

 **HungaroControl**

SIMULATION  HUB

SERVICE CATALOG

EMPOWERED THROUGH EXPERIENCE

We provide direct and indirect services for air navigation service providers, airports, functional airspace blocks and other industry partners.

OUR STORY

HungaroControl provides air navigation services in Hungarian airspace and – on a NATO assignment – in the upper-airspace over Kosovo, trains air traffic controllers and undertakes extensive air navigation research and development.

HungaroControl established Simulation HUB in 2011 to respond to the increasing requirement for a platform that covers all aspects of the simulation and validation lifecycle from experimental HMI (Human-Machine Interface) to training delivery.

To date, we have worked with numerous partners globally, who successfully managed to optimise the performance of their operations. We are continuously improving Simulation HUB in order to create a range of services tailored to your needs.

SIMULATION HUB

is Europe's largest commercial
radar simulator for validation
activities

Global air traffic is set to grow at approximately 4.5% annually till 2042 (ICAO 2016). This significant increase in air traffic and frequent capacity problems must be addressed by progressive solutions. This results in a growing demand for research, development and innovation, as well as simulation and validation.

OUR SHARED APPROACH

PROFESSIONAL



You are a professional service provider, who demands the highest level of proficiency when it comes to simulation, validation and training. Our technical expertise and proven experience will support your simulation and validation journey and guide you through this complex process.



FOCUSED

A focused approach is key to your success. Our modular service portfolio enables you to tailor a solution that meets your unique requirements.



INNOVATIVE

You are constantly looking for the latest, cutting-edge concepts that can help you overcome operational performance issues. We are consciously preparing for the future challenges of the ATM industry.

