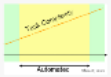
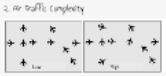
Side Issues
- Novice vs Expert complexity ratings
- Trust = miscalibrated monitoring (Moray et al 2000)
- Trust and Acceptance = Transparency + Involvement
- Degraded "off-nominal" mode
- Strategy clusters and strategy-based automation (EEC?)

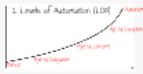
Realtime response capture
(ie ident human's chosen strategy)
Closed-loop solution
(ie. strategy triggers the "automation" solution)
Script-driven experimental design
Human chose solution
Automation offered conformal (same) solution
Automation offered non-conformal (but optimised) solution

MUFASA
Multivariate Framework for Advanced SESAR Automation



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



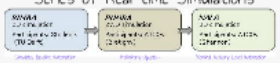


3. Strategic Conformance
the degree to which automation output mimics that of the human
- Will controllers accept automation that 'thinks' like them?
- Will controllers reject their own solutions if they believe that such resolutions come from automation? ie. operationalise automation bias

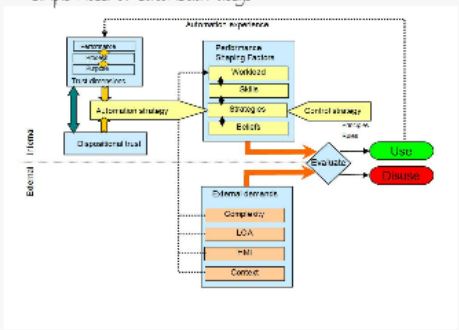
Automation acceptance: Will people reject their own solutions, if they mistakenly believe their solutions come from automation?
- unrecognisable replay of their own performance...

unrecognisable replay of their own previous solutions

Series of Real time Simulations



Simple model of automation usage



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?

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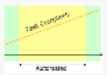
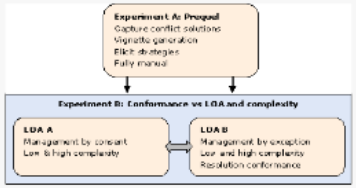
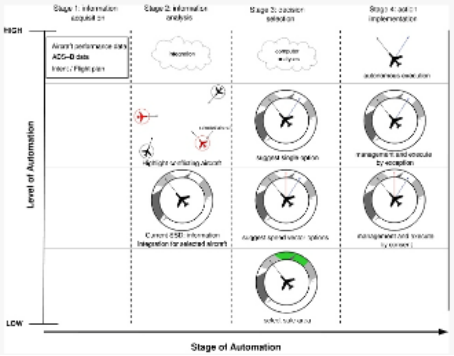
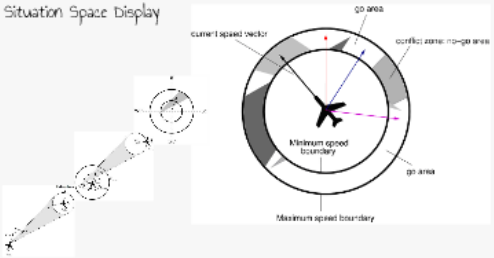
Summary
- Do controllers accept advanced decision aiding?
- What factors drive acceptance?
- What is the impact of mismatch between human and machine strategy?







Situation Space Display



Mismatches between Automation & Human Strategies: An Investigation into Future ATM Decision Aiding

Brian Hilburn [1] Carl Westin [1] Clark Borst [2]

