. Novel market mechanisms in ATM
Andrew Cook
University of Westminster
CNS vulnerability and security
Paula López
CNS vulnerability and security

Abstract (1/2)

CNS/ATM components (e.g., ADS-B, SWIM, datalink, Asterix) of the current and future air transport system present vulnerabilities that could be used to perform an ‘attack’.

Further investigations are necessary to mitigate these vulnerabilities, moving towards a cyber-resilient system, fully characterising ATM data, its confidentiality, integrity and availability requirements.

A better understanding of the safety-security trade-off is required.
CNS vulnerability and security
Abstract (2/2)

Additional security assessments for legacy systems are also needed to identify possible mitigating controls in order to improve cyber-resilience **without having to replace and refit**.

Future systems security by design is essential: a new generation of systems architectures and applications should be explored to ensure confidentiality, cyber-resilience, **fault tolerance**, **scalability**, **efficiency**, **flexibility** and **trust** among data owners.

Collaborative, security-related information exchange is essential to all actors in aviation. This is specially challenging in a multi-stakeholder, multi-system environment such as ATM, where confidentiality and trust are key.
CNS vulnerability and security
Workshop planning (Spring 2019, SJU, Belgium)

• Facilitate discussion among aviation stakeholders (airlines, ANSPs, airports...) regarding systems security challenges
• Foster a multidisciplinary community of researchers to enhance the transferability of knowledge from other disciplines (e.g. IT security) into ATM

• Open a debate on the trade-off between the opportunities and risks of data sharing among aviation stakeholders
• Identify the potential ATM systems vulnerabilities and the measures that should be further investigated to mitigate such risks

• Propose ideas on how to perform an initial security assessment and detect security threats in current and future ATM
• Create awareness of the on-going initiatives in the CNS/ATM systems security field

• Discuss common ideas on how to model emerging security problems
CNS vulnerability and security

Example ideas for potential exploration

• Assessing the security of ATM elements and relationships to identify vulnerabilities and ensure protection against global threats
• Enhancing cybersecurity of systems without having to replace and refit, including certification, legal and liability issues
• Building data-sharing architectures capable of connecting and providing access to distributed data while preserving privacy

• Adapting mental models to prepare operators to understand and manage cyber threats
• Updating software and firmware of IT components to resolve security vulnerabilities of critical infrastructures
• Further researching security analyses of aviation-specific protocol implementations (vulnerabilities, trust, software libraries)
Data-driven trajectory prediction
Dirk Schaefer
Data-driven trajectory prediction

Abstract (1/2)

Accurate and reliable trajectory prediction (TP) is a fundamental requirement to support trajectory-based operations.

Lack of advance information and the mismatch between planned and flown trajectories caused by operational uncertainties from airports, ATC interventions, and ‘hidden’ flight plan data (e.g., cost indexes, take-off weights) are important shortcomings of the present state of the art.

New TP approaches, merging and analysing different sources of flight-relevant information, are expected to increase TP robustness and support a seamless transition between tools supporting ATFCM across the planning phases.
The exploitation of historical data by means of machine learning, statistical signal processing and causal models could boost TP performance and enhance the TBO paradigm.

Specific research domains include machine-learning techniques, the aggregation of probabilistic predictions, and the development of tools for the identification of flow-management ‘hotspots’.

These could be integrated into network and trajectory planning tools, leading to enhanced TP.
Data-driven trajectory prediction

Example ideas for potential exploration

- Trajectory predictors supporting airborne self-separation: definition of requirements (accuracy, robustness, run time) & concept development of enabling technologies and capabilities
- Improved matching of capacity to demand: enhanced TPs integrating uncertainty assessment, robust planning and cost-efficiency assessment allowing better demand assessment at network level – and better capacity planning
- Data-driven approaches for understanding and prediction of AU preferences and behaviours enabling improved NM operations and flexibility-predictability trade-off
- Collaborative multi-sector CD&R: requirements definition and concept development of data-driven TP in support of CD&R involving various sectors
- Optimising and integrating local planning activities to assess, contain and communicate their network effects
- Improving data-sharing and data access to satisfy AU, NM and ANSP technical and organisational requirements and expectations: data format and availability, incentives for data sharing, confidentiality issues
Efficient use of MET data

Tatjana Bolić
The main objective of this challenge is to improve overall ATM system performance by providing better user-support tools based on improved meteorological (‘MET’) products.

