Airbus Human Factors Design Process: Experiences and lessons learned
Human Factors Problem Statement in 2010 +++

- Aviation panorama: economical w-context, environment, society,
  => The future Aircraft programs
- The ATM evolution
- Extended Certification
- New questions!

Human Factors Problem Statement for 2000-2009

- A380, novelties for the crews,
  First actual HF plans
- First HF regs
- A400M, novelties for the crews,
  New HF regs

Matching HF issues & approaches

A380&A400M Responses

Lessons learned
Human Factors in aviation safety 2000-2009, aircraft point of view aé

Environment: Various and constrains

Tasks complexity

Continuous process

HF Integrated Process

HF Final Assessment

Pilots are high qualified and trained

Users from various cultures

Complex systems logics & MM interactions

Jetlags, fatigue

Team cooperation

Tasks are "multi-skills"

Limited reaction time

High dynamicity of situations

High risk

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Human Factors issues 2000-2009, complexity on board

Environment: Various and contrainst

Tasks complexity
- Continuous process
- High dynamicity of situations
- Limited reaction time
- High risk
- Tasks are “multi-skills”

Complex systems logics, MM interactions
- Integration issues

Users
- Jetlags, fatigue
- Team cooperation
- Pilots are high qualified and trained
- Users from various cultures
(a) Flight deck controls must be installed to allow accomplishment of these tasks and information necessary to accomplish these tasks must be provided.

(b) Flight deck controls and information intended for flight crew use must:

1. Be presented in a clear and unambiguous form, at resolution and precision appropriate to the task.
2. Be accessible and usable by the flight crew in a manner consistent with the urgency, frequency, and duration of their tasks, and
3. Enable flight crew awareness, if awareness is required for safe operation, of the effects on the aeroplane or systems resulting from flight crew actions.

(c) Operationally-relevant behavior of the installed equipment must be:

1. Predictable and unambiguous, and
2. Designed to enable the flight crew to intervene in a manner appropriate to the task.

(d) To the extent practicable, installed equipment must enable the flight crew to manage errors resulting from the kinds of flight crew interactions with the equipment that can be reasonably expected in service, assuming the flight crew is acting in good faith. This sub-paragraph (d) does not apply to skill-related errors associated with manual control of the aeroplane.”””
Compare HF Integrated Process and Final Assessment

**HF Integrated Process**

- High Cost, time consumption, Low risk
- « Design optimisation for safety and use »
- Innovation tank

**HF Final Assessment**

- Cost reduced, Time limited by Entry into service
- High risk
- « Just repare for safety acceptance »
A380, A400M response
HF organisation: adequate competences

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The Human Factors plan: support development and ensure certification demonstration

Explore, learn, rationalise, consolidate, demonstrate

A380: Systemic & systematic approach, Pilots involvement: test pilots & training pilots & end users pilots (A380; MAS, SIA, QFA, JAL, FDX, AFR, DLH…), Human Factors methods, HF certification
Lessons learned => what do we need to improve

Lessons learned?
- Cost of evaluations: human resources, simulator development cost, etc
- Alleviate the cost of HF methods: exploration versus validation
- Quite Good Efficiency to find most of HF issues
- Rethink relation between Human errors & decision making on design acceptance: safety & other criteria (easy to use, to learn, efficiency)

What do we need to improve?
- MM Modelling but with moderation: task, interactions, key behaviour
- HF Knowledge on Novelty/complexity issues
- Develop studies and actions on « processing Inconsistency » in [Env-pilots-Atco-Ops center] and safety nets.
- HF precise guidelines for facilitating integration
- Define adequate tech/ops solutions to specific human behaviour (tunneling effect...)
- A common Ground and Air HF framework (methods, hypotheses on authority sharing, human errors management...).
Human Factors in aviation safety in 2010+, 2010++,
2010+++, aircraft point of view & airground point of view!

Environment: Various and contrainst
+ new ATM applications+ all ops

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& MM interactions

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Tasks are “multi-skills” : To Be Decide

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Human factors in aviation in 2010+++

2020 SafetyX10
Forecast ATM: traffic x3 ➔ Safety x10 ⇓ new management modes

Safety: HF, Nº1 accident cause ??

Human Factors certification for G and A

Encourage Positive Performance & Manage human errors
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