1 Center for Human Performance Research, CHPR BV (NL)
2 Delft University of Technology, TUD (NL)

MUFASA

Multivariate Framework for Advanced SESAR Automation

ALA WP-E

27 month

TU Delft

CHPR

MUFASA

MUltivariate Framework for Advanced SESAR Automation

HALA WP-E

27 month

TU Delft
Delft University of Technology

CHPR
Center for Human Performance Research

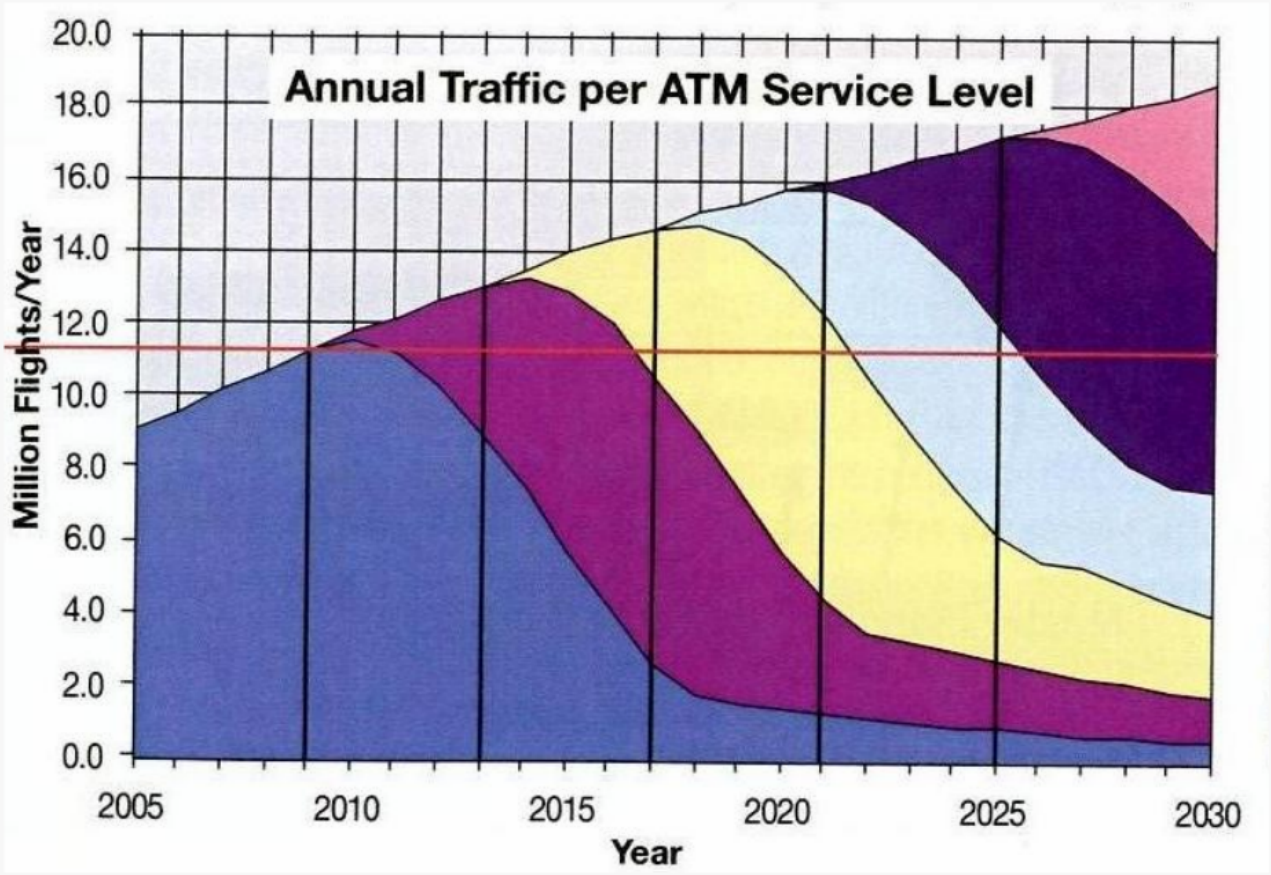
IAA

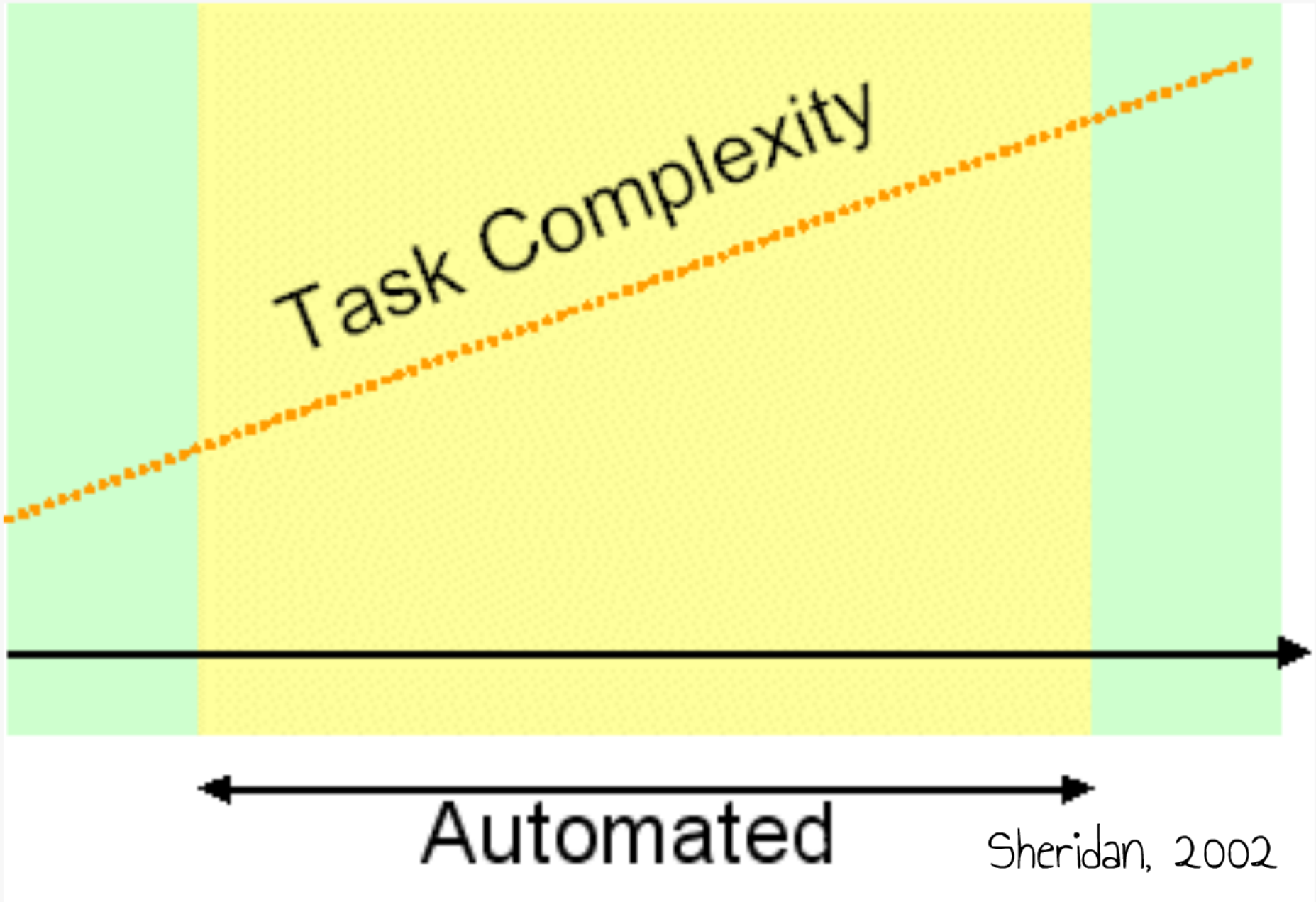
LOCKHEED MARTIN

Potential HumPerf Costs of Automation e.g.

HAL

SESAR Service Levels





Delft
- Software and Interface Design
- Develop vector-based CBAR solutions
- Modify TSD interface
- Real-time human response capture (to alert humans chosen strategy)
- Closed-loop solution (i.e. strategy triggers the "automation" solution)
- Script-driven experimental design

Potential HumPerf Costs of Automation e.g.

