Human Factors Aspects during Post-Maintenance Flight Tests

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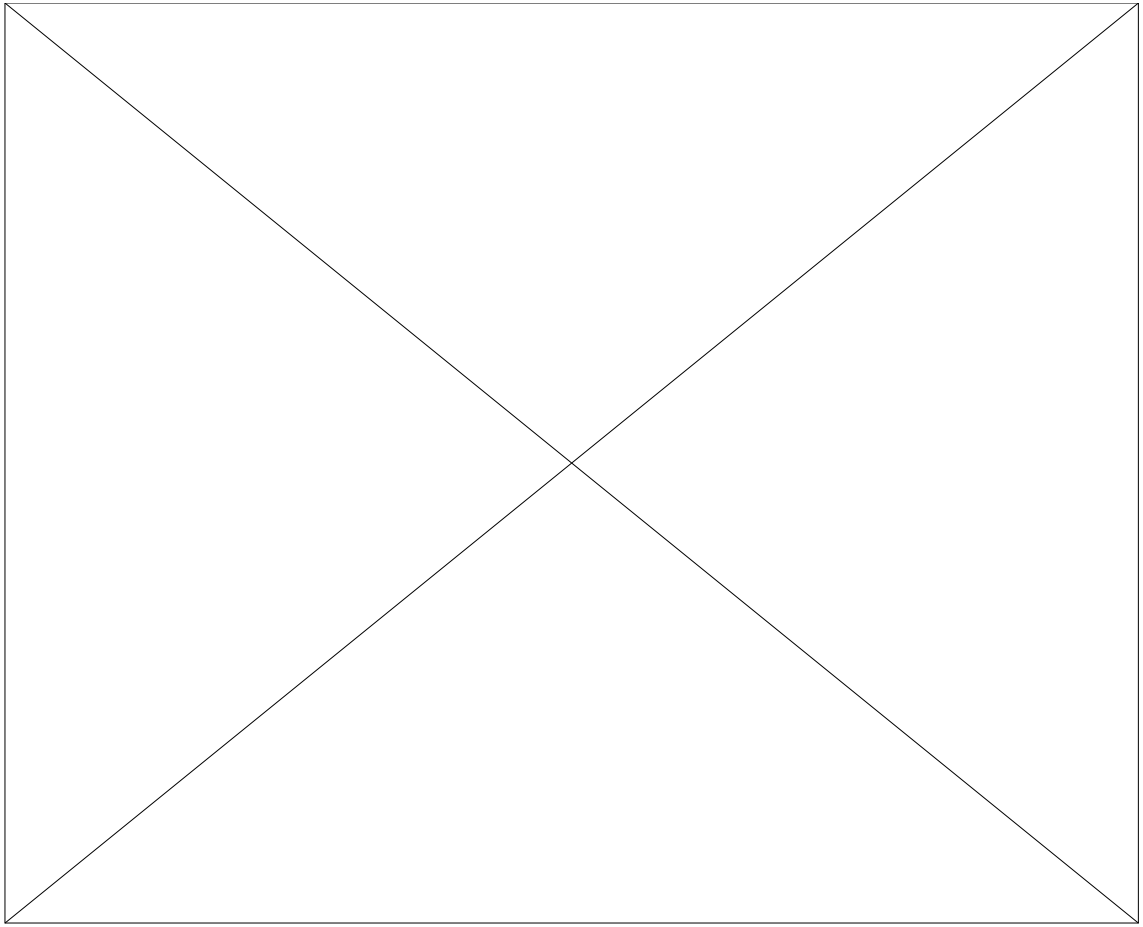
Continuous Safety

Outline

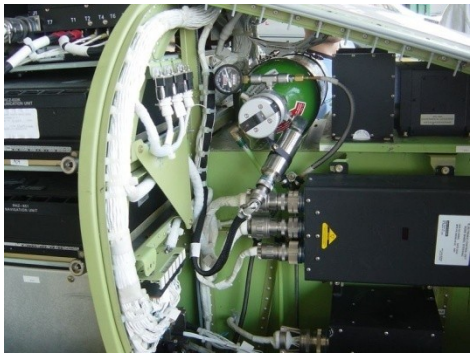
- Post Maintenance Flight Tests
- Human Factors (HF) Aspects
- Research methodology
- Haz. Ident. & Risk Manag. Appr.
- Human Factors fundamentals
- Proposed Strategy to conduct safe FTs
- Recommendations

