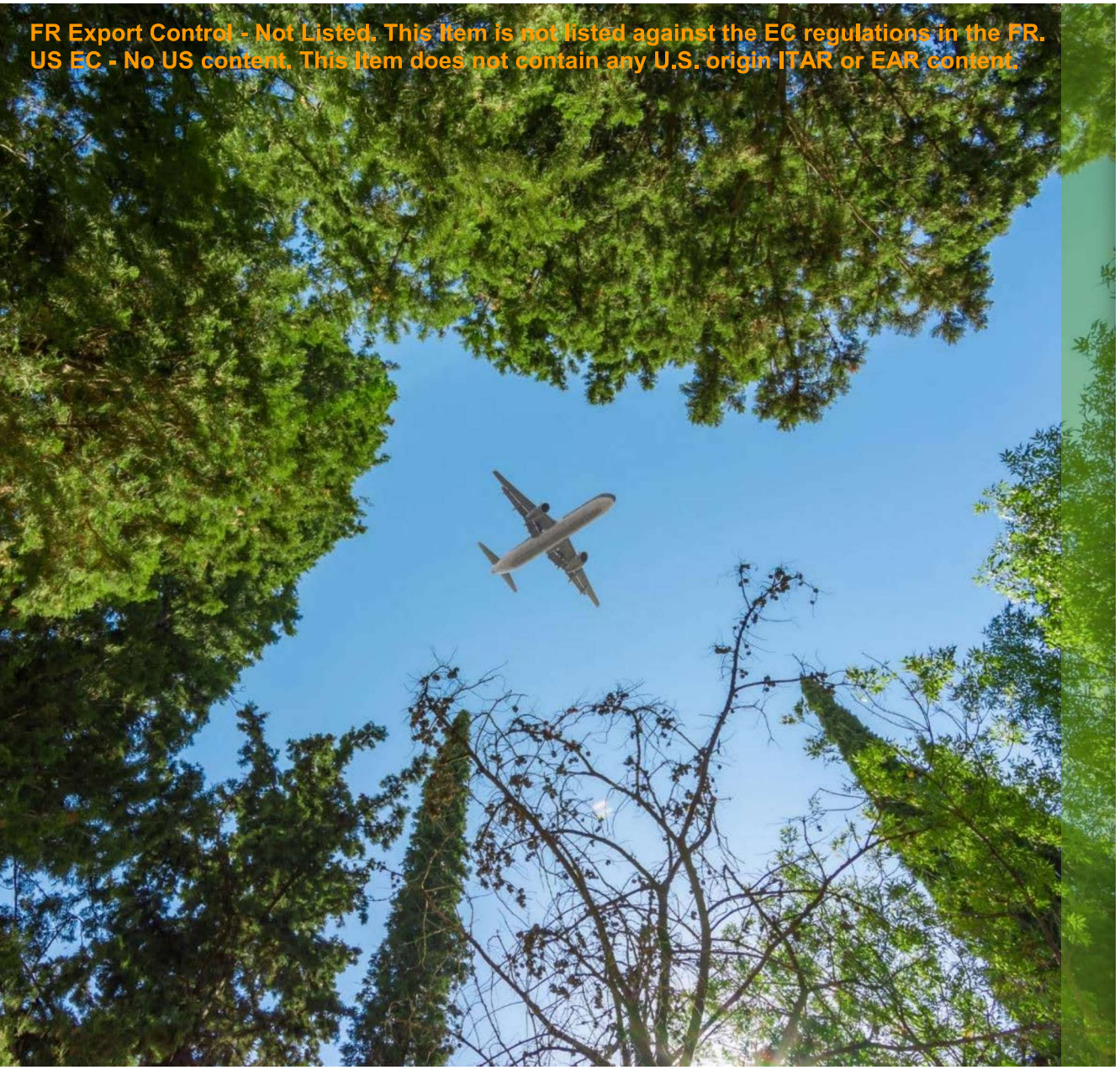

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AIAA-SCITECH
NATIONAL HARBOR, MD, USA
27 JANUARY 2023

Integrated Systems Management: towards pilots workload reduction & robustness in degraded conditions

PRESENTED BY:
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SUPPORTED BY:
CA/ CS2 PLATFORM 3 CONSORTIUM

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Airbus Systems Management history

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Generation 1 & 2 Commercial Jet Aircraft:

- Dial, gauges, switches and warning lights
- Paper procedures
- Flight Engineer

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Airbus Systems Management history

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Generation 3 & 4 Commercial Jet Aircraft:

- Electronic Centralized Aircraft Monitoring (enabler for forward facing crew cockpit)
- Contextualized failure management procedures in avionics
- Standard Operating Procedures in Electronic Flight Bags

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Airbus Systems Management history

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What could be the systems management for a 5th generation Commercial Jet Aircraft?