- Workload
- SA
- Reversion-to-Manual Problems

ACCEPTANCE

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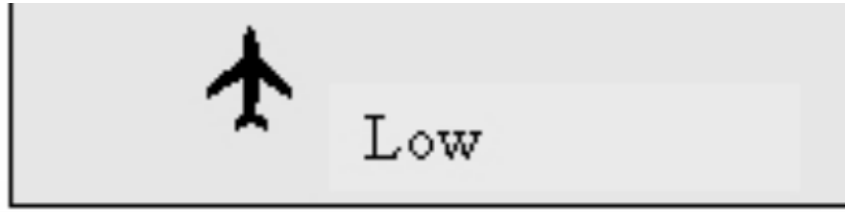
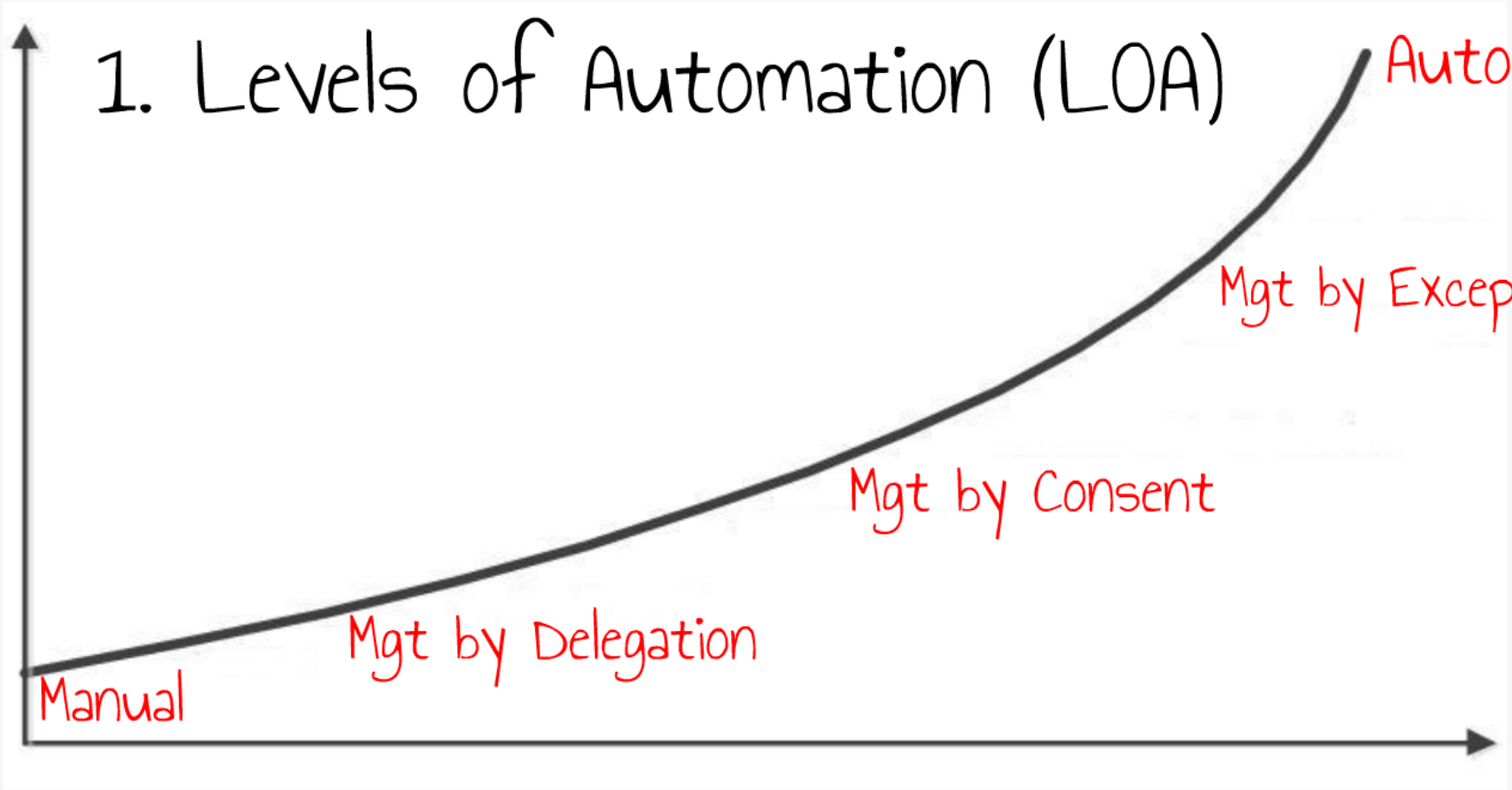
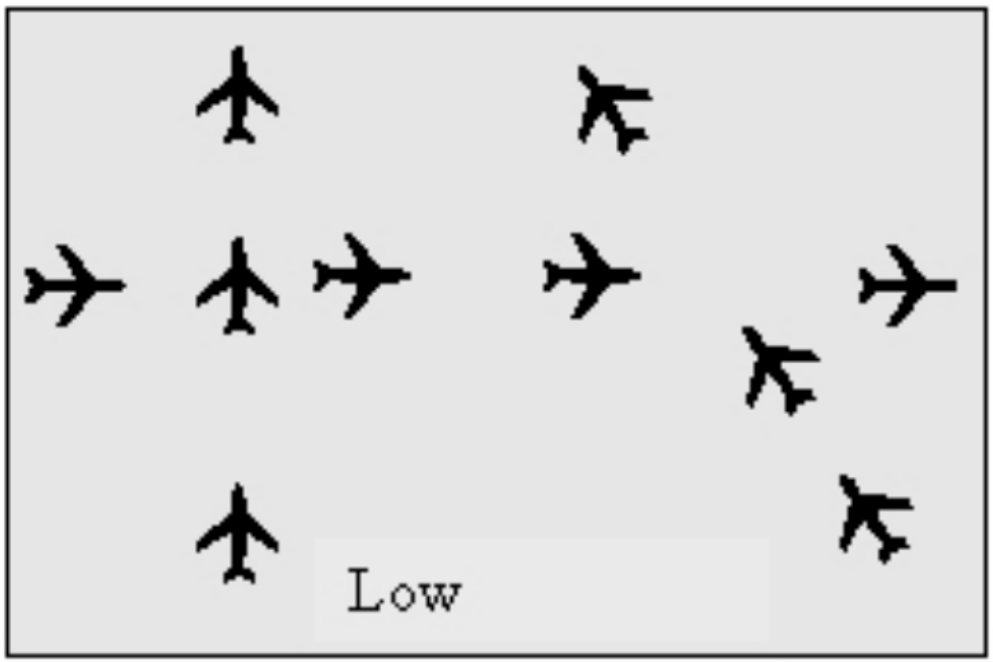
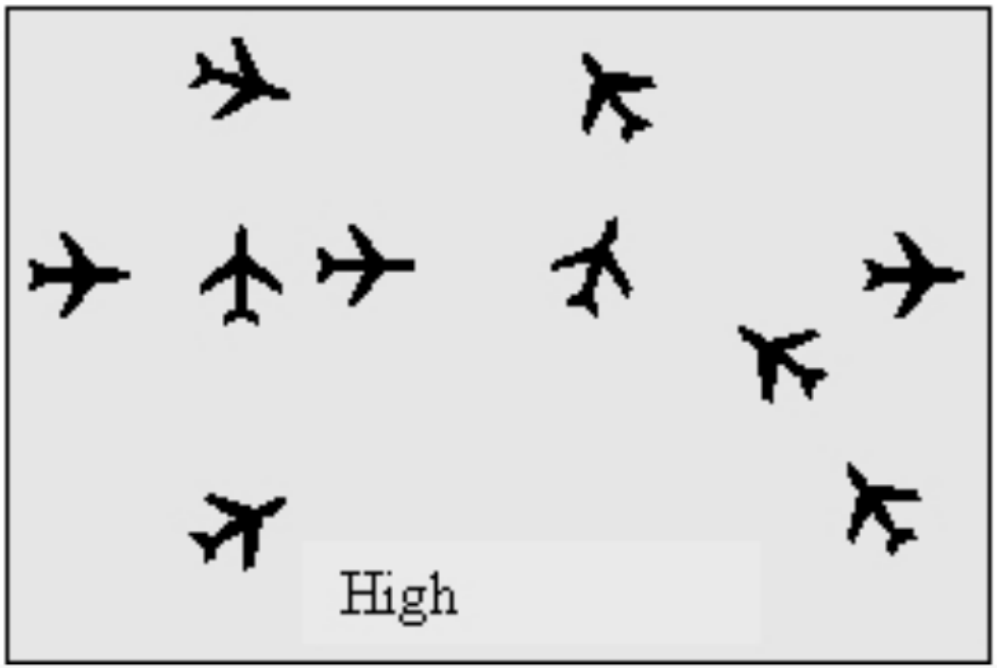