Study case



Post Maintenance Flight Tests

- Necessary to confirm Rotorcraft airworthiness performance data
- Risky activity
- No repetitive activity, no frequent data
- Performed by highly qualified staff
- Performed in busy skies
- Improvisation increases the risk

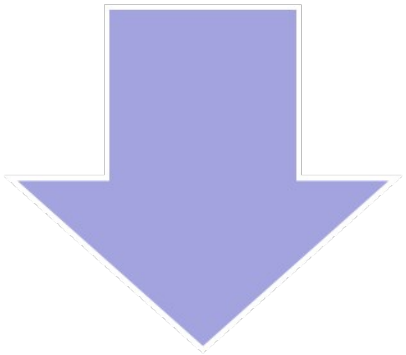


Flight Tests - Objectives

- Flight testing is conducted to ***ensure*** that the *overall performance or handling* qualities of a rotorcraft *have not fallen* below a **defined standard** (i.e.: in the RFM).
- After certain fault rectification or replacement of components when checks for proper operation cannot be carried out on ground.

Flight Tests - Objectives

- To deliver ***safe*** Flight Tests operations and meeting the technical objectives.

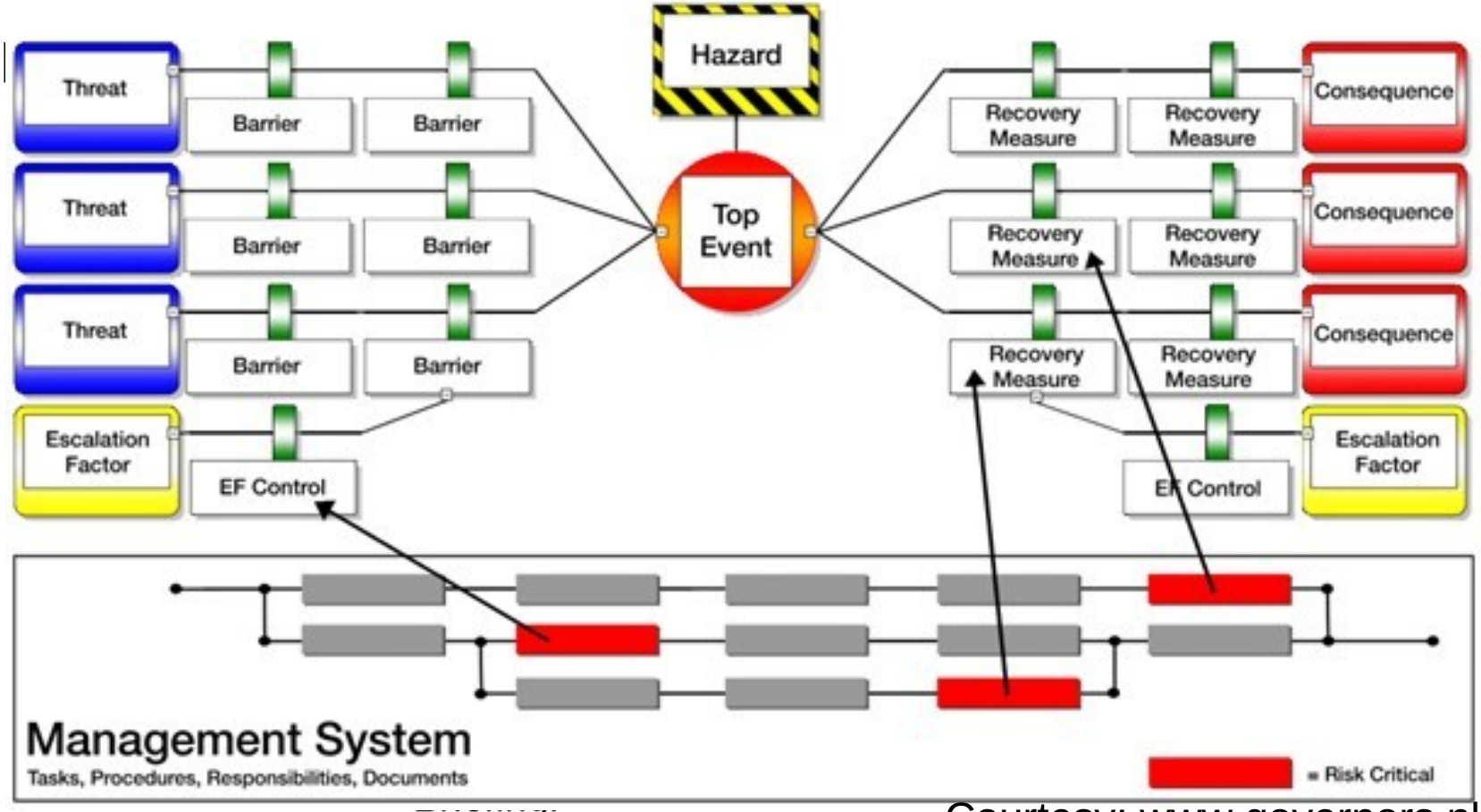


Risk(s)

