Effectiveness of the application of the HP assessment process in SESAR1

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Background: SESAR 1 – Development Phase

- Define in detail operational concepts and develop their technical enablers

- HP/HF material out there
  - ISO 9241
  - Eurocontrol HF case
  - Standards & process in other domains (e.g. UK MoD)

→ Need for a consistent HF integration approach
→ Shared air/ground methodology
Requirement for HP assessment process

- Alignment with relevant **key performance areas** (e.g. capacity, efficiency, security and in particular safety)

- Provide a **standardised** HP assessment process to ensure that HP aspects are **systematically** taken into account in the SESAR operational and technical projects

- Provide data that **can be aggregated** with data obtained from other HP assessments

- Provide data that can feed the **SESAR Business Case**

- Applicable to both **air & ground** systems
HP assessment process 1/4

Step 1
Understand the ATM concept

Step 2
Understand the HP implications

Step 3
Improve and validate concept

Step 4
Collate findings and conclude on transition to next V-Phase

Update solution & assumptions

Update HP issues & benefits

Concept description

Update HP log

Update HP log

Update HP log

Update HP log

HP log

Update HP assessment plan

Update HP assessment report
ARGUMENT AND EVIDENCE BASED APPROACH

An HP argument is ‘a HP claim that has to be proven’

For each argument the ‘evidence’ required to prove the claim is defined, together with the HP activities that need to be performed.
THE FOUR HIGH LEVEL ARGUMENTS

- Human Roles
- Human and System
- Team Structure and Communication
- Transition Factors (e.g. acceptability of the solution, training needs)
Top level argument: The contribution of the human in the ATM system will support the expected ATM system performance

**Argument**

Arg. 2.1.3: Transition from automatic to manual modes and vice versa, human-intended or failure induced, can be performed by the human actors in a timely, efficient and accurate manner.

**HP activity**

Perform Cognitive Task Analysis on transition tasks to identify cognitive demands, potential error, and recovery means.

Assess timeliness and accuracy of transition actions in Real-Time Simulation with:

- Objective methods: observation, data recordings
- Subjective methods: interviews, debriefings

and analyse operational impact with safety specialists.

**Evidence**

There are no excessive cognitive demands or error potential for transition tasks.

- Number and/or impact of late actions not higher in the solution than in the reference scenario.
- Number and/or impact of late actions is within acceptable limits.
- Number and/or severity of errors in the solution not higher than in reference scenario.
- Occurrence and/or severity of errors is within acceptable limits, taking into account error type & operational impact.
Effectiveness evaluation-Study objective

- **Retrospective evaluation**
  - Effectiveness of HPAP application:
    - Goals are accomplished (e.g. Sproles, 2001)
      → Human Factors are adequately integrated in the operational and technical design by having resolved HP issues & benefits

- **Identify recommendations for a more efficient HP application**
Effectiveness evaluation - Method

- Criteria based on combination of Goal-oriented & System view (Nadkarni & D’souza, 2015)

<table>
<thead>
<tr>
<th>System view</th>
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</thead>
<tbody>
<tr>
<td>Inputs</td>
<td>• Number of partners and HF specialists involved</td>
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</tbody>
</table>
| Process     | • HPAP applied in operational focus area (OFA)  
|             | • OFA requiring combined air/ground assessments compared to separate air or ground assessments  
|             | • Form of HF specialist involvement (continuous vs. punctual) |
| Outputs     | • Available Form of Evidence (HP reports/logs produced)  
|             | • Arguments addressed (Roles, System, Teams, Transition) |

**Goal view**

<table>
<thead>
<tr>
<th>Outcome</th>
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</table>
|         | • Number and Status (open vs. closed) of Issues & Benefits at Airside/Groundside/Air-Ground  
|         | • Number and Status (Open vs. closed) of Recommendations Airside/Groundside/Air-Ground |