2. Air Traffic Complexity





(LOA)

Autonomous

3. Strategic Conformance

the degree to which automation output mimics that of the human

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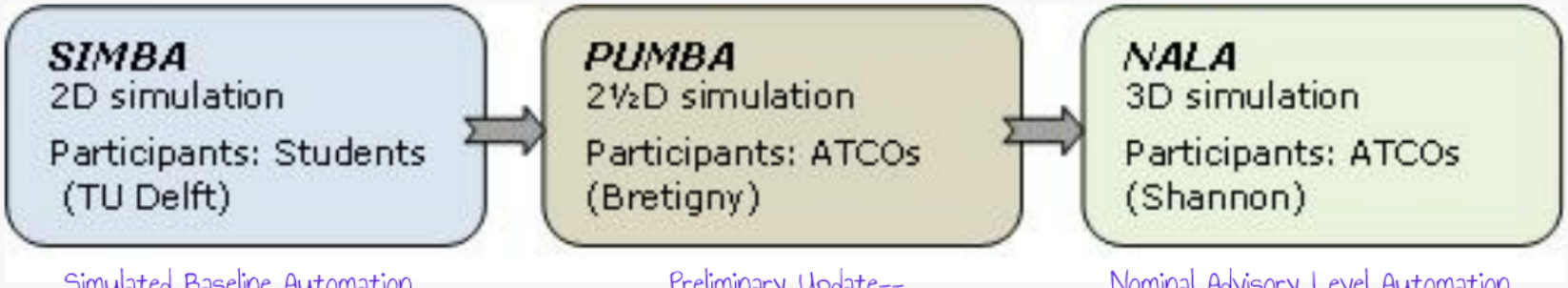

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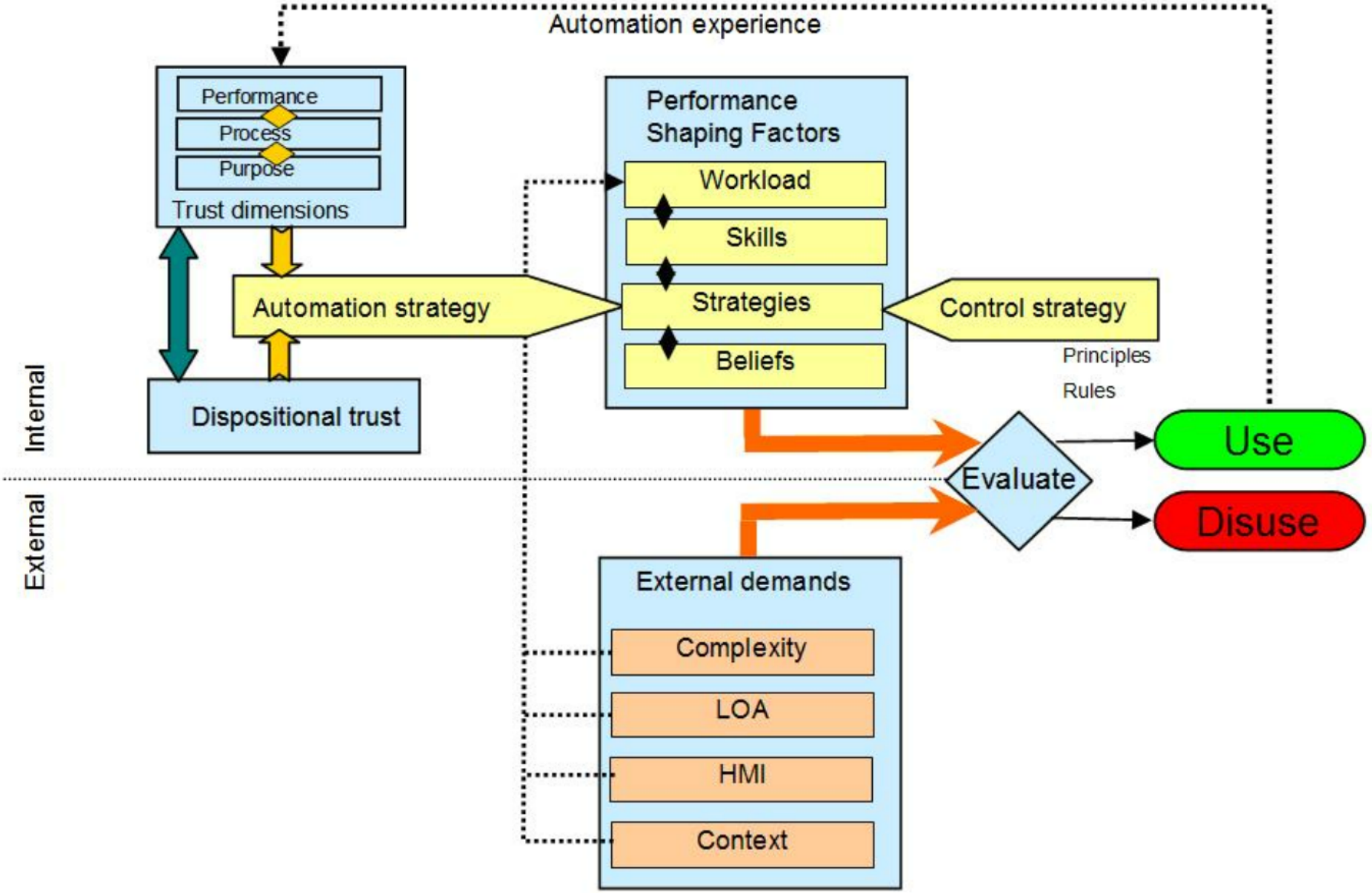