Control Measure

Flight Tests – HF Objectives

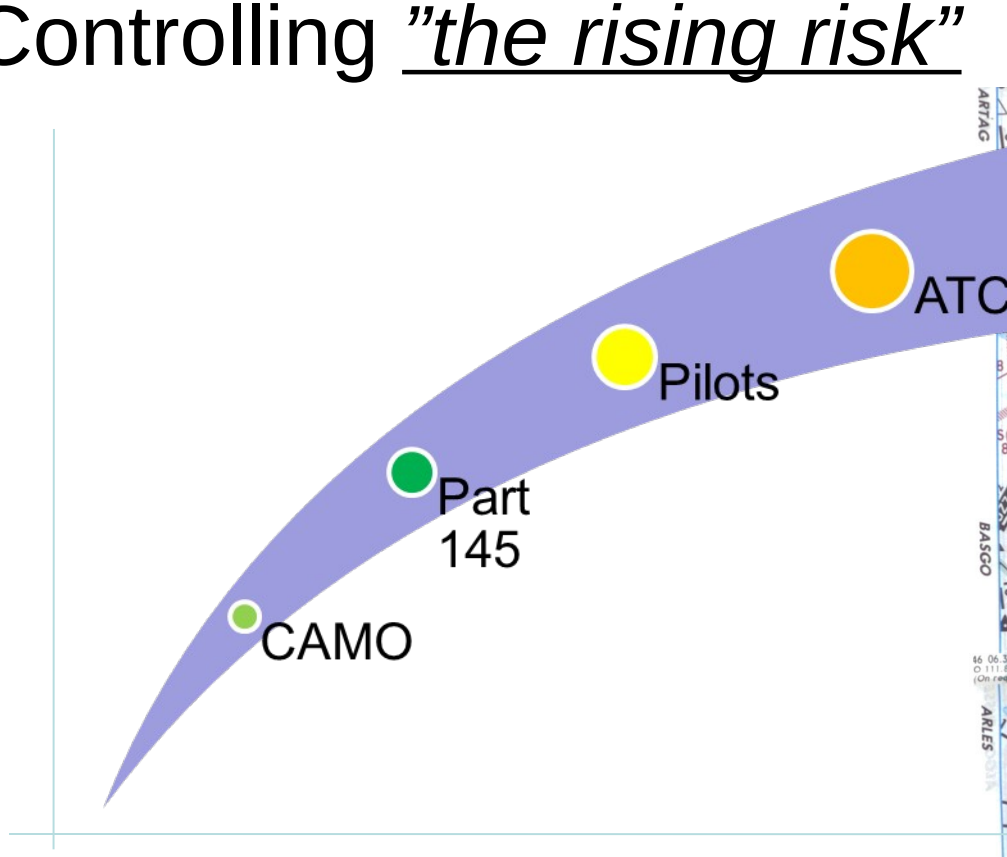
- To deliver ***safe*** Flight Tests operations and