Objectives of the project:

- Safety Beyond Standards
- Operational and economical efficiency

This can be achieved through:

Workload reduction:

- Failure management
- Turn Around Time

Resilience to error:

- Global safety case

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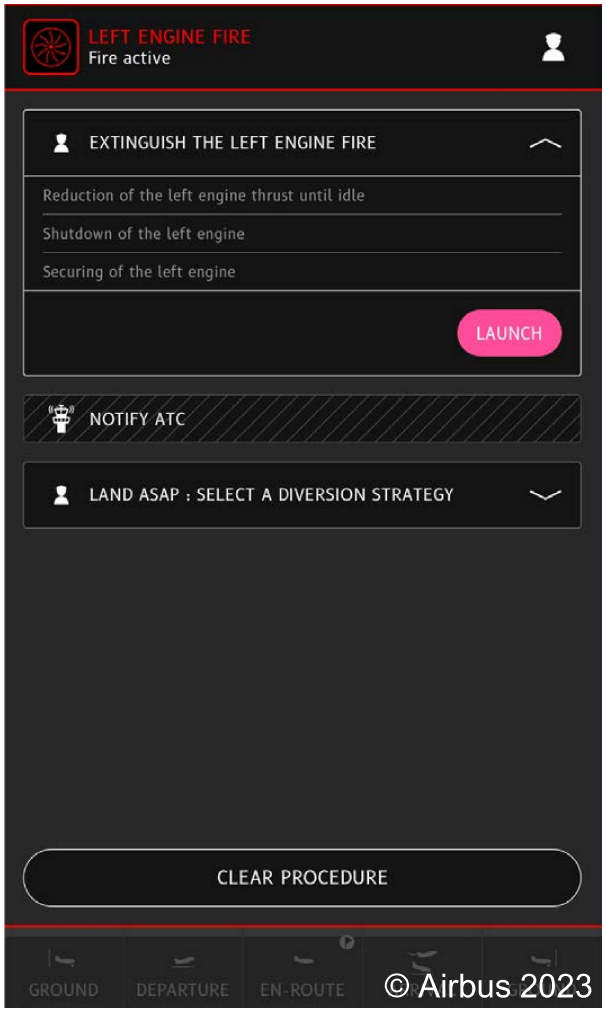
Proposed concept (1/4): assisted systems management

Assisted systems management (workload reduction)

- Procedure split in high level objectives, including systems, mission, and communication tasks
- Strategy selected and automation triggered by the crew, reducing risk of erroneous interacts
- Low level systems reconfiguration sequenced by machine, with feedback to the crew
- Failure impacts on mission taken into account automatically when/where relevant

System management automation concept applicable to:

- Failure mitigation (ECAM procedures)
- Nominal systems configuration tasks, mainly on ground to optimize Turn Around Time (Standard Operating Procedures, Supplementary Procedures, Dispatch Procedures)



