Table Issues:
- Notice on Expert complexity ratings
- Trust - performance monitoring (Merrett et al. 2000)
- Trust and Acceptance - Transparency, feedback
- Degraded task-orientation model
- Strategy change and strategy-based automation (Mafs)
Mismatches between Automation & Human Strategies: An Investigation into Future ATM Decision Aiding

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MUFASA
Multivariate Framework for Advanced SESAR Automation
MUFASA
Multivariate Framework for Advanced SESAR Automation

HALA WP-E
27 month

Potential HumPerf Costs of Automation e.g.
SESAR Service Levels

Annual Traffic per ATM Service Level

Million Flights/Year

2005 2010 2015 2020 2025 2030

Year

20.0 18.0 16.0 14.0 12.0 10.0 8.0 6.0 4.0 2.0 0.0
Task Complexity

Automated

Sheridan, 2002
Potential HumPerf Costs of Automation e.g.
- Workload
- SA
- Reversion-to-Manual Problems

ACCEPTANCE
Potential HumPerf Costs of Automation e.g.
- Workload
- SA
- Reversion-to-Manual Problems

ACCEPTANCE
FACTORS
1. Levels of Automation (LOA)
2. Air traffic complexity
3. Strategic conformance
1. Levels of Automation (LOA)

- Manual
- Mgt by Delegation
- Mgt by Consent
- Mgt by Exception
- Autonomous

Strategic conformance
2. Air Traffic Complexity

(LOA) Autonomic
High Complexity
3. Strategic Conformance

the degree to which automation output mimics that of the human

- Will controllers accept automation that "thinks" like them?
- Will controllers reject their own solutions, if they believe that such resolutions come from automation? i.e. operationalise automation bias

unrecognisable replay of their own previous s
3. Strategic Conformance

the degree to which automation output mimics that of the human

- Will controllers accept automation that “thinks” like them?
- Will controllers reject their own solutions, if they believe that such resolutions come from automation? i.e. operationalise automation bias
A series of their own previous solutions

Series of Real-time Simulations

SIMBA
2D simulation
Participants: Students (TU Delft)
Simulated Baseline Automation

PUMBA
2½D simulation
Participants: ATCOs (Bretigny)
Preliminary Update—Modified Baseline Automation

NALA
3D simulation
Participants: ATCOs (Shannon)
Nominal Advisory Level Automation

Research Questions

• Can automation benefit performance?
• Trade off between CV levels?
Research Questions

- Can automation benefit performance?
- Trade off by Cx level?
- Acceptance (willingness to veto) differ by Cx?
- Algo vs human solutions?
- ATC accept / consent to auto solutions?
- Does acceptance vary by conformity?
- Does acceptance vary by assumed source?
Simple model of automation usage
Situation Space Display
Stage 1: information acquisition
- Aircraft performance data
- ADS-B data
- Intent / Flight plan

Stage 2: information analysis
- Integration

Stage 3: decision selection
- Computer analyses
- Suggest single option
- Suggest speed vector options
- Select safe area

Stage 4: action implementation
- Autonomous execution
- Management and execute by exception
- Management and execute by consent
Experiment A: Prequel
- Capture conflict solutions
- Vignette generation
- Elicit strategies
- Fully manual

Experiment B: Conformance vs LOA and complexity

LOA A
- Management by consent
- Low & high complexity

LOAB
- Management by exception
- Low and high complexity
- Resolution conformance
Summary

* Do controllers accept advanced decision aiding?
* What factors drive acceptance?
* What is the impact of (mis)match between human and machine strategy?
www.chpr.nl/mufasa.htm

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