Engage 2 KTN
Winter school, 27-31 January 2025, Belgrade:

Lecture summaries

Lecture title	Lecturer(s)	Learning objectives (Abstract)	Contact e-mail
Flight planning and messaging	**Graham Tanner**	Appreciate the main principles of current flight planning through discussion of the information required for an example flight plan, including available sources of aeronautical information. The role of the Network Manager at filing, subsequent message distribution and slot allocation is summarised. A comparison is given between the basic ICAO flight plan and the more detailed operational flight plans generated internally by airlines using commercial tools. The extended flight plan and its expected benefits are also introduced.	tannerg@westminster.ac.uk
Performance measurement in ATM	**Andrew Cook**	Appreciate key aspects of performance measurement in ATM; gain knowledge of the latest regulatory and KPI contexts, and some of the main challenges ahead. Background of the Single European Sky targets, contributions from ICAO, main aspects of the key performance areas, comparison of the SES Performance Scheme and SESAR Performance Framework discussed. Overview of latest changes in SESAR 3 and new Master Plan context. Insights into current, actual performance.	cookaj@westminster.ac.uk
Delays in European aviation: trends and costs	**Andrew Cook**	Appreciate the methodology for calculating the cost of delay to European aviation; gain familiarity with the key associated trends and distributions, plus uses of the cost data by industry and academia. Understand the difference between strategic and tactical delay, plus the contributions from the various elements (aircraft ownership, maintenance, fuel, crew and passenger costs). Key challenges for future research are also discussed. Insights into new, open-source tools and resources.	cookaj@westminster.ac.uk
Data in aviation and ATM - essential sources	**Graham Tanner**	Gain familiarity with the key datasets available from official, commercial and open data sources to support aviation and ATM research. Whilst the focus is on European traffic (flights) and passenger data sources, other useful data sources (e.g. enablers, calibration) are discussed. Examples of data granularity show a contrast between high level/aggregated data and individual flight data/passenger itineraries. Costs and accessibility, dataset cleaning and preparation, pros and cons plus synergies are all considered.	tannerg@westminster.ac.uk
Modelling methods in aviation: comparative benefits	**Gerald Gurtner**	Understand what is a model, why it is necessary to make decision. Understand basic concepts of overfitting, underfitting, prediction power, falsifiability etc. Understand the different characteristics of a model; in particular understand differences between logical/causal models and ML/correlation models. Understand how data enter the picture and what is training and calibration. Review the main models used in ATM, including agent-based models, neural networks, Bayesian networks etc. Understand their logic, the pros of and cons of each and see some examples of how they have been used in ATM.	g.gurtner@westminster.ac.uk
Tools for data science	**Gerald Gurtner**	Get started on how to do data science in ATM, including following aspects: ▪ What tools, languages and modules to use for modelling purpose? (could include Java, Python, C, but also JADE. Could also include things on code management, like git). ▪ In particular, what languages and modules to use for statistical analysis? (could include Python and R, maybe Tableau) ▪ How do you take care of data? (could include excel, open-source equivalent, Mysql databases, non-relational databases like DynamoDB) ▪ How do you produce graphs? For whom? (could include simple excel, matplotlib graphs and maybe more advanced D3.js things)	g.gurtner@westminster.ac.uk
Future concepts in ATM	**Tatjana Bolić**	Description of the ATM research environment in Europe by defining SESAR project, SESAR Innovation pipeline. Defining the new research and deployment priorities through the Master Plan update. What are the future concepts to be researched, developed and deployed?	t.bolic@westminster.ac.uk
Aviation meteorology, airborne natural hazards and environmental impacts	**Tatjana Bolić**	Introduction to the aviation meteorology, normal operations, jet streams, convective weather and natural hazards, climate impact of aviation and how to include route charges into balancing environmental impact.	t.bolic@westminster.ac.uk
Risk and Safety Modelling in Civil Aviation	**Fedja Netjasov**	Risk and safety are considered the most important operational characteristics of civil aviation. Usually, they refer to the potential occurrence of air traffic accidents which might result in loss of life, damage to infrastructure and third party property damage. Consequently, they have been regarded as externalities in addition to other adverse effects such as noise, air pollution, land-use, water/soil pollution, waste, and congestion. This lecture deals with a review of the research on risk and safety modelling in civil aviation. In such a context, the basic (generic) concepts and definitions of risk, safety and their evaluation are described. A review of the research is focused on four categories of methods/models for risk and safety assessment: causal for aircraft and ATC/ATM operations, collision risk, human factor error and third-party risk. The review is carried out with respect to their purpose, problems, recommendations and relation to new technologies.	f.netjasov@sf.bg.ac.rs