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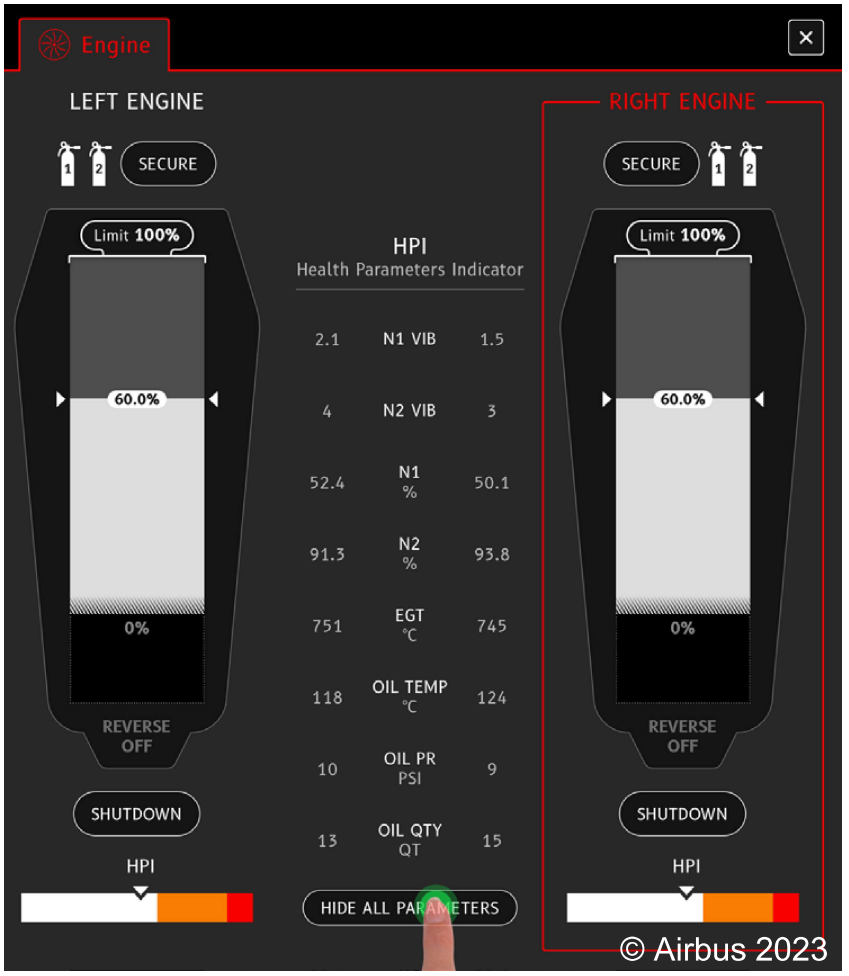
Proposed concept (2/4): manual systems management

Manual systems management (backup)

- All systems controls available in interactive systems pages
- Ergonomic Physical controls (designed for frequency of use, quick access, blind use,...) with multimodality concept
- Crew retains full manual control capability through interactive system pages and/or physical controls



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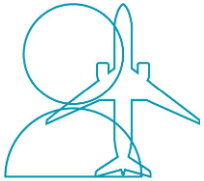
Proposed concept (3/4): fully automatic systems management



Fully automatic systems management (provision)

- Under heavy workload and/or stressful situations, crew may opt to fully delegate systems management tasks to aircraft in order to be able to concentrate on other tasks
- Systems management will then switch in fully automated mode applying default reconfiguration strategies

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Proposed concept (4/4): Resilience to errors

Resilience to errors

- System monitors every system reconfiguration command, manual and automated
- When application of the command leads to significant adverse effects in current context, an arbitration is presented to the crew ensuring they are aware of the consequences of the command before it is actually applied.
- The crew may then opt to either reject or confirm the command in full knowledge of the facts.

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Methods : multi-skill teams

Results achieved thanks to multi-skill teams allowing fast loop iterations:

- Operations engineers
- Systems engineers and architects
- Human-factors specialists
- Safety specialists
- Ux/Ui designers
- Test and training Pilots
- Experts
- …

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Methods: operational validation campaigns

Operational demonstrator
(demonstrator out of Clean Aviation project, funded by french DGAC)

Ops & UX Testing

- In-house designed and assembled demonstrator
- Simulating new functions and user experience for a representative concept of operations
- Airbus & Airline pilots testing

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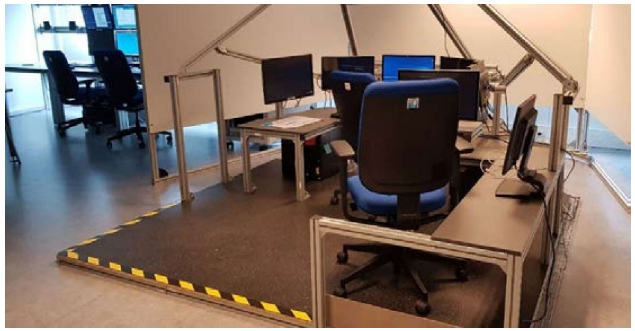
Methods: systems early prototyping and integration

DISCOBENCH demonstrator - Systems Integration Testing



- State-of-the-art Airbus Virtual System Platform
- Simulates the real aircraft systems architecture
- Suppliers/partners systems models integration (Flight Management, Displays, Engine, Multisystem conf/reconf…)
- For ISM: Demonstration of the concept on Engine and Fuel systems use cases (Manual reconfigurations, Engine Fire, Fuel Leak, Fuel Pumps Faults)

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What are the next steps?