The focus is on the synergy of several methods and techniques in order to better meet the needs of operational users and to support aviation safety (e.g., through creating early warning systems) and regulation-makers (e.g., moving from text-based to graphical information provision).
Efficient use of MET data

Abstract (2/2)

All stakeholders may benefit from this synergy: ANSPs (e.g., sector reconfiguration and separation provision), airlines (e.g., storm avoidance), airport operators (e.g., airport management under disruptive events), and the Network Manager (e.g., demand-capacity balancing).

The challenge is, therefore, to bring the following perspectives closer: (a) for meteorological/atmospheric science, the development of products tailored to ATM stakeholders’ needs, which are unambiguous and easy to interpret; (b) for stakeholders, the identification of the most suitable information available and its integration into planning and decision-making processes.
Efficient use of MET data
Workshop overview (13 November, SJU, Belgium)

• Goal of enhanced situational awareness (re. MET conditions) for ATM stakeholders
• Consistent and agreed European weather ‘picture’ does not exist yet

• Trend in MET products is towards ensembles, which calls for education of ATM stakeholders re. interpretation of results

• MET products can be classified by two dimensions:
  ▪ spatial resolution - global, limited area and high-resolution
  ▪ time resolution - long, medium, short and very short range

• Often research funding and fragmentation of MET provision present a barrier to holistic European progress

• User trust and reliability, plus sensitivity of operational processes, cited as barriers
• Long-term effort in both communications and research needed
Efficient use of MET data

Example ideas for potential exploration

- Very high-resolution, very short-range forecasts using numerical weather prediction models & observational data assimilation
- Quantifying the sensitivity of operational processes to MET uncertainty, comparing these with other sources of uncertainty
- Incorporation of ensemble weather information into decision-support tools, adapted for different ATM stakeholders

- Accurate prediction of weather conditions (e.g. visibility, glide-path wind) influencing airport arrival and departure operations
- Consolidation of climate risk assessment methodologies for airports
- Creating a climate forecast ‘baseline’ for aviation from the IPCC UN panel report
Novel market mechanisms in ATM

Andrew Cook
Novel market mechanisms in ATM
Abstract (1/2)

This research explores the design of new allocation markets in ATM, taking into account real stakeholder behaviours. It focuses on designs such as auctions and ‘smart’ contracts for slot and trajectory allocations.

It seeks to better predict the actual behaviour of stakeholders, compared with behaviours predicted by normative models, taking into account that decisions are often made in the context of uncertainty.
Which mechanisms are more robust against behavioural biases and likely to reach stable and efficient solutions, equitably building on existing SESAR practices? The research will address better modelling and measurement of these effects in ATM, taking account of ‘irrational’ agents such as airline ‘cultures’.

A key objective is to contribute to the development of improved tools to better manage the allocation of resources such as slots and trajectories, and incentivising behaviour that benefits the network - for example by investigating the potential of centralised markets and ‘smart’ contract enablers.
Novel market mechanisms in ATM
Workshop overview (25 October 2018, UoW, UK)

- New market designs for allocation & trading of tactical slots may support potential future mechanisms for slot swapping & trading between AUs
- Potential beyond FPFS: matching market, centralised batch auctions, primary & secondary markets (double auction or bilateral exchanges)

- Need to consider trade-offs between: individual rationality, budget balance, allocative efficiency and incentive compatibility in design of new mechanisms
- Need to model more realistic human interactions in a multi-stakeholder, complex socio-technical environment, c.f. highly constrained/limited simulation environments

- Most current models are normative, making assumptions about agent rationality: do not always work as predictors
- Behavioural science in general, and behavioural economics in particular, may bring complementary solutions

NB. Strategic airport slots are not in scope for this challenge
Novel market mechanisms in ATM