Experimental methods	**Dirk Schaefer**	Experiments are a common and very useful part of scientific methods as they allow gathering experimental evidence that allow answering a research question or refusing/confirming a hypothesis. Experiments are often costly in effort and time, especially when human participants are involved, and proper planning is necessary to obtain the evidence sought in support of the research question. The tutorial will cover the following topics: ▪ Formulating research question and hypothesis ▪ Observations, longitudinal studies and experiments ▪ Dependent and independent variables ▪ Correlation and causality, Granger causality ▪ Measurement Scales and Distributions (continuous and concrete, examples of distributions) ▪ Population metrics, sampling methods and sample size ▪ Categories of validity ▪ Statistical power ▪ Factorial design ▪ Sequence effects, counterbalancing, latin-square design ▪ Ethical guidelines and participant consent ▪ Experimental design in practice: limitations and considerations Three short exercises, building on each other, will help applying the above concepts.	dirk.schaefer@eurocontrol.int
Introduction to airfield and airspace simulation modelling	**Vojin Tošić, Bojana Mirković**	To discuss basic advantages and possible shortcomings of simulation models. Basics of Monte Carlo simulation. Stochastic processes and variables. Structure of simulation models. Illustrative generic example of an airfield/airspace model. Overview of the commercial and custom-made airport operations simulations, and areas of their application.	b.mirkovic@sf.bg.ac.rs
Artificial intelligence in the aviation industry: A new prediction approach for airlines	**Slavica Dožić, Danica Babić**	The basic definitions of AI and different techniques. EASA's AI Roadmap: three general AI levels (human assistance (Level 1 AI), human-AI teaming (Level 2 AI) and advanced automation (Level 3 AI)), and their sublevels. An overview of AI applications in aviation (ATM, airports, manufacturers, airlines). One of the critical applications of AI in aviation is in understanding vast amounts of data generated by various systems and stakeholders. Predictive analytics driven by AI is another significant aspect of its application in aviation. The lecture will be narrowed down by specifying the topic of flight delays and airport landside access modes. It demonstrates how machine learning algorithms can continuously learn from past flight data and help in improving the operational efficiency and minimise delays.	s.dozic@sf.bg.ac.rs d.babic@sf.bg.ac.rs
Human factors awareness	**Tommaso Vendruscolo**	The course covers the fundamentals of Human Factors, human abilities and limitations, and methods and tools to ensure a human-centred approach to technological and procedural innovations, incident investigation, safety activities, and regulatory oversight. The course ensures that all the participants acquire key Human Factors concepts while recognizing and emphasising the strengths of the human being – such as flexibility, adaptability, and learning skills – thereby enlarging the scope of HF analysis beyond human errors and incident investigation. At the end of the course, participants also have a full understanding of the central contribution of humans to business performance and can describe how HF can improve their daily operations and organisation.	tommaso.vendruscolo@dblue.it
Open-source tools and open-science for ATM research	**Luis Delgado, Gerald Gurtner**	Introduction to the open-source tools and open-science available for ATM research. Content includes what is (and what is not) open-source, an overview of some of the open-source tools and resources for ATM, as well as worked examples which illustrate how such tools work in practice.	l.delgado@westminster.ac.uk
Ground infrastructure for UAM - vertiports	**Bojana Mirković**	EASA (2021) emphasises that the biggest challenges for UAM service establishment are expected to be related to infrastructure, safety and noise, namely: finding suitable locations / buildings for vertiports, aiming for safety level similar/equal to commercial aircraft, and achieving low noise level for better social acceptance. The lecture focuses on ground infrastructure as one of the key enablers of the UAM service. It provides state-of-the art on UAM ground infrastructure, covering: ▪ vertiport design and operation, ▪ regulatory requirements, ▪ eVTOL aircraft characteristics related to vertiport planning ▪ vertiport infrastructure cost, ▪ placement methods considering UAM demand distribution, ▪ vertiport site selection problem considering capacity constraints and other relevant factors, etc.	b.mirkovic@sf.bg.ac.rs
Introduction to UAS and U-space	**Dirk Schaefer**	This course provides an overview of current operations of Unmanned Aerial Systems, the status of drone regulations and U-space, the European system for the management of UAS traffic. It will specifically focus on the development of the U-space Concept of Operations developed in the CORUS projects (CORUS, CORUS-XUAM, CORUS five) under funding by the SESAR 3 Joint Undertaking. The ConOps includes airspace categories, flight rules and vertiport operations.	dirk.schaefer@eurocontrol.int