HALA! SESAR Research Network
Towards Higher Levels of Automation in ATM

A wide range for research.

HALA! RESEARCH NETWORK
WHITE PAPER

ATACCS’2011
27/5/2011
HALA! SESAR Research Network
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CONTENTS:

- Objectives of HALA!
- Main Activities
- HALA! Management Team
- Participants
- Intended Audience
- Heritage in ATM and Automation
- The new paradigm shift in Automation in ATM
  - Overall system performance as main driver for ATM Automation
  - The three interdependent dimensions for the paradigm change.
  - New roles assignment based on:
    - “best time”
    - “decision place”
    - “best player”
- HALA! main research areas
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Higher Levels of Automation in ATM

- Go beyond traditional approaches on automation in ATM
- Cover ATM automation activities not currently addressed by the other work packages of the SESAR work programme
- Foster research in automation in ATM
- Offer better framework conditions for ATM research
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PhDs
• 2 Call for PhDs
• First call has already taken place
• Second Call for PhDs -> June 2011

Conferences
• HALA! Annual conference (ATACCS)
• Summer School
• Joint Conference

Promote the Best Research in Automation in ATM

Progress on Automation
• White paper

Scientific collaborative platform
Pollinizer (facilitator) www.hala-sesar.net
Currently there are over **80 Organizations** in the Network!

**300+ researchers** registered in the HALA! Network

- **55%** Universities
- **26%** Research Centres
- **19%** Companies
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Participants

Researchers in ATM
Researchers in related areas
Researchers in human factors
Researchers in control and automation
Mathematics experts
Researchers in avionics
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- SESAR and NextGen automation strategy
- Automation limits based on human performance consequences!
- Automation vs. Human factors
- Learn from other Safety Critical industries: nuclear industry, etc...
- State of the art of automation in safety critical applications
Shift from Airspace – Based operation towards a Trajectory – Based operation concept.

“In the ATM Target Concept it is recognised that humans will constitute the core of the future European ATM Systems operations.”
D3. – ATM Target Concept. SESAR.

Shift from a controller-based system towards a more distributed system.

SESAR will help create a paradigm shift.
NEW PARADIGM SHIFT IN ATM AUTOMATION

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Focus on ATM Invariant Processes

Automation driven by overall system performance

New role assignment based on:
- “best time”
- “decision place”
- “best player”
ATM Invariants

**Goals**
- Safety (Separation Assurance)
- Efficiency (broad sense: user, provider & society)

**Limitations**
- Airport Capacity
- Atmospheric Behaviour
The three interdependent dimensions for the paradigm change

New role assignment based on:

1. **First dimension** "BEST TIME" for decision making: Strategic vs. tactical planning layer
2. **Second dimension** "DECISION PLACE": Controlled vs. autonomy.
3. **Third dimension** "BEST PLAYER": Human vs. automated player.
First dimension “BEST TIME” for decision making: Strategic vs. Tactical layer questions to be answered

STRATEGIC VS. TACTICAL

- What is the impact of uncertainties in a system when most decisions are taken long time in advance?
- As ATM processes, at different planning layers, will have feedback to absorb unexpected changes: will the overall system (composed by different nested loops) maintain the required stability?
- Do strategic functions imply more complex and rigid operational scenarios?
- Can tactical decisions alone manage ATM goals and limitations?
- Other?
What is the level of correlation between complexity and centric controlled systems?

**Autonomy: where? When?** Are segregated airspace structures (UMAS/MAS) a solution?

In which scenario (controlled or autonomous) will automation provide higher overall system performance?

Is high traffic density/complexity a key factor limiting autonomy?

Do tactical decisions imply autonomous and fully automated processes?

Does strategic decision making imply centric controlled scenarios?

Others?
**NEW PARADIGM SHIFT IN ATM AUTOMATION**

**Third dimension “BEST PLAYER”: Human vs. Automated player questions to be answered**

**HUMAN VS. MACHINE**

- Should trajectory management (e.g., Trajectory deconfliction, even tactical decisions) be fully automated?
- To what extent do strategic decisions require human intervention?
- How can uncertainty be managed in automated systems?
- Are the current frameworks for automation, cognition and human factors enough to capture ATM singularities?
- Is a fully automated air transport system socially/psychologically acceptable?
- Can the ATM system be decomplexified through automation?
- How to deal with transition issues when implementing higher levels of automation?
- How can resilience be taken into account in automated systems design?
- Does uncertainty require human centred decision-making?
HALA! main research areas

Technical Support: Automation Complexity

Strategic Versus Tactical

Controlled Systems Versus Aircraft Autonomy

New Roles Assignment

Social Impact: Economic Legal
HALA! main research areas

- Trajectory management
- Decision support tools
- Control system techniques
- Human factors
- UAS

Technical Support: Automation Complexity

Social Impact: Economic Legal
We need your expertise to improve the White Paper!

Please sens your ideas to hala@hala-sesar.net or USE THE FORUMS INSIDE the HALA! Website!
Thank you for your attention!