Example ideas for potential exploration

- Incorporating behavioural science methods into improved traffic demand & distribution predictor tools for ANSPs & UDPP
- Assessing if incentives or penalties work as better drivers of behaviour: whether social norms can be used to improve collaboration
- Predicting and avoiding undesirable behaviour, such as gaming, in ATM allocation mechanisms
- Building a better understanding of ‘equity’ and ‘fairness’, plus trade-offs across different stakeholders, and with ‘flexibility’
- Improving the assessment of uncertainty and disturbance, and of new mechanism implications for policy recommendations
- Running models and tools in shadow-mode, with practical user interfaces and value in output metrics (e.g. costs, overloads)
Next steps for the challenges
Next steps for the challenges

On the website

Thematic challenge 3 – Efficient provision and use of meteorological information in ATM

**Workshop:** 13 November 2018, SESAR Joint Undertaking (SJU), Brussels, Belgium – Atmospheric scientists and ATM stakeholders shaping a more efficient provision and use of meteorological information in future aviation.

**Final programme here. Presentations:** zip file1 (10MB); zip file2 (13MB).

The main objective of this challenge is to improve overall ATM system performance by providing better user-support tools based on improved meteorological ('met') products. The focus is on the synergy of several methods and techniques in order to better meet the needs of operational users and to support aviation safety (e.g., through creating early warning systems) and regulation-makers (e.g., moving from text-based to graphical information provision). All stakeholders may benefit from this synergy: ANSPs (e.g., sector reconfiguration and separation provision), airlines (e.g., storm avoidance), airport operators (e.g., airport management under disruptive events), and the Network Manager (e.g., demand-capacity balancing). The challenge is, therefore, to bring the following perspectives closer: (a) for meteorological/atmospheric science, the development of products tailored to ATM stakeholders’ needs, which are unambiguous and easy to interpret; (b) for stakeholders, the identification of the most suitable information available and its integration into planning and decision-making processes.

**Fuller text here (updated November 2018)**

engagektn.com
Next steps for the challenges
Call for catalyst fund proposals

- Call open until 15 February 2019
  - maturing from exploratory to applied-orientation
  - up to €60k, 12 months, ‘light touch’ (also ‘open’)
  - during and post evaluation, how we can support development...
Next steps for the challenges
Support from consortium and partners

Monitoring thematic challenge (and PhD / post-graduate thesis) proposals, where we:

• can add value and technical support
• coordinate with industry partners (e.g. expertise and data)
• seek interdisciplinary / expert advice
  • specific (e.g. student)
  • generic (e.g. summer school)

(More on wider picture, later)
Next steps for the challenges
Support from EUROCONTROL

• Specific effort for supporting Engage (challenges, PhDs, etc.); + two initiatives open to all:
  • **ESCAPE-Light**
    • trial of real-time, open-source ATC simulator
    • controller & pseudo-pilot positions; runs on Linux
    • rich ATC data (e.g. voice, inputs, tracks)
    • can run own algorithms (e.g. ML) & data analytics
    • free software; users can build / propose improvements

  More info: philippe.debels@eurocontrol.int and https://simulations.eurocontrol.int/

• **Data accessibility**
  • historical PRISME (DDR) data: improved access for research purposes
  • easier access to data over 2 years old
  • four months per year (March, June, September, December)
  • beta download site expected soon
  • will be notified on Engage, EUROCONTROL and ART websites
Look ahead
More from Engage coming up
Look ahead
More from Engage coming up

