



Network Manager
nominated by
the European Commission



What Next ? In the partnership EUROCONTROL & DFS & Prof Hollnagel

FRAMily

Munich 11-13 September 2013

Tony Licu

Head of Safety

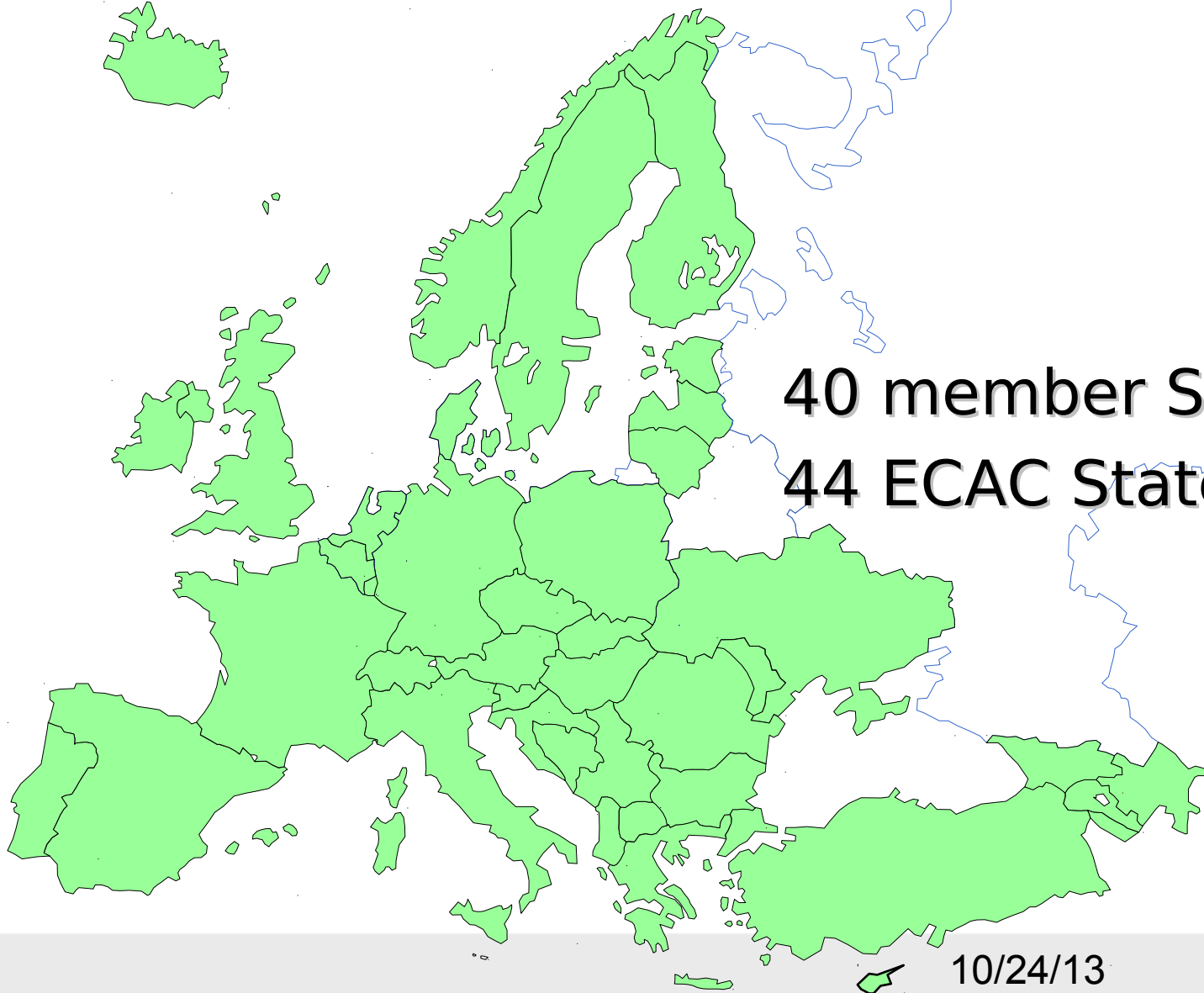
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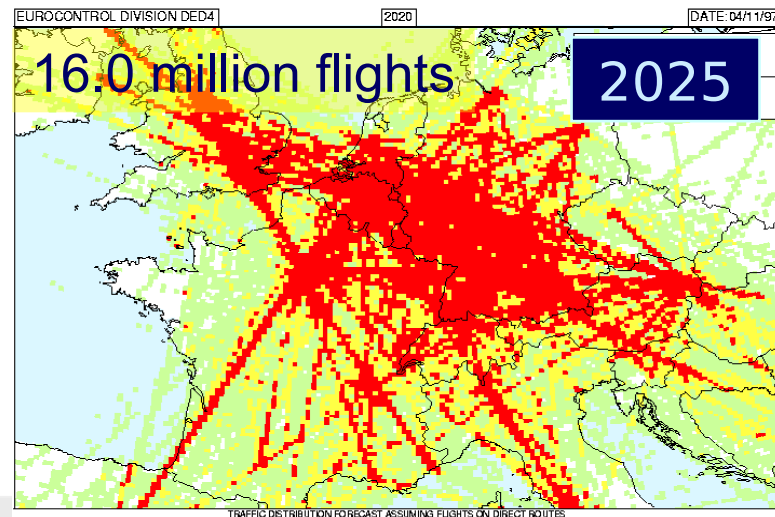
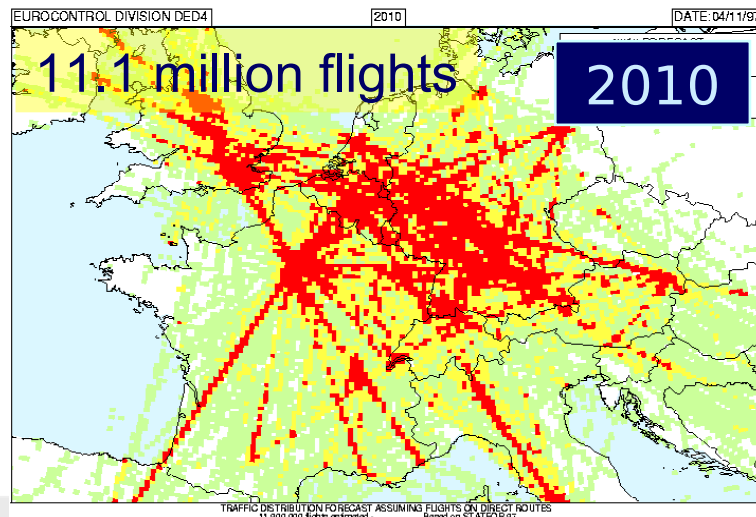
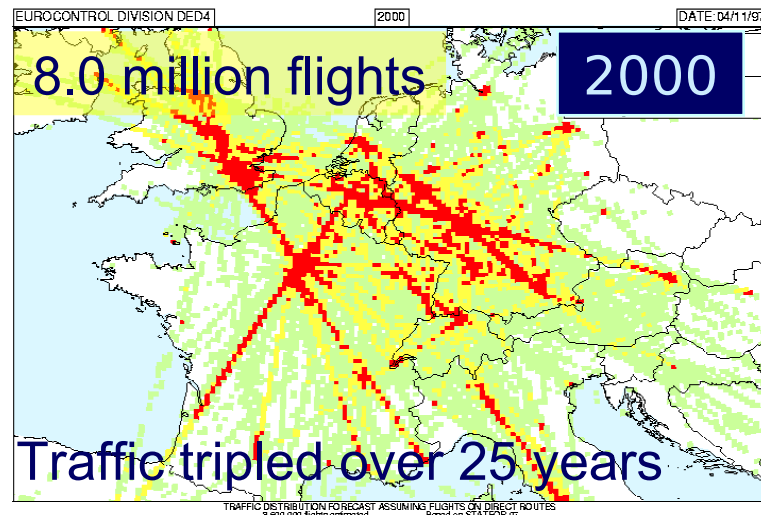
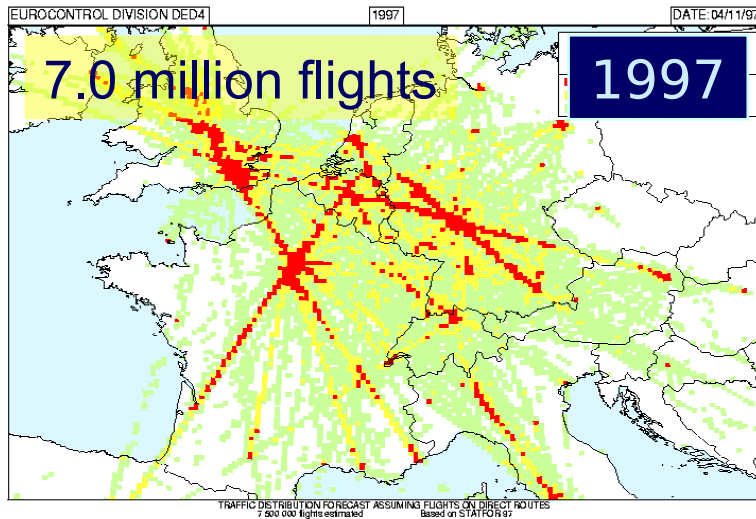
Who is EUROCONTROL