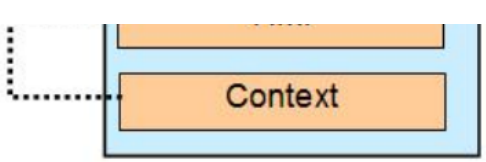

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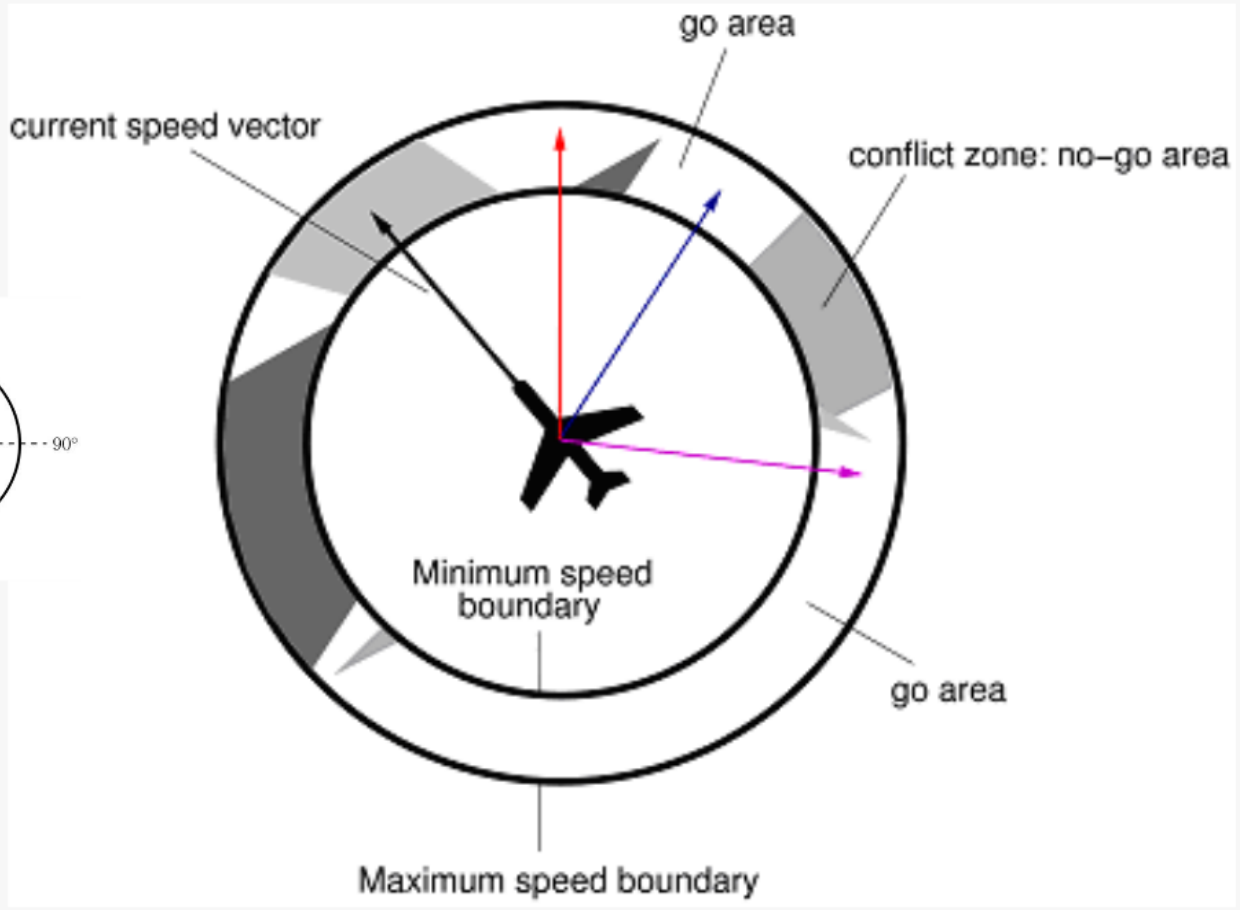