Multiple failures management

Overall integration with all aircraft systems and functions

Systems management processes methods and tools

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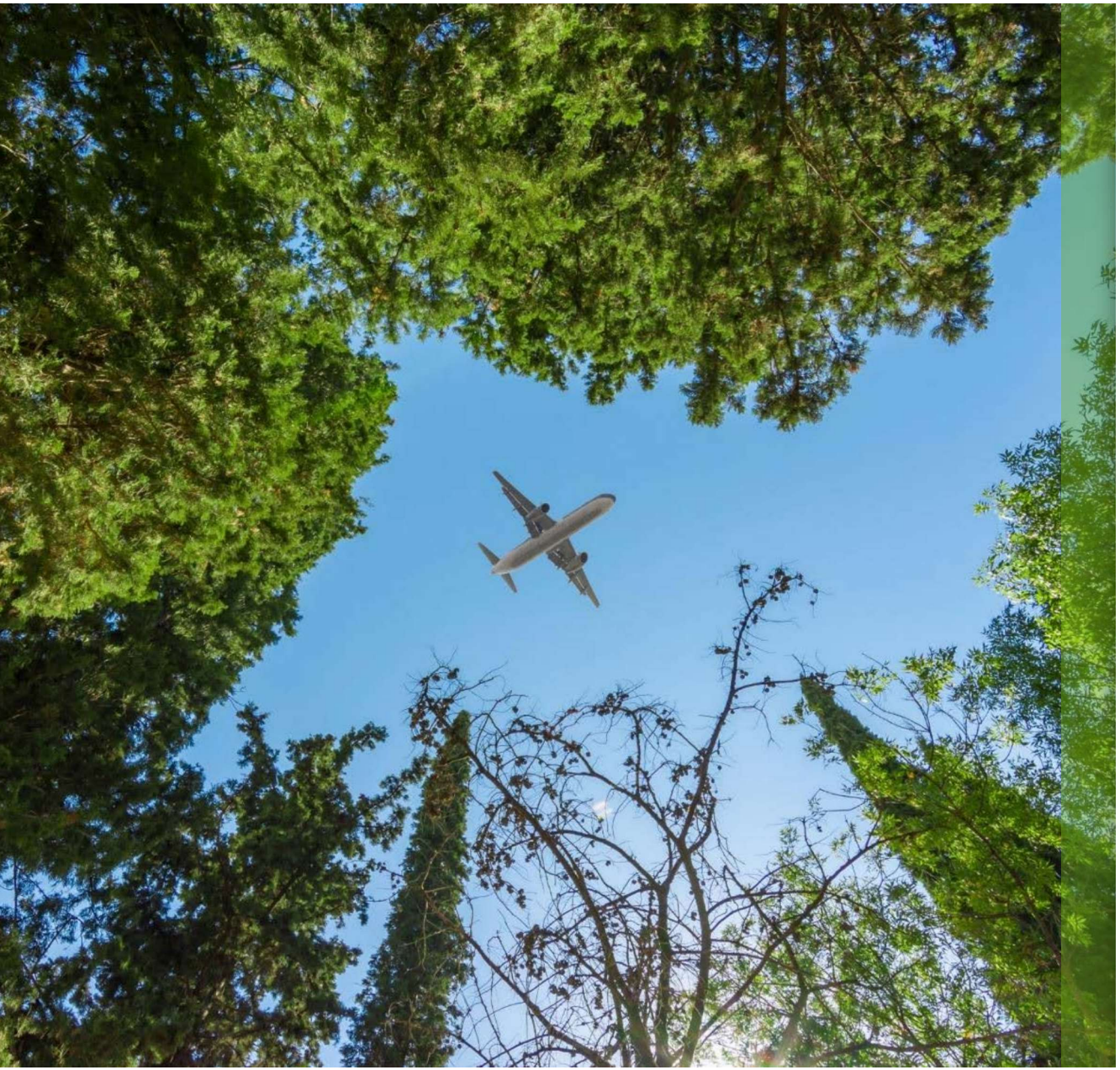

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