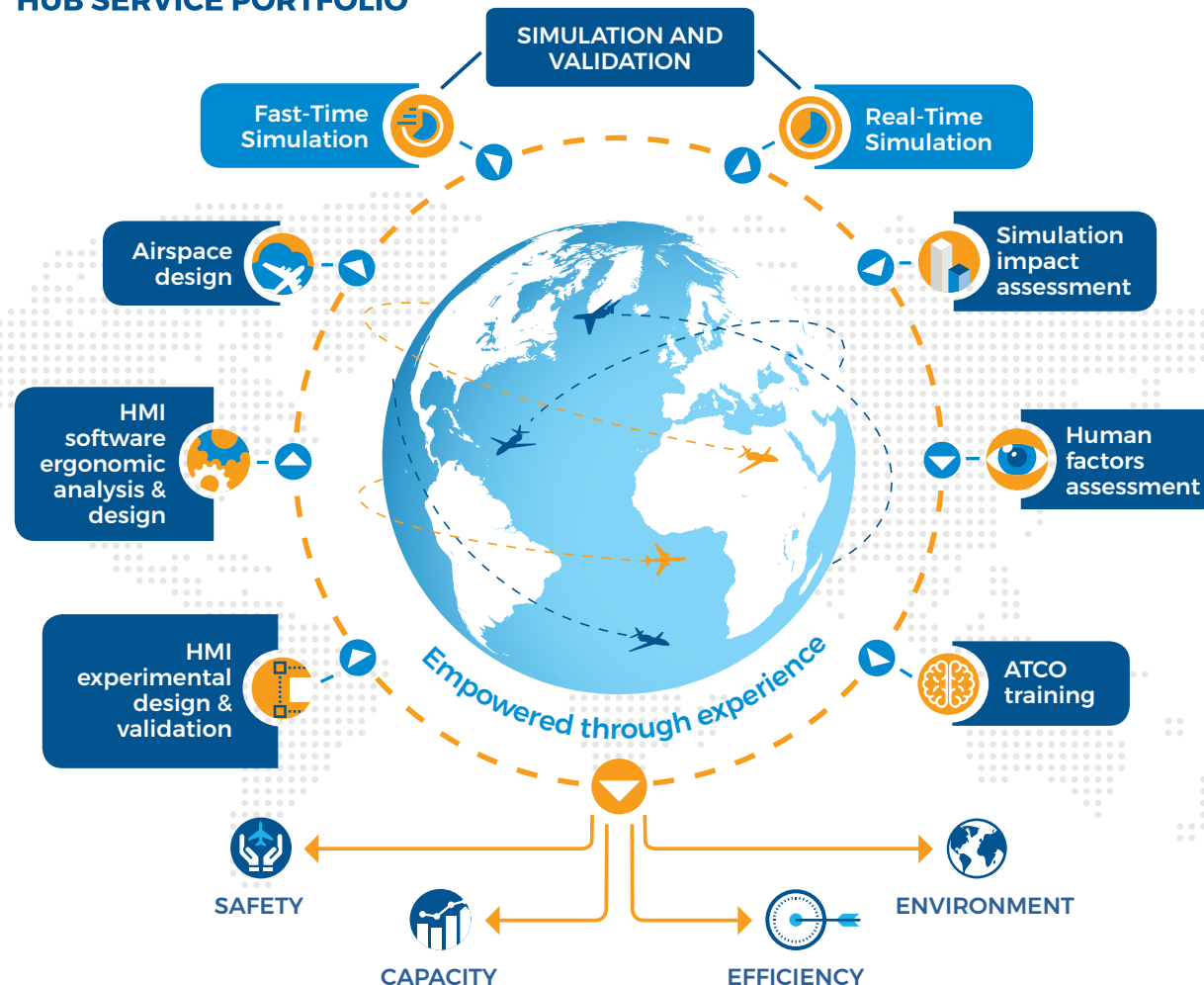
THE SIMULATOR

- Fully customisable Human-Machine Interface (HMI)
- World-class simulator hardware
- **34** controller working positions and **27** pseudo-pilot working positions
- Featuring the latest ESCAPE platform
- Supported by acknowledged ATM and simulation experts, air traffic controllers and human factors analysts
- Extensive experience with large-scale commercial simulations and validations

SERVICES OVERVIEW

End-to-end simulation solutions based on our experience, in a **state-of-the-art** technical environment, and compliance with the **highest standards** of innovation.

ELEMENTS OF SIMULATION HUB SERVICE PORTFOLIO



PORTFOLIO

- HMI experimental design and validation
- HMI software ergonomic analysis and design
- Airspace design
- Simulation and Validation
- Fast-Time Simulation
- Real-Time Simulation
- Simulation impact assessment
- Human factors assessment
- ATCO Training

HUMAN-MACHINE INTERFACE (HMI) EXPERIMENTAL DESIGN AND VALIDATION

Successful ATM system deployment is dependent on connecting humans with technology. A **HMI that supports end-users in executing their tasks efficiently and effectively** is key to this link. In order to create realistic and high-fidelity scenarios, **Simulation HUB offers clients the opportunity to use the HMI of their ‘home’ ATM system reproduced by Simulation Developers;** new functions can also be implemented and validated.

FEATURES

- ATC HMI replication
- New system/concept/tool integration
- Experimental design of new functions

ADVANTAGES

- Easy-to-use and flexible working environment
- Practical test and validation of new functions
- Improved HMI compatibility with human capabilities and limitations

BENEFITS

- Increase in controller-to-system compatibility
- Cost-effective implementation of new functions
- Improvement in controller effectiveness and efficiency

Danube FAB CPDLC validation

“The DANUBE FAB ANSPs ROMATSA and BULATSA conducted in 2014, a Real Time Simulation for Controller Pilot Data Link Communications (CPDLC) in order to validate the operational concept for Data Link Services (DLS) implementation at FAB level. The RTS was performed with support from Simulation HUB (former HungaroControl CRDS) in Budapest and it was a success. Thanks to the result of the study, we were able to develop efficient procedures to obtain an early understanding of how the DLS implementation affects ATCO workload and we’ve learned how to translate this into an available airspace capacity.”

Adrian Florea, ROMATSA

HMI SOFTWARE ERGONOMIC ANALYSIS AND DESIGN

User interface (UI) is the where **humans and machines meet**. Its design and ergonomics can make the difference between impractical and user-friendly systems. **Our experienced professionals understand** how controllers and pseudo-pilots think, behave and act. This innate know-how can be leveraged to drive the design of user-centric software.