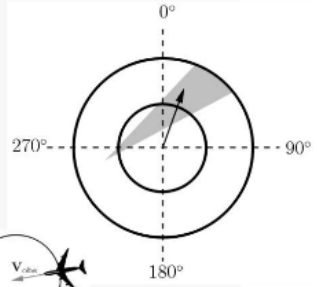
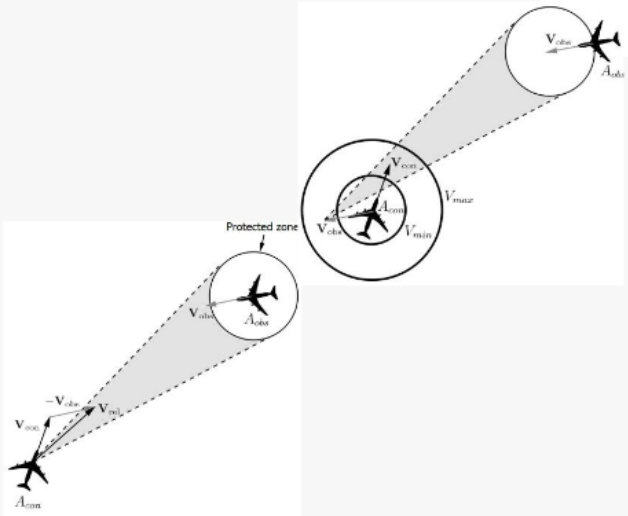
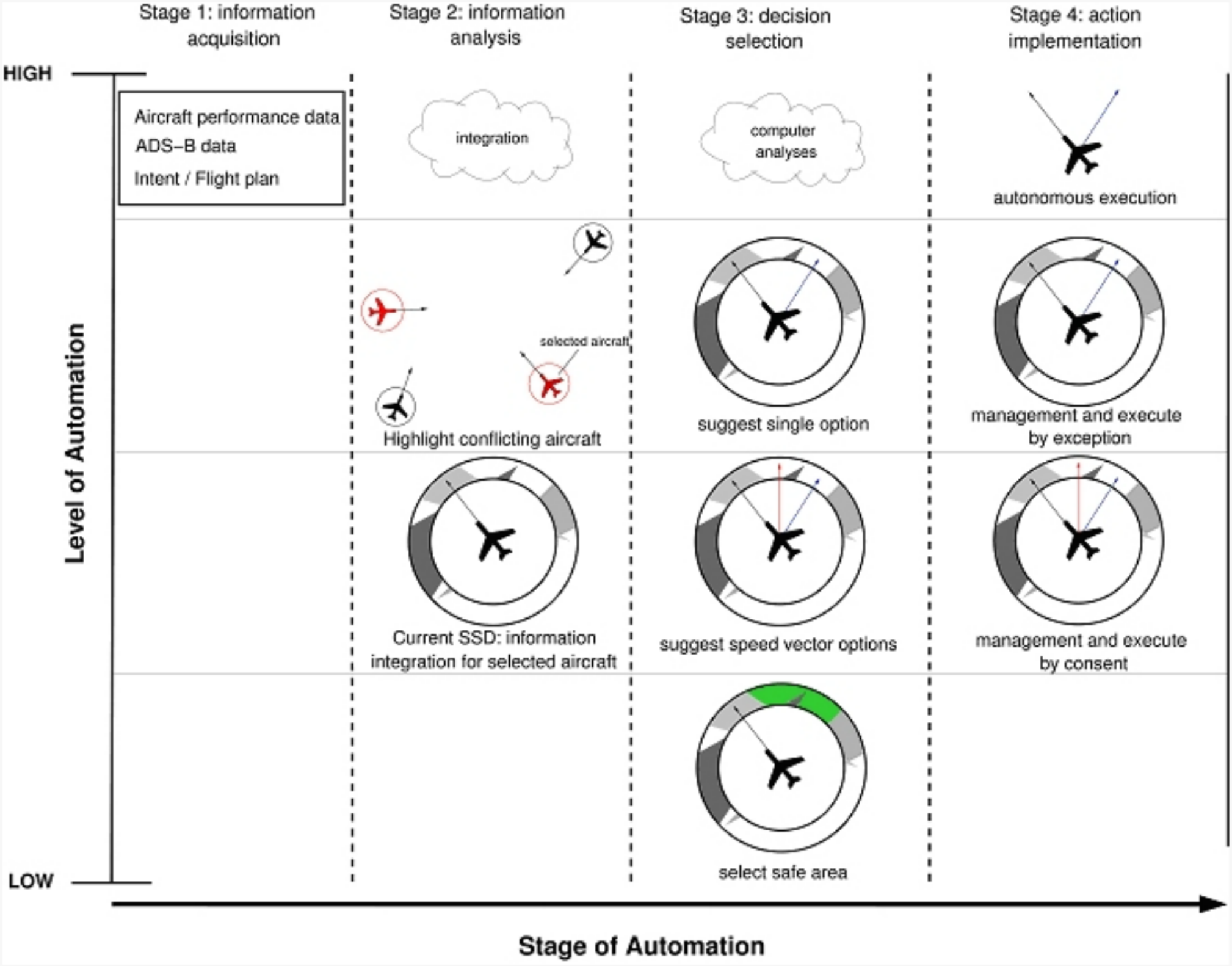
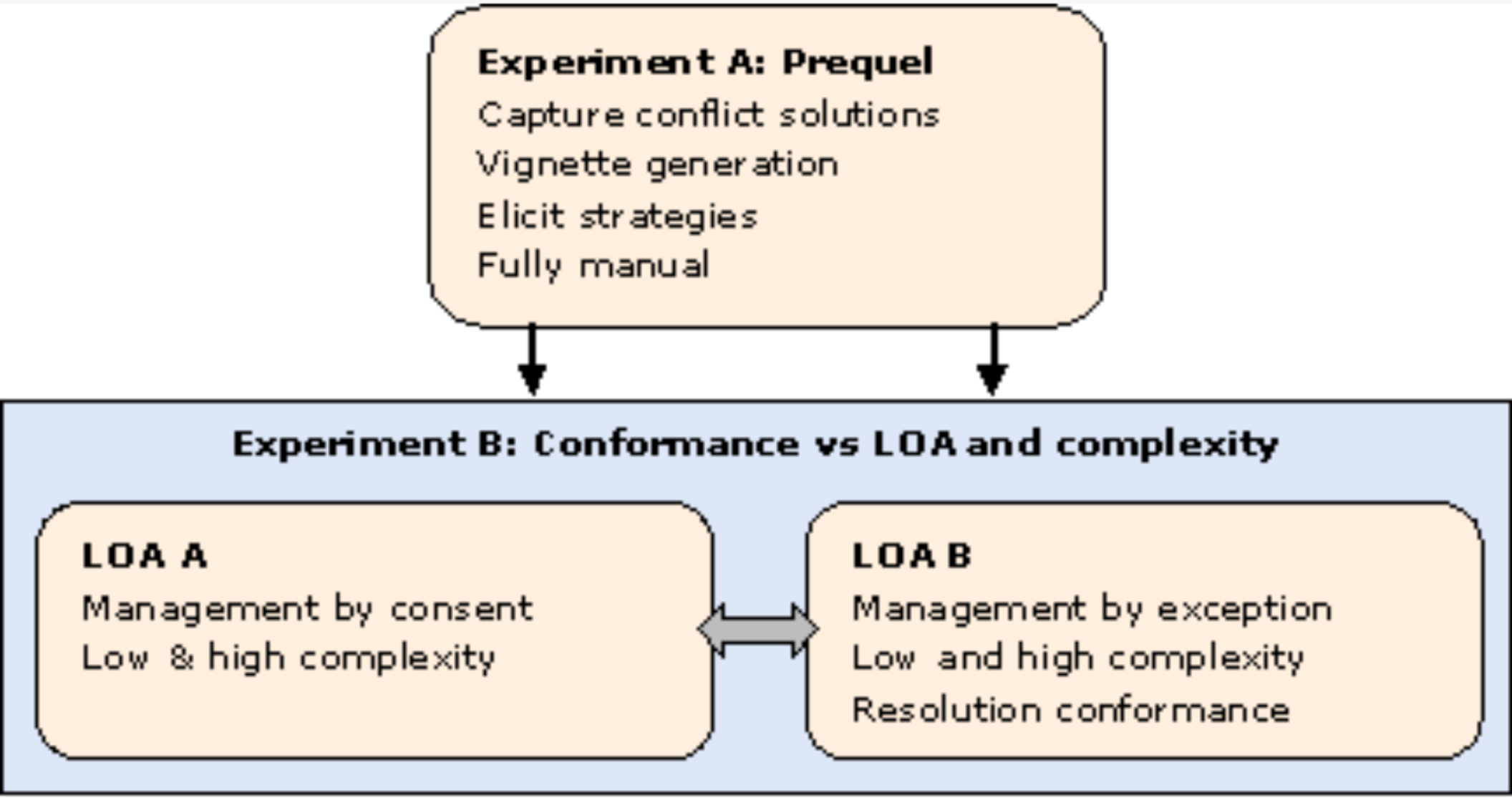




