Tutorial on ATM & Automation

“HALA! Position paper: Research Themes”

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Introduction

Main Issues related to the automation process

ATM Research themes

Trajectory Management

- Human Factors
- Trajectory Management
- Decision Support Systems
- Control System Techniques
- Seamless UAS testbed for innovation
The future ATM system
How do we get the questions?
Asking the right questions

Focus on the hard questions that will define the challenges

- Make you think
- Linked to the overall objective
- Stimulate critical thinking and creativity
- Clear

Focus on the hard questions that will define the challenges
• Background
• Scope
• Relationships

Understand the problem

Know your area
• Current systems & technologies
• On going research

Analyze
• Identify Technical & Operational enablers
• Identify Operational Improvements
• Identify Gaps
Main R&D questions related to the automation process
Adequateness and correctness of the human role in the control system
Responsive and adaptive automation
Automation R&D questions
Resilience and control system degradation
Modelling
Resilience and control system degradation

- Designing resilient systems
- Defining recovery paths in degraded modes of operation
- Monitoring for system degradation
- Human role
  - Assessing abilities & prerequisites
  - Recovery from system degradation
Adequateness & correctness of the human role in the control system

- Human trust & dependence on automation
- Maintain or enhance situational awareness
- Modelling the human role
Responsive and adaptive automation

Function allocation is changed during system operation based on operator needs

Provide aid to reduce workload

- Reduce cost
- Ensure efficiency
- Safety first!!!
Modelling

Understand and model the system control interactions

Normal and Abnormal operational conditions

Possible unexpected situations
Specific ATM R&D questions
Human Factors

Seamless UAS testbed for innovation

ATM R&D questions

Trajectory Management

Control System Techniques

Decision Support Systems
Human Factors

- Distribution of responsibilities & Competences required for pilots, ATCos and other actors
- Human Machine Interfaces
- Situational Awareness
Trajectory management

Creating, Maintaining & Synchronizing a consistent view of the trajectory

Establishing common formats to describe the trajectory

Enable ground-based automation systems to efficiently deconflict and expedite Business Trajectories
Decision-Making and Autonomous Behaviour

- Sense and Avoid technology
- Data filters (optionally adaptive) for received information
  - Fully automated pre-processing
  - Fully automated preselecting
- False alarm situation prevention
Control System Techniques

- Air Traffic Management decision-support tools for mixed traffic (manned and unmanned)
- Network-centric trajectory negotiation protocols for ATM automation in mixed traffic scenarios
- Data fusion
Seamless RPAS test bed for innovation

- Sense and avoid
- Automated separation assurance
- RPAS nmission design
Centro de Referencia I+D+i ATM

“You have a sack of corn. If you eat it all now, you die later. If you plant it all now, you die now. If you plant half of it now and eat the other half now, you survive now, and sustain yourself for later. Science is that part of the corn that you plant”

Heuer, Rolf. Director of CERN. Presentation of results that confirm the existence of the Higgs boson.