FEATURES

- HMI software ergonomic analysis
- HMI software optimisation
- Pseudo-pilot User Interface design

ADVANTAGES

- Knowledge and experience-based design advisory
- Flexible design environment
- Flexibility over design controls

BENEFITS

- Reduction in stress levels for controllers
- Reduction in design attributed safety risks
- Increase in controller-to-system compatibility

Isavia Pseudo-pilot interface design

"HungaroControl's extensive knowledge of operating various ATC training environments gave Isavia and Tern Systems useful insight and knowledge when designing the new human machine interface for the Tern ATC Simulator (TSIM). We are certain that the newly implemented design of TSIM supports the stringent requirements for all phase of control (ground, tower, approach and en-route training)."

Arnór Kristinsson, ISAVIA

AIRSPACE DESIGN

Capacity issues you might be facing, **must be addressed** by progressive solutions. The design and modelling of simulated airspace is the **foundation of implementing new procedures or re-sectorising airspace**.

FEATURES

- Multiple airspace modernisation and reconfiguration options
- New sector configurations
- New departure and arrival procedures
- Fixed-route and free-route based optimisation options for en-route environments

ADVANTAGES

- A dynamic and flexible working methodology
- Accelerated evaluation and analysis of design feasibility
- Instant measurement results

BENEFITS

- Increase capacity and efficiency
- Added value through professional experts
- Improve operational efficiency (fuel burn, carbon emissions, noise)

CEAP (Central and Eastern European Air Navigation Service Providers' Platform) validation

Simulation HUB hosted a cross-border real-time simulation with PANSA, LPS SR and HungaroControl in May 2013 with multiple HMIs in one exercise to design, model and validate Polish, Slovakian and Hungarian airspace to be seamless. Applying a dynamic design methodology and simulating a life-like airspace environment enabled greater assurance during implementation.

SIMULATION & VALIDATION – FAST-TIME SIMULATION (FTS)

Fast-time simulation is a **cost-effective method** to examine the impact of new aspects on operations and help stakeholders to make informed decisions. Based on mathematical models, this type of simulation is **executed at an accelerated speed, which provides opportunity to test various scenarios** in a short period of time. It is an ideal tool for **quick prototyping and instant evaluation of airspace redesigns** and new concepts.

FEATURES

- All performance parameters can be captured (e.g. fuel burn, airspace occupancy, flight distance and duration and number of passengers served)
- Event logs can be processed for future simulation activities or performance analysis
- FTS can be used stand-alone or to select the most promising scenarios for more mature real-time simulations (RTS)

ADVANTAGES

- Model-based simulation process
- Large data processing capacity
- Accelerated multi-scenario modeling

BENEFITS

- Informed decision making
- Ability to test a multitude of options
- Cost-effective analysis of future concept/system changes

Budapest terminal area optimization

The goal of the project was the redesign of procedures used in Budapest's tower and approach areas, and the amendment of airspace borders. The project was successful as:

- it complies with the growing air traffic demand;
- it satisfies the requirements of airspace users as much as possible, allowing an effective and economical operation;
- it supports the potential integration of military and terminal area airspace;
- it assists the use of modern technological solutions.

SIMULATION & VALIDATION – REAL-TIME SIMULATION (RTS)

Real-time simulation is used to validate new operational concepts with the support of controllers proficient in the respective airspace. In order to create realistic and high-fidelity scenarios, **Simulation HUB offers clients the opportunity to use the HMI of their ‘home’ ATM system reproduced by our Simulation Developers.**

FEATURES

- Simulation is executed in real-time supported by controllers and pseudo-pilots
- Fully customised HMI with 34 controller and 27 pilot working positions
- Application of the European Operational Concept Validation Methodology (E-OCVM)

ADVANTAGES

- Scalable simulation facility to accommodate small-to-large scale simulations
- ‘Feels-like-home’ ATM system environment
- Holistic and rigorous validation process

BENEFITS

- Ease of focus on real problems with a reproduced ‘home’ ATM system
- Ability to identify and detect operational challenges and improve performance
- Improvement in operational risk management and assurance from simulation outcomes

FAB CE FRA validation

The Functional Airspace Block – Central Europe (FAB CE) – part of the Single European Sky project – is a joint initiative of seven states and air navigation service providers (ANSPs) from Central Europe – Austria, Bosnia & Herzegovina, Croatia, Czech Republic, Hungary, Slovakia and Slovenia – located in the heart of Europe and managing critical air traffic flows across the continent.