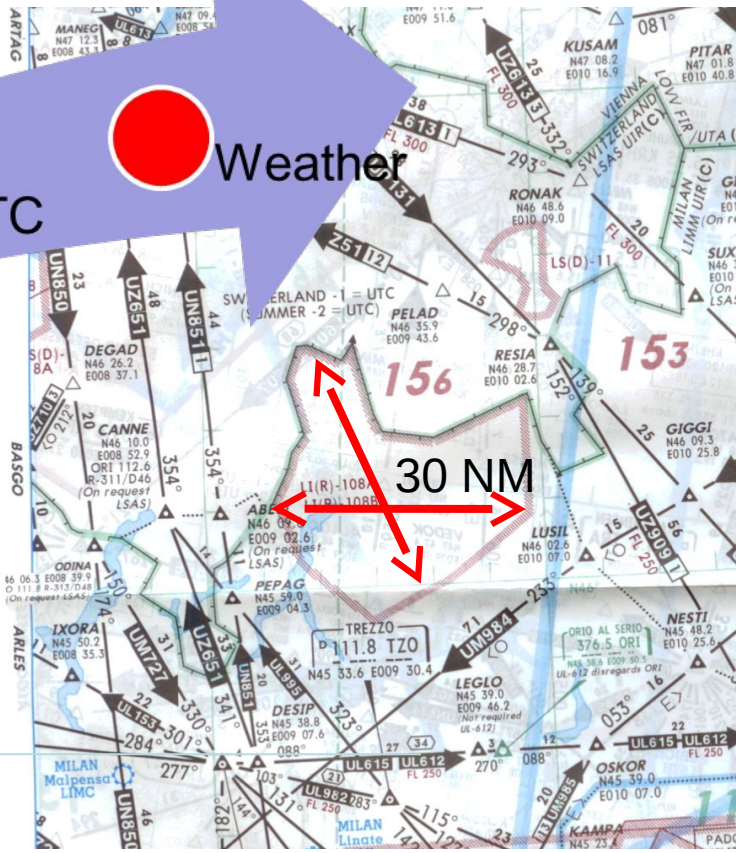


Courtesy: www.governors.nl

Safe Operations - Objectives

- Controlling *”the rising risk”*





HF aspects

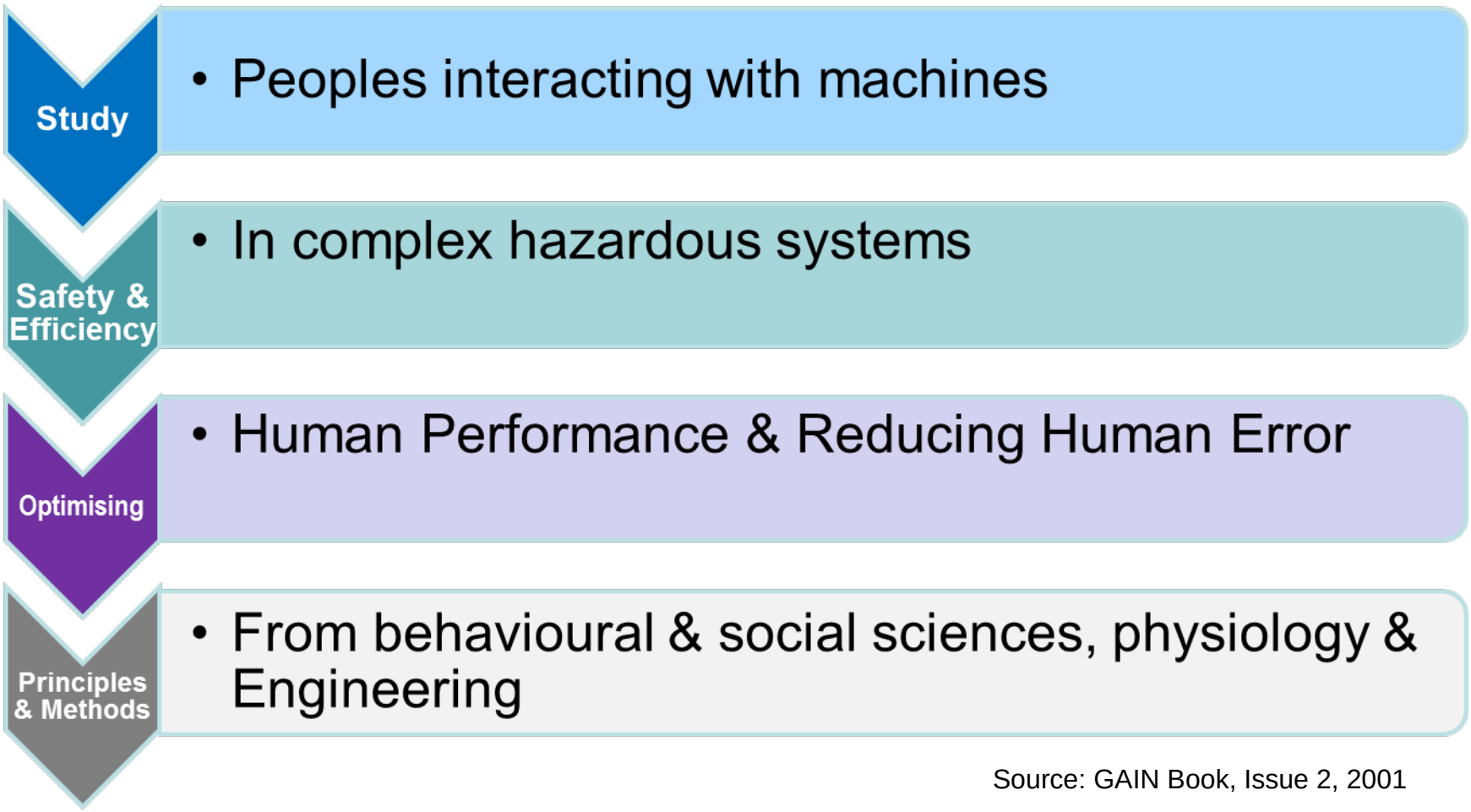
- Pilots are asked to deliver their best
- Non-cyclical-activity
- Excessive reliance on “experienced” staff
- Provision of clear policy, procedures and practices are essential
- Planning is a key factor