40 member States
44 ECAC States

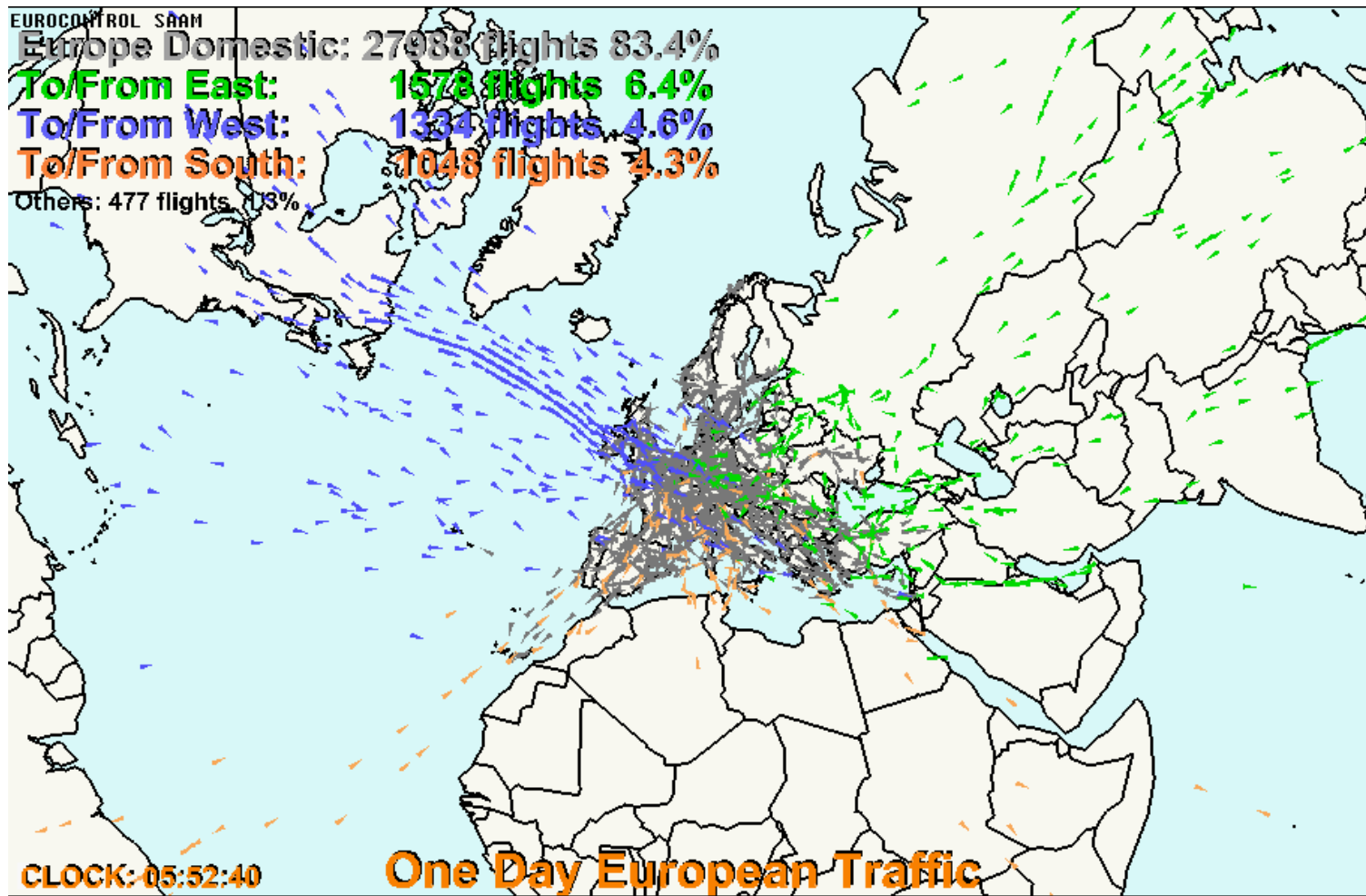


Traffic doubles by 2020



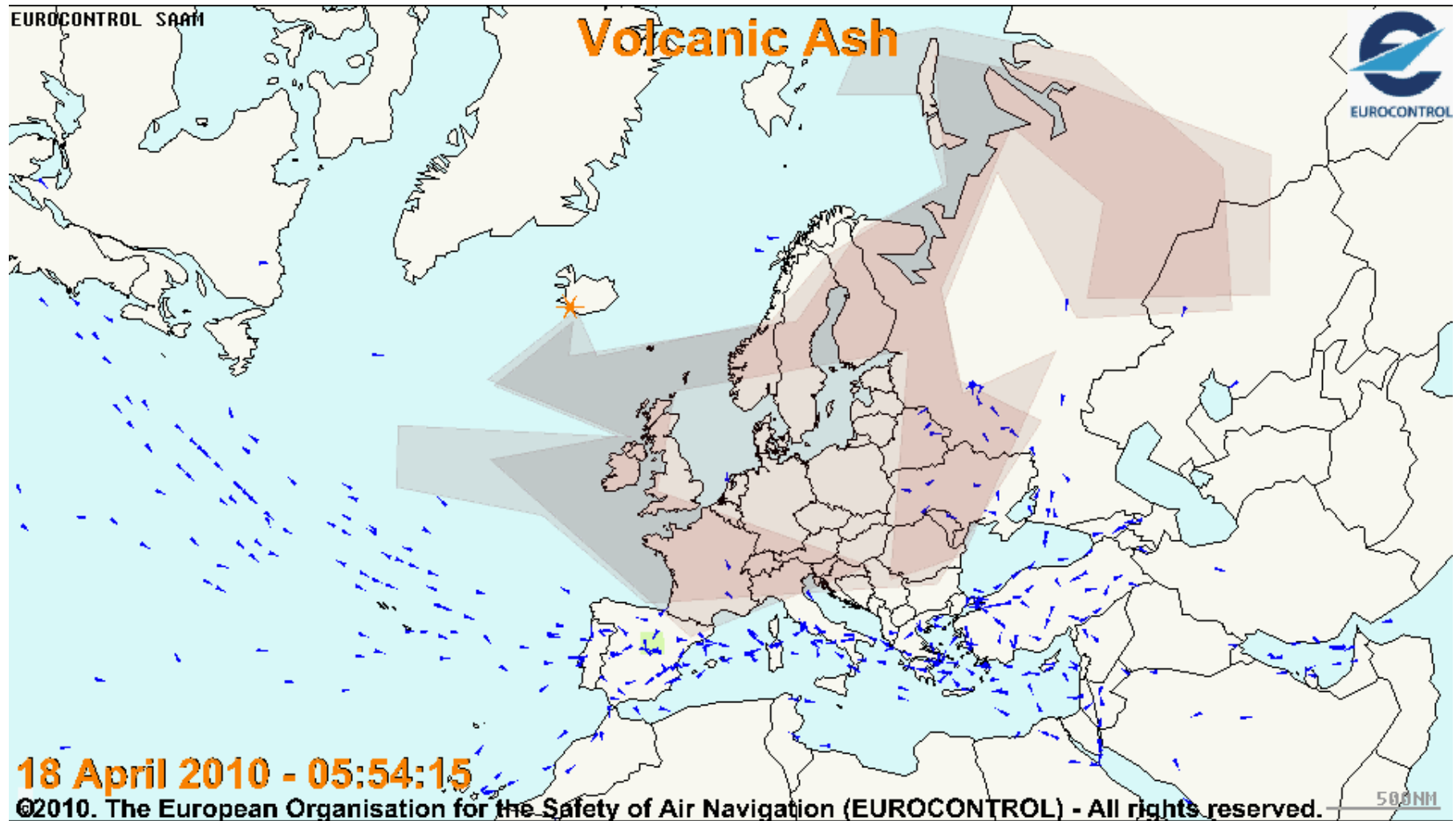


One normal day of Traffic





One less normal





What next

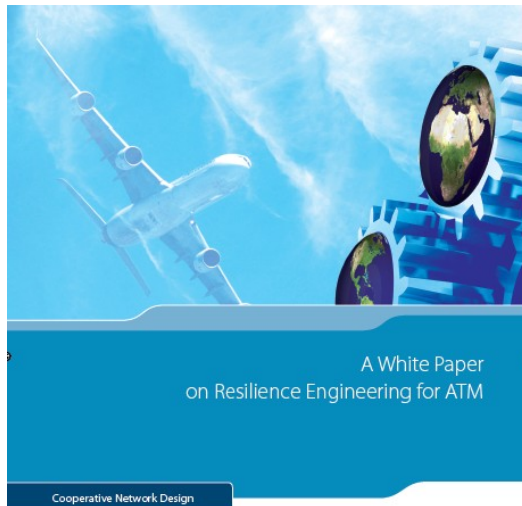
- Communicate on the work done in the recent past;
- Develop White Paper(s);
- Work on Positive methods
 - Weak signals;
 - Neutralised taxonomy;
 - 10 principles of introducing HF in investigations;
- Bring together DFS and NAV-P (others ?) to Model ATM/ANS using FRAM (not starting from scratch).



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Building the foundation in the past - Resilience Engineering White Paper 2009



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Project Team



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Erik Hollnagel is Professor and Industrial Safety Chair at NTNU, Trondheim (Norway) and Visiting Professor at the Norwegian University of Science and Technology (NTNU) in Trondheim (Norway). He has for many years worked at universities, research centres, and industries in several countries with problems from several domains, including nuclear power generation, aerospace and aviation, software engineering, healthcare, and land-based rail. He has published widely and is the author/editor of 17 books, including three books on Resilience Engineering. The latest title from Ashgate is "The ETIO Principle: Why things that go right, sometimes go wrong".

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Luigi Macchi is a PhD student in the industrial safety chair of the Maresca-Pertuchetti University (Pavia). He holds a Psychology degree from the Università degli Studi di Torino (Italy). His PhD adopts the Resilience Engineering perspective and aims to develop a safety assessment methodology accounting for the human contribution to Air Traffic Management safety.

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EUROCONTROL Point of Contact



Dr Barry Kwan leads Safety Research and Development in EUROCONTROL. He has degrees in Psychology, Human Factors and Human Reliability Assessment. He has worked in the oil, gas, chemical, petrochemical, marine and air traffic sectors of industry, and lectured at the University of Birmingham in Human Factors. He was formerly Head of Human Reliability at BMT in the UK nuclear industry, and Head of Human Factors at NATS (UK). For the past nine years he has been working for EUROCONTROL, managing a team of safety researchers and safety culture specialists at the EUROCONTROL Experimental Centre in Brétigny, near Paris. He has published four books and around 200 articles. He is also a visiting Professor of Human Reliability & Safety at Nottingham University in the UK.