The aim of the simulation was to validate the developed Concept of Operations (CONOPS). Among other objectives, we investigated what changes the FAB CE Free Route Airspace (FRA) would imply on the current fixed route network and the effect of FRA within individual FAB CE Member State borders. Validation exercises were also carried out through Real Time Simulation, where FRA specific operational procedures were tested and successfully validated. Special attention was given to the adequacy of ATC support tools, capacity analysis and the scenarios with active restricted areas.

SIMULATION IMPACT ASSESSMENT

Perfection within a complex ATM environment is no easy feat to realise. Impact assessments across all performance dimensions (safety, efficiency, capacity) are crucial to pre-determining the operational performance of airspace designs and procedures. **This pre-implementation assessment is critical to refine designs in order to maximise operational performance and resilience.**

FEATURES

- Support by ATM, Safety, Human Factors experts and engineers experienced in validation methodology
- Measurement of key simulation parameters (occupancy, conflicts, complexity, workload)
- A strong focus on human performance evaluation

ADVANTAGES

- Provides a solid understanding of challenges that drive human performance
- Broad functional team with deep experience to respond to complex design problems
- 'Feels-like-home' ATM system environment

BENEFITS

- Detailed insight into future operational performance prior to concept and design implementation
- Anticipation and identification of current and emergent operational risks for remediation
- Opportunity to optimise human performance from design

SEAFRA Simulation

Air Traffic Controllers and ATM experts from Croatia Control (CCL), Serbia and Montenegro Air Traffic Services (SMATSA) and Bosnia and Herzegovina Air Navigation Services Agency (BHANSNA) successfully conducted the South-East Axis Free Route Airspace (SEAFRA) Real-Time Simulation in 2016 in our facility. *"Participating in real-time simulation of cross border free route airspace, SMATSA gained valuable insights into problems that may be expected during project implementation. Building different HMIs for several ACCs and running it on the same simulator was a challenging and difficult task. High professionalism of staff at HungaroControl Simulation HUB quickly resolved all minor setbacks inevitable during simulation of this magnitude, allowing us to complete the cross border Free Route Airspace project in time. Friendly atmosphere and excellent team work truly contributed reaching important project milestone. Since SMATSA participated in more than one simulation in Budapest, Simulation HUB performance excellence is not closely related to SEAFRA project only - it is rather a high standard service continuously delivered."*

Nenad Sakic, SMATSA

HUMAN FACTORS ASSESSMENT

One of the main goals of a human factors assessment is to ensure good interactions between human capabilities and the working environment. Where a new concept or system function is to be introduced, its potential impact on users' needs to be assessed thoroughly. HungaroControl applies this human-centred approach throughout the lifecycle of the project. We apply different validation techniques depending on the maturity of the tested concept and the most applicable measurement methodology is used to gather information on the subject. The results ensure that the tested change will support human capabilities and minimise the potential for human error. Change management empowered with human factors can further support the deployment and acceptance of new concepts.

FEATURES

- Definition of evaluation strategies to formulate clear objectives and hypotheses
- Continuous support and observation during the project
- Analysis of objective and subjective data
- Debriefing sessions with subject matter experts

ADVANTAGES

- Evidence based scientific approach
- Human-centred evaluation methodology
- Actionable insight on human performance

BENEFITS

- Improvement in the acceptance of new concepts
- Identification and mitigation of potential human error
- Improvement in the effectiveness and efficiency of controllers

Flight-centric ATC validation – a SESAR project

"DLR conducted Flight-Centric validation runs as part of SESAR2020 together with Frequentis and HungaroControl in Budapest in January 2019. These runs consisted of one-hour simulations of a busy day in Hungarian airspace above FL325. Ten Air Traffic Controllers and numerous supporting staff from HungaroControl took part in these simulations. The dedication shown by all members of the HungaroControl team in preparing and conducting the simulations was extraordinary. HungaroControl even organized an Open Day related to the simulations with more than 50 visitors, giving us all the opportunity to present our work to a broad ATM audience. It was a great pleasure working with the HungaroControl team and we are looking very much forward to have more Flight-Centric runs in Budapest in 2022!"