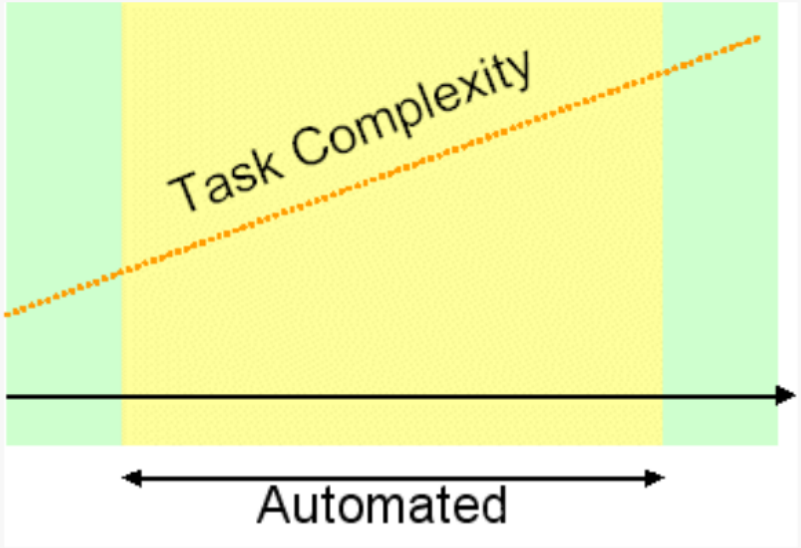



Stage 1: information acquisition
Stage 2: information analysis
Stage 3: decision selection
Stage 4: action implementation
HIGH
LOW
Level of Automation
Aircraft performance data
ADS–B data
Intent / Flight plan
integration
computer analyses
autonomous execution
selected aircraft
Highlight conflicting aircraft
suggest single option
management and execute by exception
Current SSD: information integration for selected aircraft
suggest speed vector options
management and execute by consent
select safe area
Stage of Automation


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
LOA B
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?



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