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- What is Resilience Engineering?
- Why do we need it in ATM?
- What is the usefulness of performance variability?
- What does Resilience Engineering look like in practice?
- How does Resilience Engineering fit with other safety methods?
- How mature is Resilience Engineering and what is the added value for ATM?



From Safety-I to Safety-II EUROCONTROL White Paper

to be launched in Dublin 26-27 Sept 2013



- Safety-I – Avoiding That things Go wrong
- Work-As-Imagined vs. Work-As-Done
- The Foundation of Safety-II – Performance Variability
- Emergency rather than causality
- The manifestation of Safety-II – things that goes right



Quick wins – neutralisation of contributing factors

The problem with negative contributory factors

- Apply only to errors/failures in **infrequent** safety occurrences;
- Need for constant expansion, **few data** in each category;
- Can be seen as **blaming**;
- Hard to use in **interviews**;
- Lead to **partial analysis** - do not allow the coding of **what went right**;
- So we need a focus on **performance variability** of activities, functions & resources.



What went right?

- How to identify **what went right** as well as what went wrong in...
 - **normal operations** – what keeps the operation safe
 - **safety occurrences** – what prevented a more serious incident or accident?
- ☺ **Mode S tools** ☺ **Emergency training** ☺ **Checklists**
☺ **TRM (Team Resource Management)**



What could go right?

- How to also identify what the person was **doing or trying to do right** at the time?
- How to identify what could **improve safety**?

Neutralise the contributory factors



Some are already neutral

D1. Documentation and Procedures

- D1-1. Documentation-manuals
- D1-2. Documentation-charts
- D1-3. Documentation-SOP
- D1-4. Documentation-checklists
- D1-5. Procedures-airport
- D1-6. Procedures-approach
- D1-7. Procedures-EnRoute
- D1-8. Procedures-oceanic
- D1-9. Procedures-oceanic contingency

And **functions & activities** should also be neutral because their performance varies

B8. Airport

- B8-1. Ground markings
- B8-2. Signage
- B8-3. Airfield ground lighting
- B8-4. Airfield layout
- B8-5. Work in progress
- B8-6. Line of sight

So most other **resources** (equipment, staffing, etc) should also be neutral because they can contribute negatively or positively to safety

(usually positively!)



And a few are already positive

E. Additional Causal Factor set - Mitigation

- E1. Good ATC planning decision
- E2. Good ATC tactical decision
- E3. Good engineering planning decision
- E4. Good engineering tactical decision
- E5. Good defensive controlling
- E6. Good resolution action
- E7. Good network management decision
- E8. Good local traffic management decision
- E9. Good co-ordination
- E10. Good assistance by

But this list will also be ever expanding as more mitigations are found (Good ATCO-ATSEP comms, Good CRM`/TRM, etc)!

So there is no need for the list if other categories are neutralised.



Examples

See - identification

A1-1. See - identification	<p>Identification or reading of visual information, after initial detection. This focuses on how the person identifies what the visual information is, following initial detection but prior to interpretation of its meaning. The visual information could be textual, symbolic, positional or physical objects. The information may be visible directly (e. g. aircraft or vehicle visible out of the VCR window or a piece of equipment), or indirectly (e. g. via a radar, flight data display, support tool, or control and monitoring system).</p>	<p><i>Example: When looking out of the tower, the controller confused two aircraft. The aircraft were visually similar and the weather conditions were poor.</i></p> <p><i>Example: The controller thought that he saw on radar that KLM112 was descending but in fact it was KLM211, which had a confusable callsign.</i></p> <p><i>Example: The engineer misread the command line from the procedure and entered an incorrect command. The procedure was written in a small font and the engineer was under time pressure to complete the task.</i></p> <p><i>Example (positive): The engineer correctly identified a System A alarm on the display. The System A alarm was almost identical to the System B alarm, which also more frequent and therefore more expected.</i></p>	<p>SKYbrary: Visual scanning technique http://www.skybrary.aero/index.php/Visual_Scanning_Technique FSF: Vision http://www.skybrary.aero/index.php/Vision_(OGHFA_BN)</p>
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Remember previous actions

A2-3. Remember previous actions	<p>Remembering a recently, previously performed action or task or that has already been conducted. This may include remembering whether a task has already been conducted or not, and 'place-keeping' within a series of task steps.</p>	<p><i>Example: The controller forgot that he had already climbed ACA112 to FL350 and transferred it to the next sector, when he tried to give it avoiding action. The flight progress strip was still in the display, and there was no reminder that the aircraft had been transferred.</i></p> <p><i>Example: The controller forgot that she had previously asked her colleague to do the co-ordination on her behalf when she made the telephone call.</i></p> <p><i>Example: The engineer forgot that he had already taken the system out of service and there was no visual reminder of this.</i></p> <p><i>Example (positive): The controller remembered that he had amended the strip to reflect the change in aircraft type.</i></p>	<p>SKYbrary: Memory in ATC http://www.skybrary.aero/index.php/Memory_in_ATC FSF: Memory http://www.skybrary.aero/index.php/Memory_(OGHFA_BN) FAA: The Controller Memory Guide: Concepts from the Field http://hf.faa.gov/technotes/dot-faa-ct-tr94-28.pdf SKYbrary: Situational Awareness http://www.skybrary.aero/index.php/Situational_Awareness FSF: Situational Awareness http://www.skybrary.aero/index.php/Situational_Awareness_(OGHFA_BN) FAA: Human Factors for Air Traffic Control Specialist: A User's Manual for Your Brain (pp. 1-7) https://www.hf.faa.gov/HFPortalNew/Search/DOCs/Hfats.pdf SKYbrary: Human Error Types http://www.skybrary.aero/index.php/Human_Error_Types</p>
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Safety Occurrence Discussion Cards Concept

2e Safety Contributory Factors



Training & Experience

Right training & experience

Did the person(s) training and experience affect performance?

Training needs to be of adequate quality and duration, and at the right time. Experience, familiarity and proficiency is also needed. What role did training and experience play, and could they be improved further?



Draft – to be developed



Other uses

- One neutral taxonomy can serve many more purposes
 - Normal operations safety surveys (e.g. to choose markers)
 - Risk assessments
 - Workshops
 - Simulations
 - etc



Next steps

- Check and amend neutralization of terms;
- Check and amend definitions;
- Check and collect more examples;
- Implement the neutralised contributing factors in RAT (Risk Analysis Tool);
- Train investigators to shift to the new paradigm of positive contributing factors .