Vilmar Mollwitz, DLR

ATCO TRAINING

More than a facility for simulation and validation activities, **Simulation HUB** is also capable of running small to large training programs for controllers across all operational environments.

FEATURES

- Emergency training
- Refresher training
- Abnormal procedural training
- Low visibility procedural training
- Winter procedural training
- High traffic load familiarization

ADVANTAGES

- Professional, licensed and experienced staff
- 'Feels-like-home' ATM system environment
- Customizable training package options

BENEFITS

- More prepared and experienced ATCOs
- More efficient working procedures
- Improving team-work skills in non-operational environments

Isavia ATCO Refresher training

"The training we received at Simulation HUB was beyond expectations. The staff were friendly and very professional, we felt like we've known each other for years. The facility satisfied all of our needs and we became definitely more confident in what we do. Also, Budapest is a wonderful city to spend a few days with colleagues. We will be back!"

Jón Ingí Jonsson, Isavia

GENSPACE

The **GENSPACE program** was started to provide a brief but meaningful **course for non-operational personnel** to gain a sneak peek into an air traffic controller's daily work. This single-day program includes a mixture of **theoretical training and hands-on experience in the simulator**, where participants can try terminal and area control.

FEATURES

- Single-day training at Simulation HUB
- Suitable for industry experts and non-industry candidates
- Fully-facilitated by experienced air traffic control instructors

ADVANTAGES

- Great opportunity to have a look behind the curtains of ATC
- A unique and memorable team building experience
- Great out-of-office location in the heart of Europe

BENEFITS

- A developed understanding into the air traffic control system
- Your team will become stronger and more integrated
- A first-hand and 'touch and feel' experience into air traffic control

"We had a great time at Simulation HUB. After a short presentation, we sat with professional controllers, talking into the headsets, controlling pseudo pilot controlled planes on the displays. This day helped us understand the complexity of this profession and made us a more relaxed flyer, experiencing the incredible background that puts us up there and guides us home. Continue present heading! Bye-bye!"

Ákos Palencsár, HungaroControl

WHY SIMULATION HUB?



Scalable to run simulation from small to large



Highly customisable user-interface



Able to run terminal and area control environment simulations simultaneously



Simulation capacity of up to 17 sectors configured concurrently



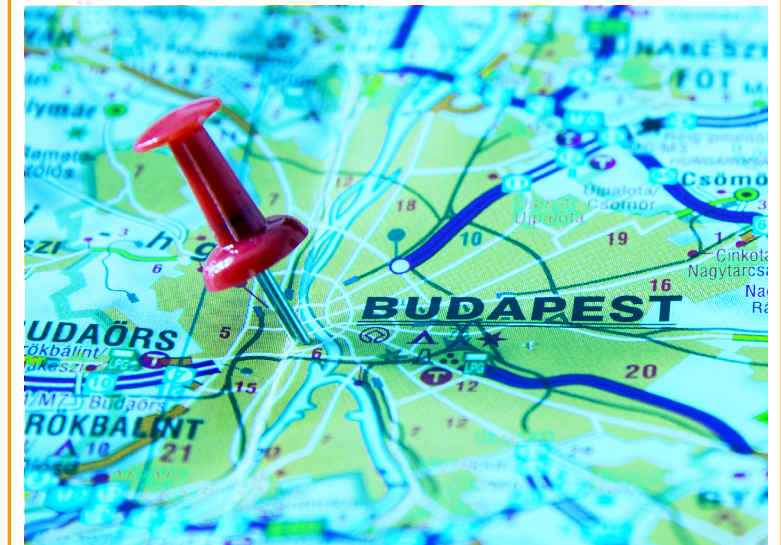
Cost-efficient services



Experienced and motivated experts

The spectacular offerings of BUDAPEST

- Winner of European Best Destinations 2019, based on 62 000 votes
- From street food to fine-dining, a great selection of gastronomic experiences
- World-famous spas and baths
- The most unique nightlife on the continent with ruin pubs, spa parties and a whole district of bars to explore
- More than a 1000 years of history to admire





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