Research Methodology

The following topics were reviewed	Data gathering
Fundamentals of HF	Reviewing the Human Limitations to FT
Risk Management	Hazard Identification, Risk awareness and system protection
Actual Legislation	EASA and NAA Rules, Regulations and good practices
Industry Approach assessment to FT	How the industry is actually managing the issue
Focus on	system safety and on risk Identification and management.

R. Sumwalt (2007), vice chairman of the NTSB, likened the hunt for precursors to "reading tea leaves" because it can require imagination to tie together incidents that don't seem hazardous at first blush.

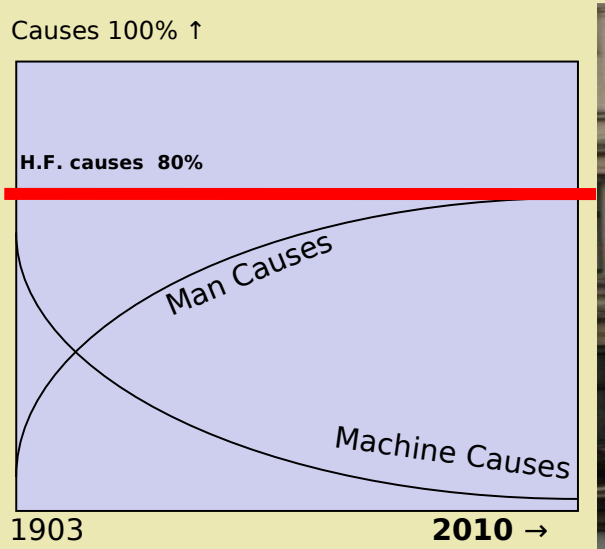
Human Factors - Fundamentals