Quick wins cont'd

Introduction of the following 10 Principles in the Investigation

1. Field experts
2. Local rationality
3. Just culture

**View of the
person as part
of the system**

4. Demand, Production pressure & Goal conflict
5. Preconditions
6. Resources
7. Controls

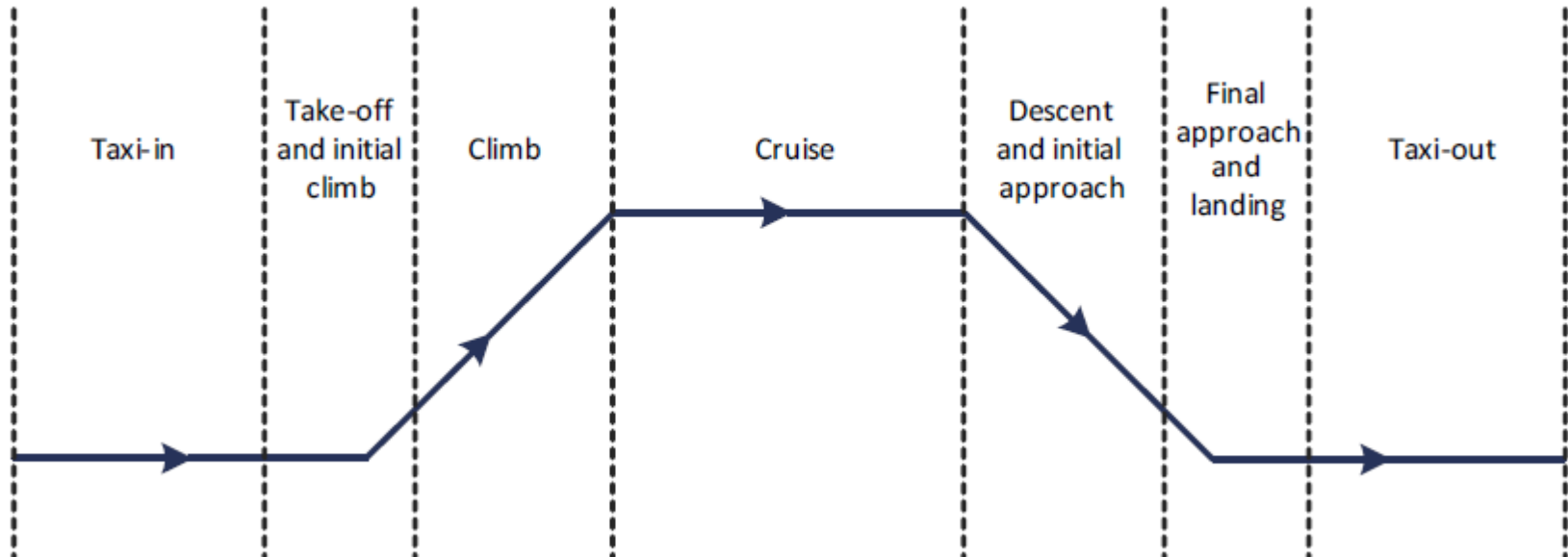
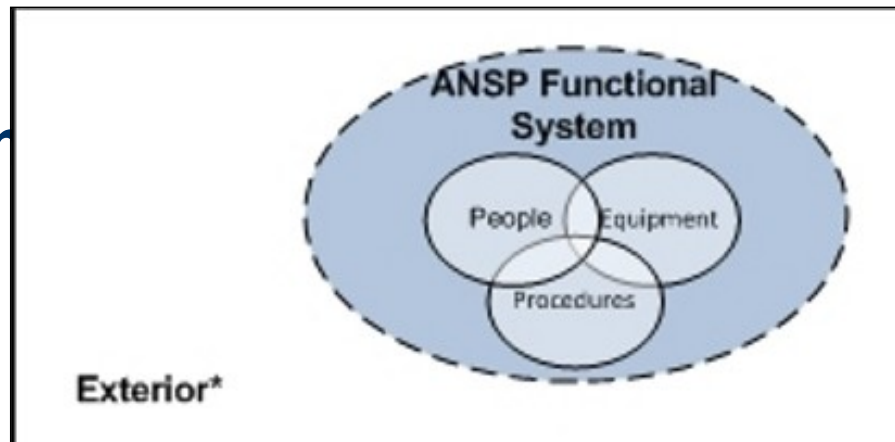
**View of
system
conditions**

