

# Use of FRAM in Aviation

Institute Humans in Complex Systems

Noëmi Cerny, Björn Kohli, Prof. Toni Wäfler

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## Agenda

- 1) Context of the case study
- 2) Methods
- 3) Results
- 4) Conclusions
- 5) Discussion



Context

Methods

Results

Conclusions

Discussion

## Setting:

- company providing aviation maintenance services
  - high safety requirements
  - highly regulated and monitored by the supervisory authority
  - highly skilled and specialized operators

## FRAM (Hollnagel, 2012):

- normal operations of the last checks of a regular check of an aircraft before release
- area was selected with members of the company



Context

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### **Data collection for the FRAM model:**

- several iterations
- document analysis and a semi-structured interview with a shift foreman
- shop floor observations of ca. 4h each with shift foremen

### **Building the FRAM model:**

- individually and through discussions in the research team
- variability within the same task or another task?
- aggregation level: high or low?
- focus: where to draw the line?
- programs: Excel and FRAM Model Visualizer



Context

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## **Validation and refinement of the FRAM model:**

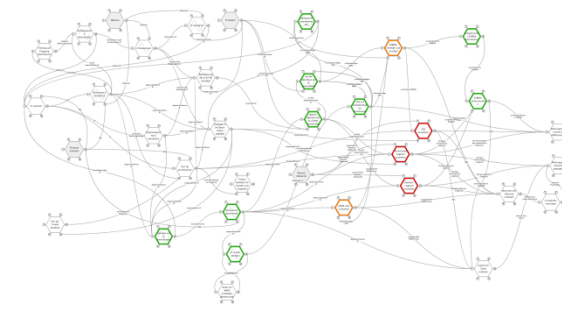
- observation interviews (during shop floor observations), a group interview and an expert interview

## **Finding the functional resonances:**

- challenge to think in a complex way
- interaction of variabilities

## **Further steps:**

- presentation to the representatives of various hierarchical levels of the company
- discussion about work as done versus work as imagined
- FRAM model shows complexity



Context	Methods	<b>Results</b>	Conclusions	Discussion
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**FRAM model:**

- 32 functions, 4 background functions

**Major variabilities:**

- late delivery or lack of material
- shortage of staff
- IT-problems
  - as background functions in the FRAM model
  - operators need to adjust to these dynamics
    - this leads in most cases to the successful completion of the checks
    - this also leads to bypasses and shortcuts

Context

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## The use of FRAM helped...

- to better understand interdependencies of variabilities (overall system)
  - enabled in-depth discussions regarding the necessity of adaptive working behavior
  - to critically reflect side and long-term effects of traditional improvement measures
  - to support decision-makers where variability should be enhanced, monitored or dampened by considering the overall system
- they thought FRAM could help to promote safety, but is a resource-intensive method

**Thank you for your attention!**





## Reference

Hollnagel, E. (2012). *FRAM: The Functional Resonance Analysis Method. Modelling Complex Socio-technical Systems*. Farnham Surrey UK: Ashgate.