• Brief thematic challenges recap; 2019-2020

• PhD / post-graduate theses Call

• Summer schools; student support

• Research community support
Look ahead
SESAR Innovation Days programme
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<tr>
<th>Time</th>
<th>Session</th>
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<tr>
<td>8:30 - 9:00</td>
<td>Welcome coffee</td>
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<td>9:00 - 9:20</td>
<td>Welcome and opening</td>
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<td></td>
<td>- Vicerector Ferreira-Briza, University of Salzburg</td>
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<td>- Elisabeth Landrichter, Director General, Austrian Civil Aviation Authority</td>
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<td>9:20 - 10:00</td>
<td>Keynotes</td>
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<td>- Filip Cornells, Director Aviation, DG MOVE, European Commission</td>
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<td>- Philippe Merlo, Director ATM, EUROCONTROL</td>
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<td>- Florian Guillermot, Executive Director, SESAR JU</td>
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<td>10:00 - 10:45</td>
<td>Engage network</td>
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<td>- Andrew Cook, Coordinator, Engage network</td>
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<td>- Paula Lopez, Consortium Member, Engage network</td>
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<td>- Tatjana Bolic, Consortium Member, Engage network</td>
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<td>- Dirk Schaefer, SIDs Programme Committee Chair</td>
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<td>(The welcome and keynote sessions will take place in the Karajan Hall)</td>
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<tr>
<td>10:45 - 11:15</td>
<td>Coffee &amp; Exhibition</td>
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<td>Machine Learning 1 *</td>
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<td>Chair: Jacco Hoekstra, TU Delft</td>
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<td>Flight Level Prediction with a Deep Feedforward Network</td>
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<td>Matthias Poppe, DFS</td>
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<td>11:15 - 13:00</td>
<td>Airports *</td>
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<td>Chair: Sara Bagassi, University of Bologna</td>
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<td>Identification of Complexity Factors for Remote Towers</td>
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<td>Christiane Schmidt, Linköping University</td>
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<td>Automated Data-Driven Prediction of Aircraft Estimated Time of Arrival</td>
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<td>Zhengyi Wang, ENAC</td>
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<td>Stochastic Control of Turnarounds at HUB-Airports</td>
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<td>Jan Evler, TU Dresden</td>
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<td>A Boosted Tree Framework for Runway Occupancy and Exit Prediction</td>
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<td>Dario Martinez, Innaxis</td>
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<td>SESAR 1 Solutions Implementation Key Feature - High Performing Airport Operations</td>
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<td>Doroteja Timotic, University of Belgrade</td>
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<td>13:00 – 14:00</td>
<td>Lunch and exhibition</td>
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<td>Data-driven Techniques *</td>
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<td>Chair: Marc Bourgeois, EUROCONTROL</td>
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<tr>
<td>14:00 – 15:45</td>
<td>Smart Data Fusion: Probabilistic Record Linkage adapted to Merge Two Trajectories from Different Sources</td>
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<td></td>
<td>Dario Martínez, Innaxis</td>
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<td></td>
<td>Visual Analytics of Flight Trajectories for Uncovering Decision Making Strategies</td>
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<td></td>
<td>Gennady Andrienko, Fraunhofer Institute IAIS</td>
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<td>Aircraft Atypical Approach Detection using Functional Principal Component Analysis</td>
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<td></td>
<td>Gabriel Jarry, ENAC</td>
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<td></td>
<td>* including 15 min poster teaser session</td>
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<td></td>
<td>Economics and Legal *</td>
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<td>Chair: Rita Markovits-Somagyi, HungaroControl</td>
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<td></td>
<td>Decision Support for an Optimal Choice of Subsidised Routes in Air Transportation</td>
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<td></td>
<td>Alan Kinene, Linköping University</td>
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<td>Shared Airspace, Shared Liability?</td>
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<td></td>
<td>Ivo Emanuilo, KU Leuven</td>
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<tr>
<td>15:45 – 16:15</td>
<td>Coffee and exhibition</td>
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<tr>
<td>16:15 – 17:45</td>
<td>Plenary session 1: ATM research in the global perspective</td>
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<td></td>
<td>• Saulo De Silva, ICAO</td>
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<td>• Ho Wei Sean, CAAS, Singapore</td>
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<td>• Steve Bradford, FAA</td>
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<td>• Tokuaki Nakajima, ENRI Japan</td>
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<td>• Parimal Kopardekar, NASA</td>
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<td></td>
<td>Moderated by Michael Stander, Chief Strategy &amp; External Affairs, SESAR JU</td>
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<td>17:45 – 19:00</td>
<td>Posters and Exhibits Cocktail</td>
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<tr>
<td>9:00 – 9:30</td>
<td>Keynote on the Human Factor in ATM R&amp;D</td>
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<td>• Tom Laursen, EVP Europe, IFATCA</td>
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<td>• Toni Waefler, IFATCA</td>
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<tr>
<td>9:30 – 11:00</td>
<td>Plenary session 2: Transport research into implementation</td>
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<td>• Carlo Borghini, Executive Director, Shift2Rail</td>
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<td>• Georg Trausmuth, Head of Corporate Research, Frequentis</td>
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<td>• Eric Nantier, Director Operations Control Process, Lufthansa Group</td>
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<td>• Olaf Dlugi, Chairman of the Industry Consultation Body</td>
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<td>• Tanja Grobotek, CANSO Europe Director</td>
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<td></td>
<td>Moderated by Peter Hotham, Deputy Director, SESAR JU</td>
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<tr>
<td>11:00 – 11:15</td>
<td>Artistic Interlude</td>
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<td>(Morning sessions to take place in the Karajan Hall)</td>
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<tr>
<td>11:15 – 11:45</td>
<td>Coffee &amp; exhibition</td>
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<td>UTM and UAS</td>
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<td>Chair: Francisco Saez, Cranfield University</td>
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<td>Drone Delivery: Urban Airspace</td>
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<td>Traffic Density Estimation</td>
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<td>Jacco Hoekstra, TU Delft</td>
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<td>11:45 – 13:00</td>
<td>Meteo and Environment</td>
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<td>Chair: Damian Rivas, University of Seville</td>
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<td>Optimal Aircraft Path Planning in a Structured Airspace Using Ensemble</td>
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<td>Weather Forecasts</td>
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<td>Antonio Franco, University of Seville</td>
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<td>Drone Information Service Requirements for U-Space</td>
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<td>Jacco Hoekstra, TU Delft</td>
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<td>Mitigation potential of environmental optimized aircraft</td>
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<td>trajectories using climate metrics</td>
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<td>Sigrun Matthes, DLR</td>
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<tr>
<td>13:00 – 14:30</td>
<td>Lunch &amp; exhibition</td>
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**NETWORKING DINNER**
**Wednesday, 5 December 2018**