8. Flow
9. Efficiency-thoroughness trade-off
10. Performance variability

**View of human
& system
performance**

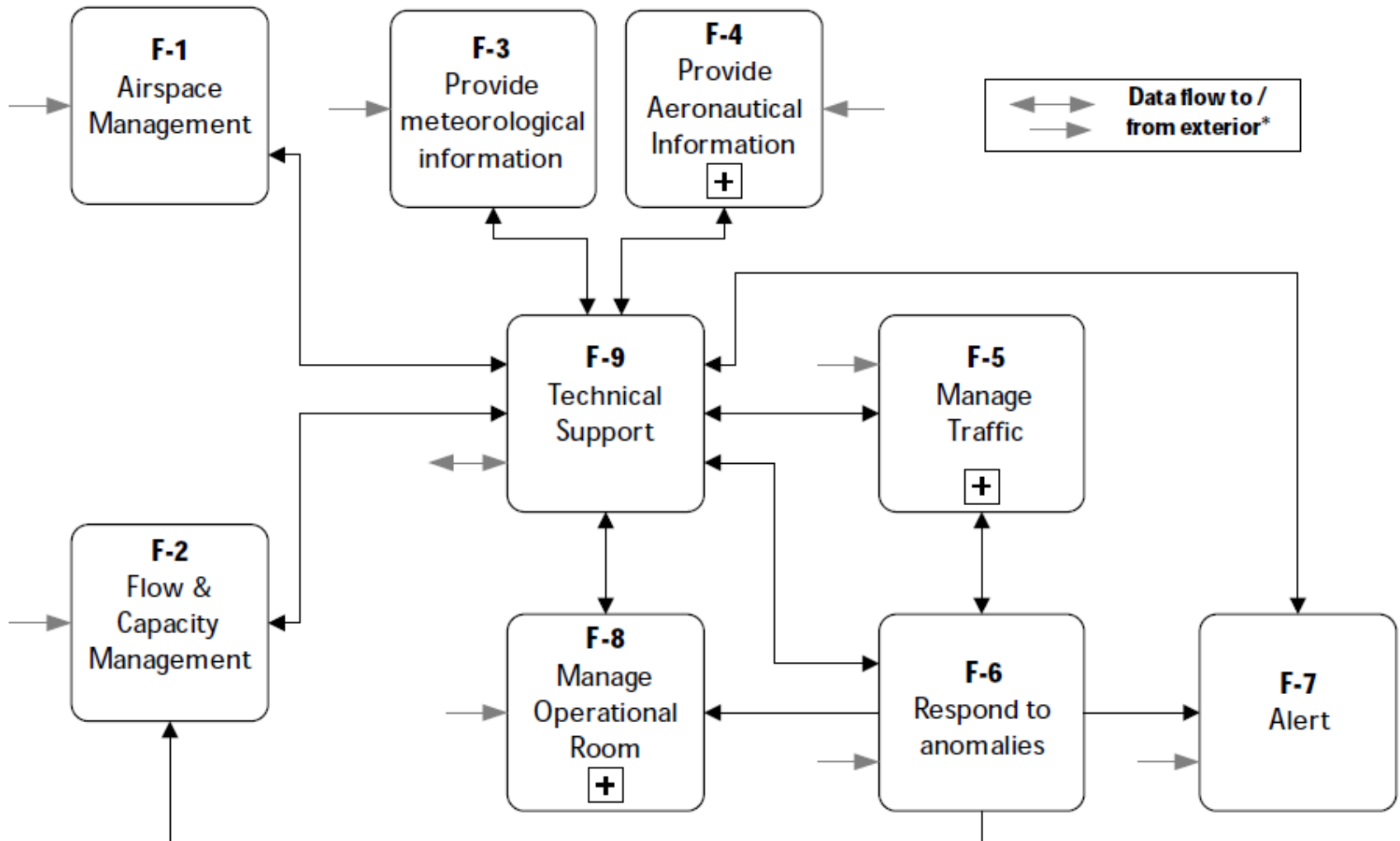


ATM/ANS Modeling of normal operation



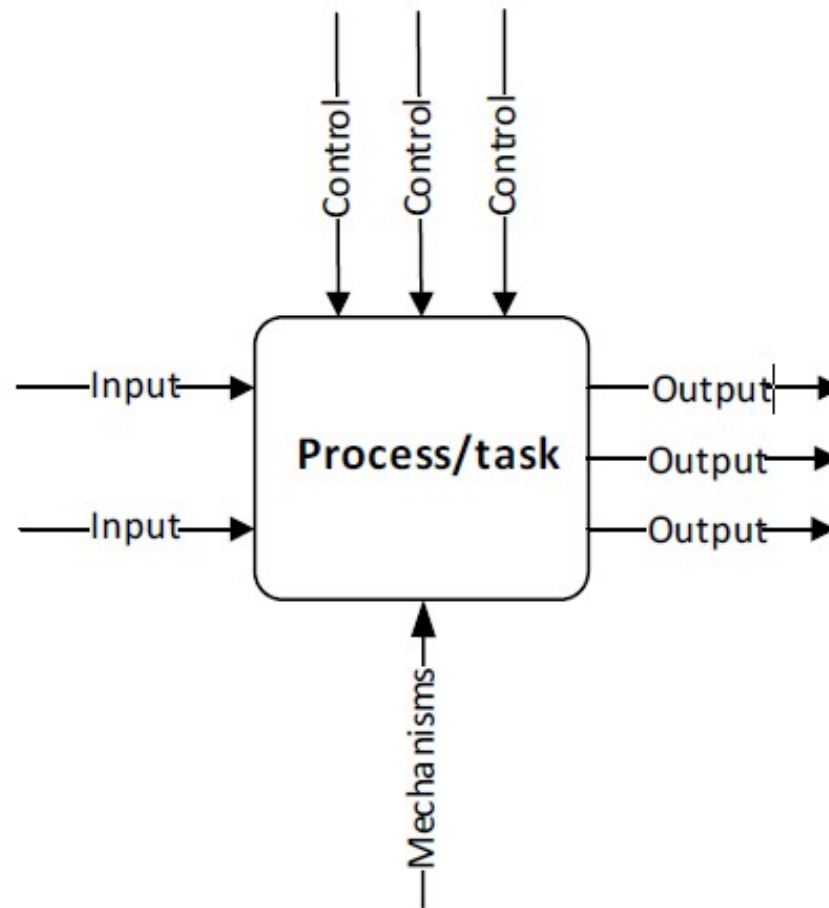


ATM/ANS Modeling - Top Level view





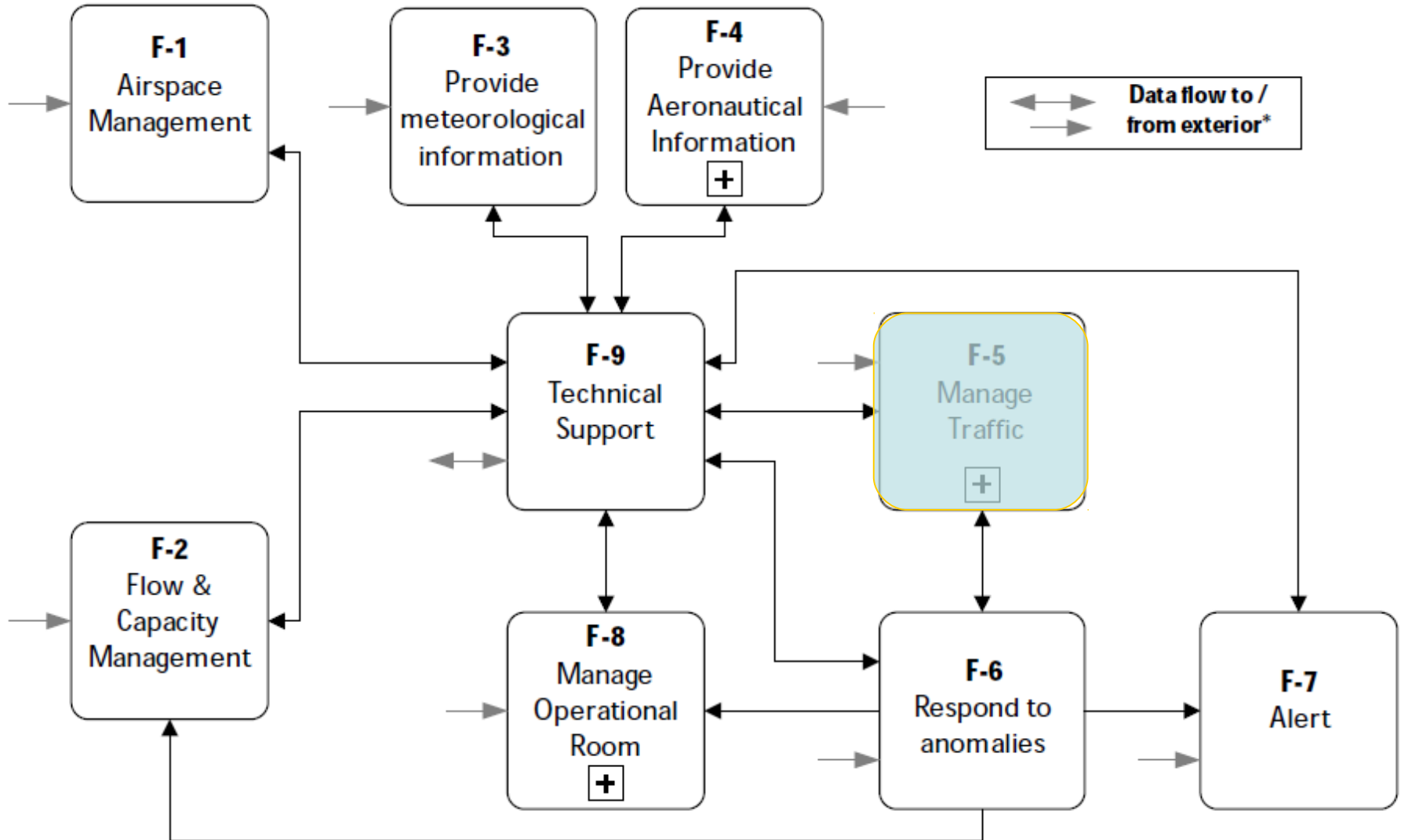
ATM/ANS Modeling - completed using SADT (Structured Analysis and Design Technique)