- Data collected from SESAR project documentation (validation reports, HP reports & logs)
Example: Providing traffic alerts to the Aircraft in Runway Area

- Intruder identification
- Alert priority & consistency
- Situation Awareness
- Message format, content & location

Lining-up
- Alert

Short final
- Alert

Take-off run
- Alert

ATC Phraseology

Operational context

January 2017
Example: Providing traffic alerts to the Aircraft in Runway Area

**Air/Ground Issue:**
The crew has to keep in mind that airport control is made by the ATC, and then, alerts onboard are not a substitute to the controller. It is an assistance for the crew to detect conflict or problems onboard related to surface movements, but it does not prevent ATC responsibility and authority on the airport. An issue could exist if procedures and responsibilities between ATC and pilots are not clearly defined and accepted by both part.

**Air/Ground Recommendation:**
It is recommended to define a phraseology associated to the alerts when this one requires to inform ATC of the conflict, in order to avoid any confusion from the operators and let time to ATC and intruder aircraft to react to avoid the conflict.

**Situation Awareness**

**Message format, content & location**

**ATC Phraseology**

**Operational context**
Effectiveness evaluation-Results 1/4

1. Coverage of HPAP

<table>
<thead>
<tr>
<th>Application of HPAP in OFA*</th>
<th>Number</th>
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<tr>
<td>Total number of OFA</td>
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<tr>
<td>HPAP applicable</td>
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<tr>
<td>Applied</td>
<td>13</td>
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<tr>
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<tr>
<td>HPAP not applicable</td>
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*OFA= limited set of dependent operational and technical improvements

24 assessments: different number of application of assessments due to different levels of aggregation in OFAs

Reasons:
- Unavailability of adequate human resources
- Late communication on applicable reference material
- Difficulty to integrate in an on-going project
- Operational/validation specialists performed HF assessments
Effectiveness evaluation-Results 2/4

2. Effectiveness related to available inputs:

Avg. 2 HF specialists allocated in 21 OFA sub-units

3. Effectiveness related to process:

continuously involved in 84% of OFA sub-units
Effectiveness evaluation-Results 3/4

4. Effectiveness related to output:

**DESCRIPTIVE STATISTICS PER ASSESSMENT CATEGORY:**

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<th>Segment</th>
<th>Issue/Recommendation</th>
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<th>Ground</th>
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• Average
• min-max
• sub-units considered
5. Effectiveness related to outcome:

<table>
<thead>
<tr>
<th>Issues</th>
<th>Number of OFA-Subunits</th>
<th>Percentage of Closed Elements</th>
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<td>(maturity V3)</td>
<td>9</td>
<td>30% (0-64%)</td>
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<td>(maturity V1-V2)</td>
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<tr>
<td>(maturity V1-V2)</td>
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Discussion 1/2

- Inconsistencies regarding
  - Unit of the HP assessments (concepts vs. exercise)
  - Number of HF specialists involved

- Variability in
  - Creation of documentation on HP assessments
  - Number of identified HP issues
    - Depending on HF specialists’ way of working (use of inputs and depth of identification)
    - Maturity level
    - Industrial property rights
Discussion 2/2

- Low Closure status of HP issues and recommendations
  - Declared level of maturity could be wrong
  - Inter-individual HF specialist’s difference in evaluating HF issue
  - Risk of transition to next step

- Retrospective evaluation completed by further methods (e.g. interviews, issue content analysis) a formative evaluation
Conclusions & Way forward

- HPAP application was effective in multi-national multi-domain (industries and operations) environment
  - Competence involved in majority of identified contexts
  - HP issues & benefits identified and recommendations managed
- More homogeneous application of HPAP
  - Understand rationale of the process
  - Project management ensures integration of HP activity in design of concept and technologies
- Follow-up effectiveness of HPAP application beyond the transition to operations
Acknowledgements

The activity was conducted in the frame of SESAR 1 project 16.6.5 “Human performance support and coordination function”.
Thank you very much for your attention!

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