- **Hangar 7 Museum**
  Wilhelm-Spazier-Straße 7a, 5020 Salzburg

  *Please note that there will be participant fee of 35 EUR to be paid in advance on-site during the main event.*

- **Buses to the Hangar 7 museum will depart at 18:30 from outside the Salzburg Congress Centre**

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**Wednesday, 5 December 2018**

<table>
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<th>Time</th>
<th>Session</th>
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| 14:30 – 16:00 | Machine Learning II  
*Chair: Fedja Netjasov, University of Belgrade*

- Airline Disruption Management with Aircraft Swapping and Reinforcement Learning
  *Gabriel Hondet, ENAC*

- Application of Machine Learning for ATM Performance Assessment – Identification of Sources of En-Route Flight Inefficiency
  *Rodrigo Marcos, Nomnom*

- Detecting Controllers’ Actions in Past Mode-S Data by Autoencoder-Based Anomaly Detection
  *Xavier Olive, ONERA*

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<th>Time</th>
<th>Session</th>
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| 19:00 -22:00 | Airspace Design and Management  
*Chair: Daniel Delahaye, ENAC*

- Free Route Airspaces in Functional Air Space Blocks
  *Judith Rosenow, TU Dresden*

- Tactical Prediction of the Number of Control Positions with Softmax Regression and Tree Search
  *Judicaël Bedouet, ONERA*

- The Effects of the Introduction of Free Route in the Hungarian Airspace
  *Fanni Kling, HungaroControl*

(LOCATION: Karajan Hall)  
(LOCATION: Wolf-Dietrich Hall)
### Modelling and Simulation

**Chair:** Lorenzo Castelli, University of Trieste

- Assessment of Future Air Traffic Management System Safety Performances using a Network-based Simulation Model  
  *Fedja Netjasov, University of Belgrade*