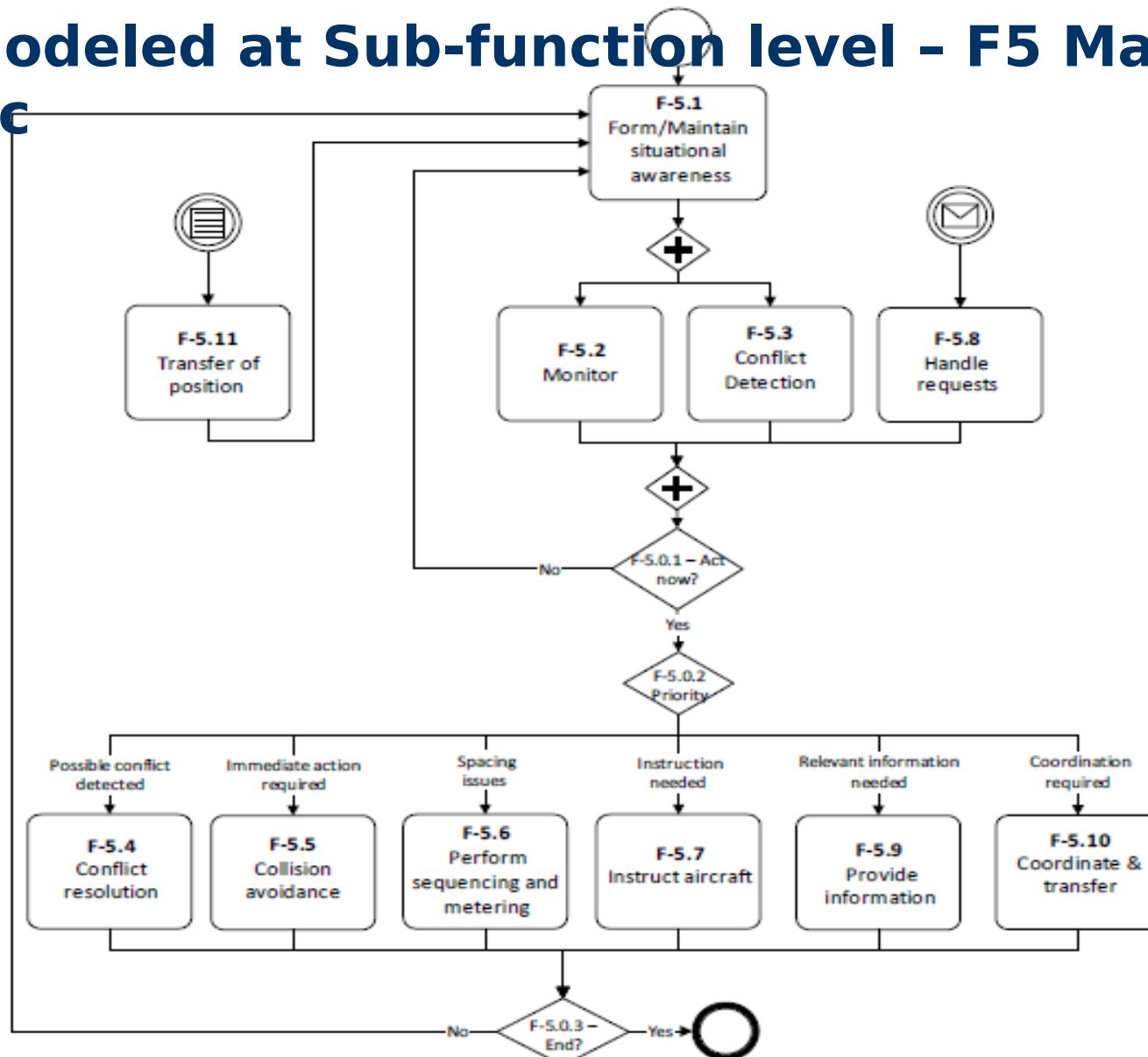
We modeled at Sub-function level - e.g. F5

Manage Traffic



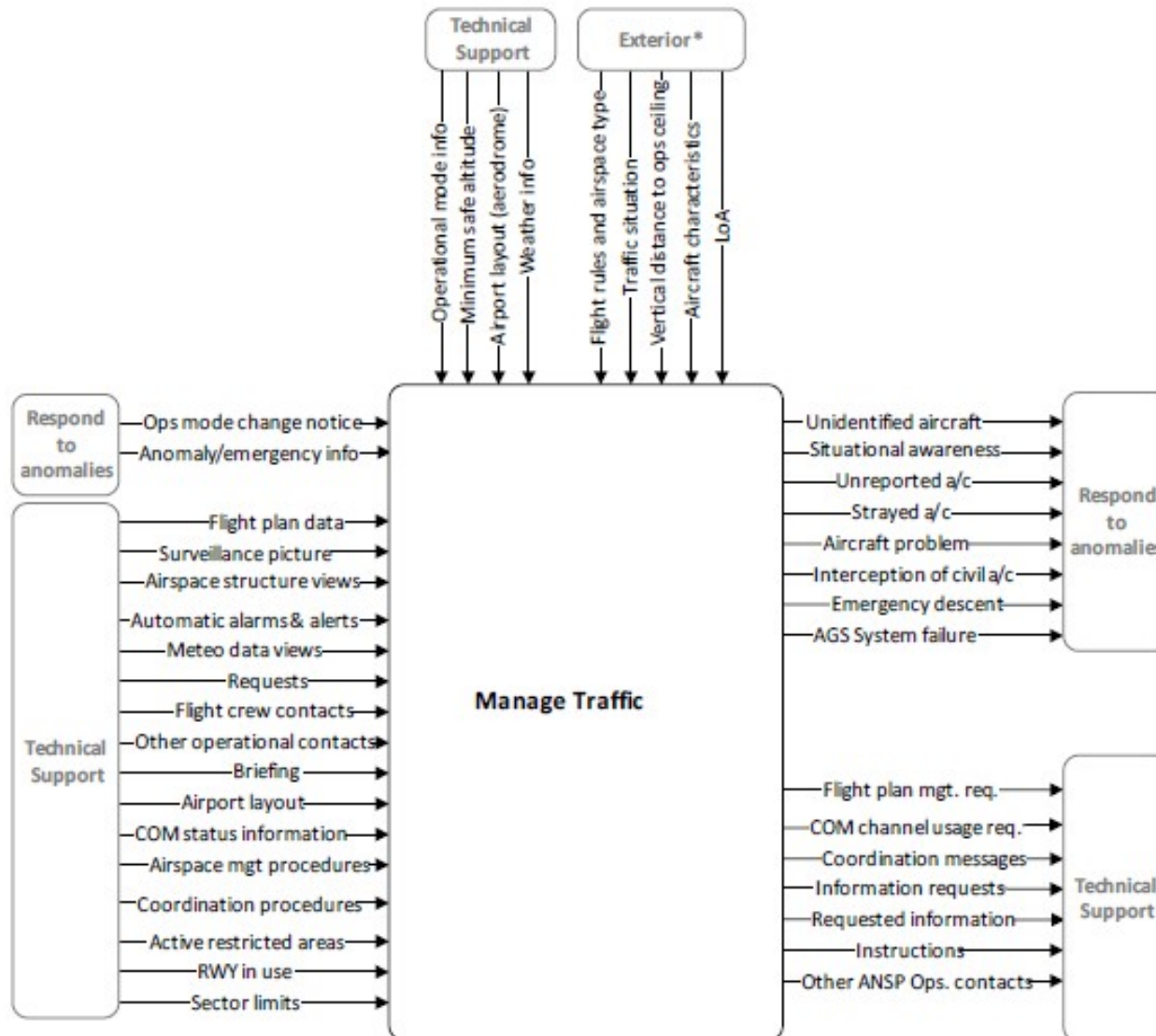


We modeled at Sub-function level - F5 Manage Traffic





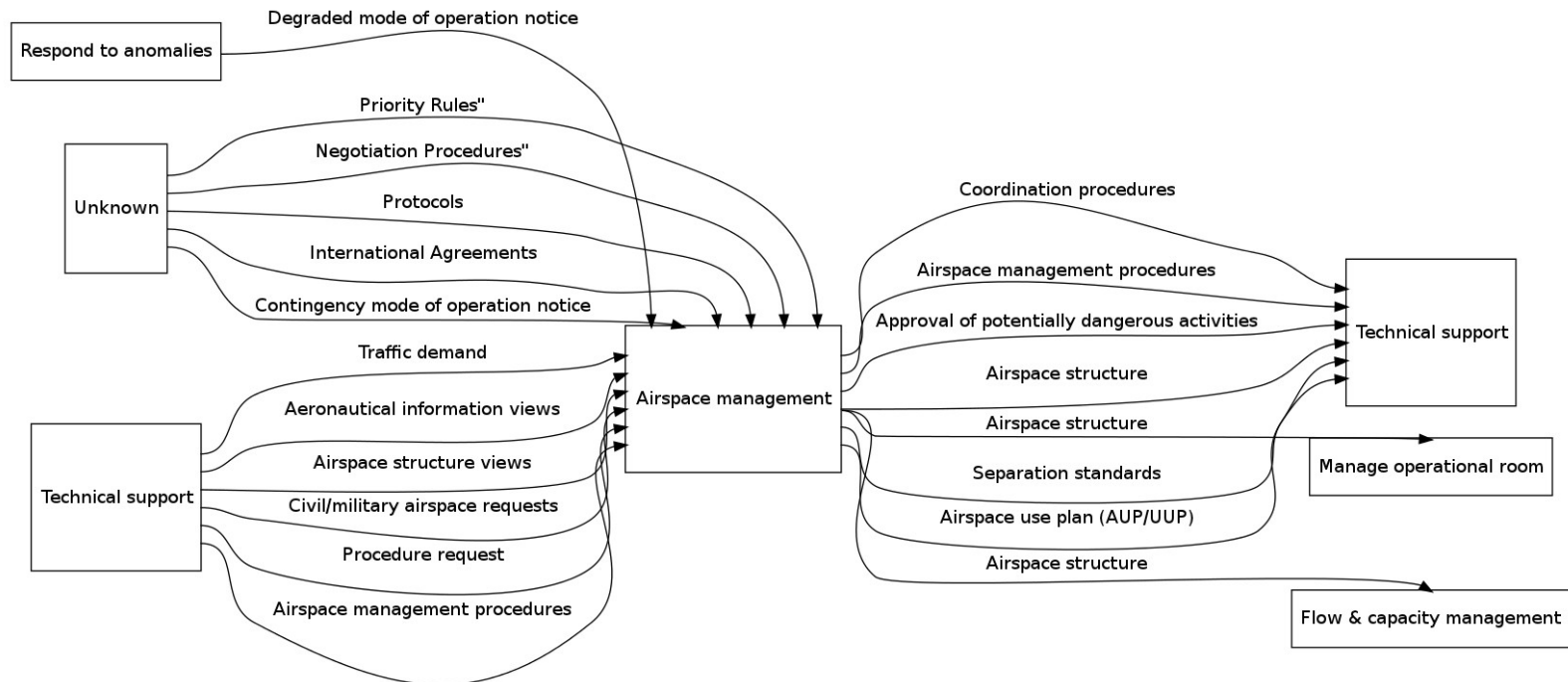
We modeled at Sub-function level - F5 Manage Traffic





Next step is to move from SADT to FRAM

- Not trivial
- Requires SW support





Expectations

- Availability of robust SW tool to support the way forward;
- Validation of the ATM/ANS functions;
- Usage of the modeling for Safety-II rather Safety-I – incidents etc.;
- Safety in support of operations rather safety against costs;
- Bring others into the project;
- Cross industry exchange;
- Prove that it works and is worth it;
- Promotion;
- Changing the culture of ATM towards Safety II. (including Regulators).



QUESTIONS ?