### Flow Management

**Chair:** Radosav Jovanovic, University of Belgrade

- Occupancy Peak Estimation from Sector Geometry and Traffic Flow data  
  *Luis Basora, ONERA*

#### 9:30 – 11:00

- **Towards New Metrics Assessing Air Traffic Network Interactions**  
  *Silvia Zaoli, University of Bologna*

- **Aircraft Drag Polar Estimation Based on a Stochastic Hierarchical Model**  
  *Junzi Sun, TU Delft*

- **Coordinated Capacity and Demand Management in the European Core Area: Results of a Large-scale COCTA Case Study**  
  *Nikola Ivanov, University of Belgrade*

- **Arrival Trade-offs Considering Total Flight and Passenger Delays and Fairness**  
  *Luis Delgado, University of Westminster*

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### Coffee & exhibition

**LOCATION:** Karajan Hall  
**LOCATION:** Wolf-Dietrich Hall
<table>
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<tr>
<th>Time</th>
<th>Session</th>
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<tr>
<td>11:30 – 13:00</td>
<td><strong>Controller Assistance Systems</strong>&lt;br&gt;Chair: Luis Delgado, University of Westminster&lt;br&gt;Building Blocks of Assistant Based Speech Recognition for Air Traffic Management Applications&lt;br&gt;Matthias Kleinert, DLR&lt;br&gt;Hotspot Resolution with Sliding Window Capacity Constraints using the Path&amp;Cycle Algorithm&lt;br&gt;Andreas Nakkerud, University of Oslo&lt;br&gt;The Semantic Container Approach: Techniques for Ontology-based Data Description and Discovery in a Decentralized SWIM Knowledge Base&lt;br&gt;Bernd Neumayr, University of Linz and Eduard Gringinger, Frequentis&lt;br&gt;(LOCATION: Karajan Hall)&lt;br&gt;&lt;br&gt;<strong>Performance</strong>&lt;br&gt;Chair: Dirk Schaefer, EUROCONTROL&lt;br&gt;Open Flight Trajectories for Reproducible ANS Performance Review&lt;br&gt;Enrico Spinielli, EUROCONTROL&lt;br&gt;A Multi-layer Model for Long-term KPI Alignment Forecasts&lt;br&gt;Gérald Gurtner, University of Westminster&lt;br&gt;Enhanced Indicators to Monitor ATM Performance in Europe – Main findings of the APACHE Project&lt;br&gt;Xavier Prats, UPC&lt;br&gt;(LOCATION: Wolf-Dietrich Hall)</td>
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<tr>
<td>13:00 – 14:00</td>
<td><strong>Lunch &amp; exhibition</strong></td>
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<td>14:00 – 15:00</td>
<td><strong>Panel 3: Women in Aviation Research</strong>&lt;br&gt;Elisabeth Koithaus, European Commission, DG MOVE&lt;br&gt;Rita Markovits-Somogyi, HungaroControl&lt;br&gt;Alison Roberts, NATS&lt;br&gt;Sara Bagassi, University of Bologna&lt;br&gt;&lt;br&gt;<strong>Moderated by Tanja Bolic, SJU Scientific Committee</strong></td>
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Thursday, 6 December 2018

15:00 – 15:30  Coffee break & exhibition

15:30 – 16:00  Look ahead from the Engage network
  • Andrew Cook, Coordinator, Engage network

16:00 – 16:30  SESAR Young Scientist Award Ceremony

16:30 – 17:00  Closing keynote
  • Florian Guillermic, Executive Director, SESAR JU

(LOCATION: Karajan Hall)

Friday, 7 December 2018

SITE VISITS

• TOUR 1: Salzburg Area (Salzburg University, Salzburg Airport, Hangar 8, Austrian Airforce)

• TOUR 2: Vienna (Frequentis, University of Vienna)

• TOUR 3: Vienna (Austrian Airlines, Austrocontrol)

(You must be pre-registered to attend these tours, please speak to someone at the SIDS registration desk should you wish to attend)
Engage KTN
Thematic challenges update; SIDs look ahead

Thank you
8th SESAR Innovation Days

Thank you!