Source: GAIN Book, Issue 2, 2001

Human Factors - Fundamentals

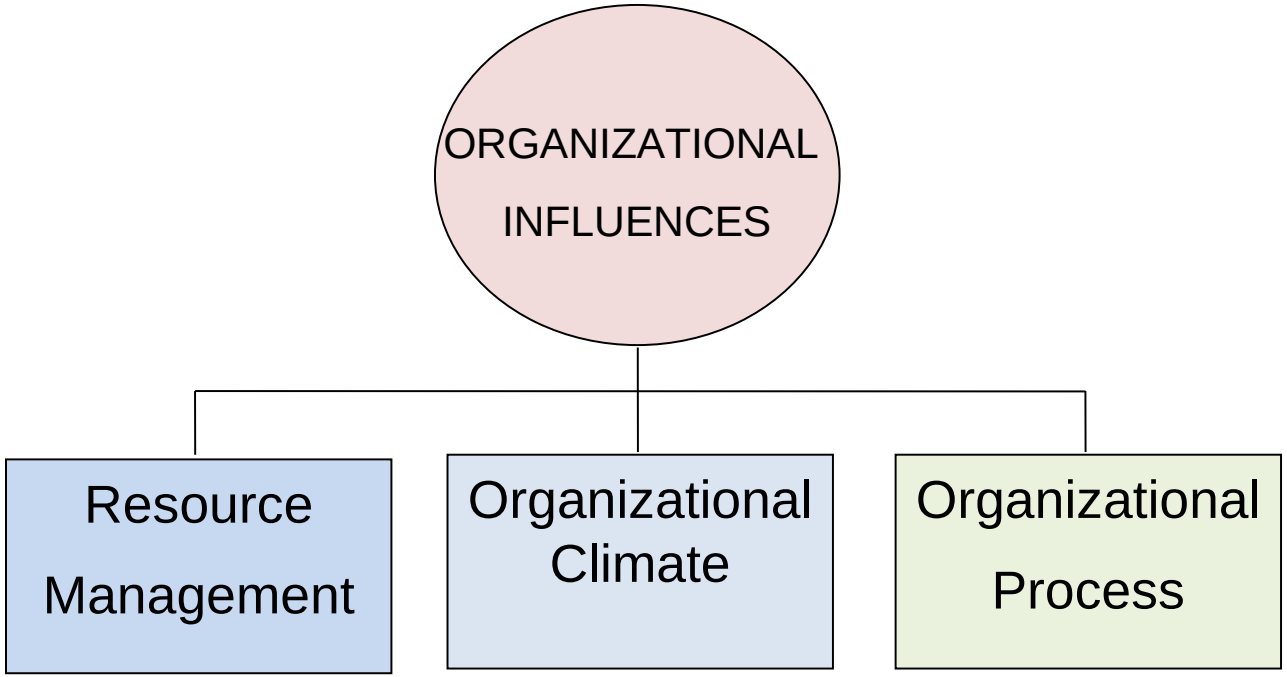
The picture: ULSTEIN-BILD



The picture: ANSA

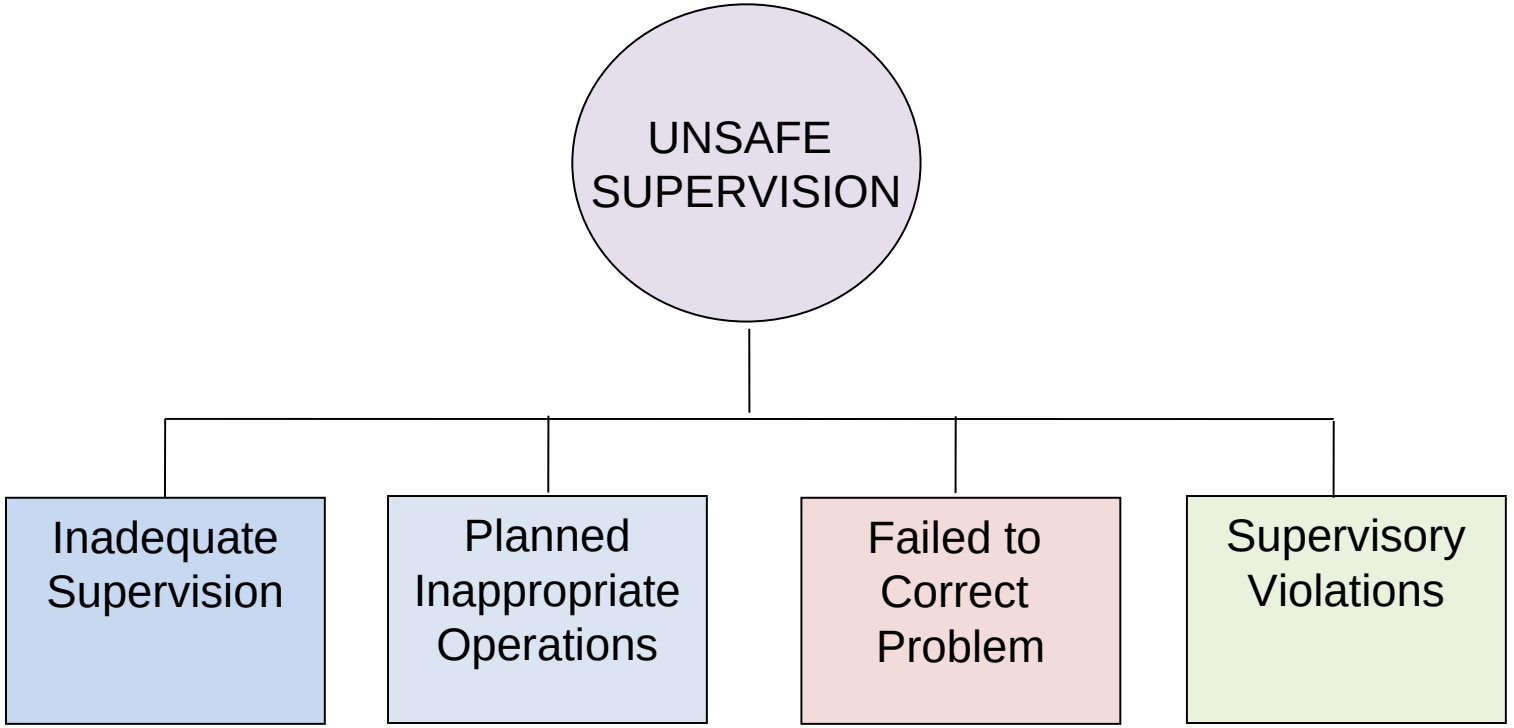
Source: HFCAS

HF - Systemic Vulnerability



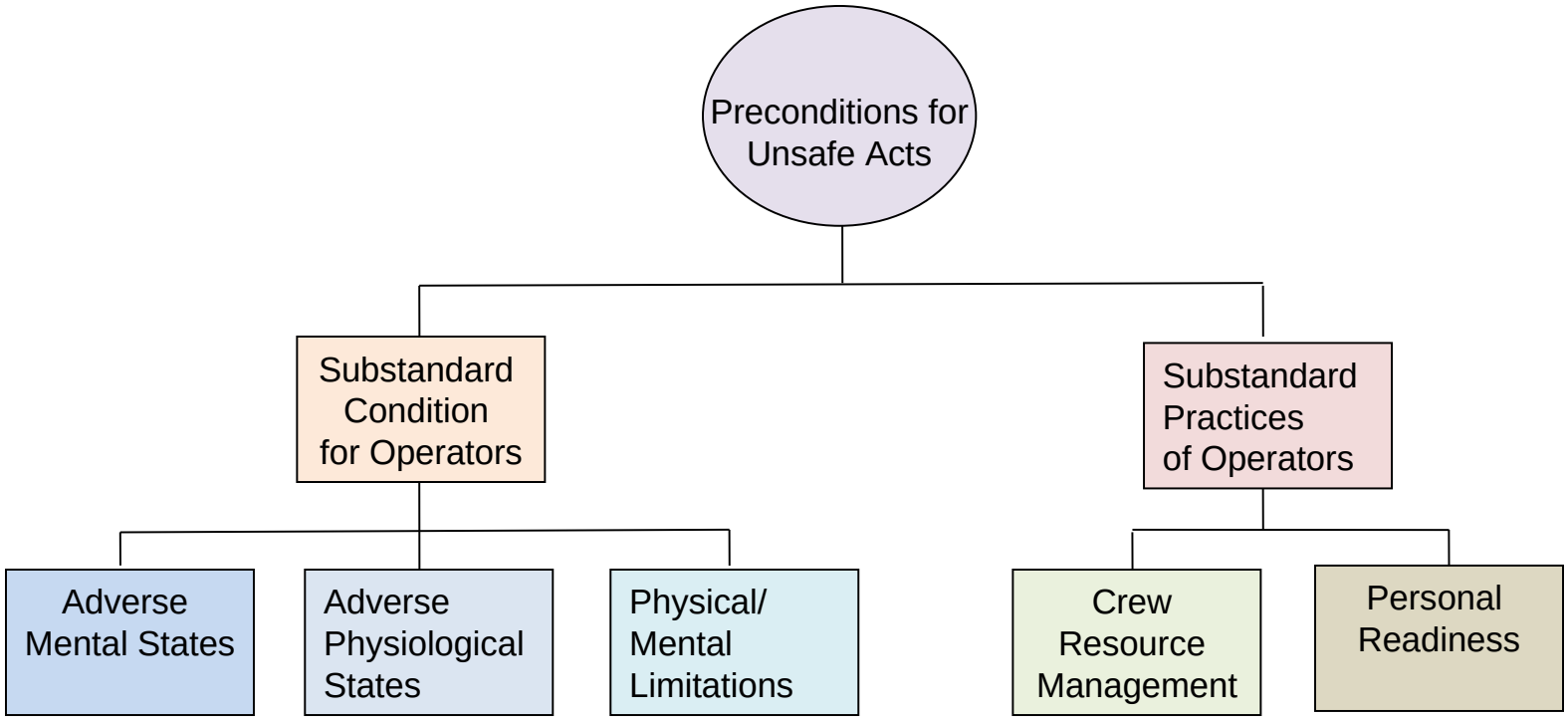
Source: HFACS

HF – Unsafe Supervision



Source: HFACS

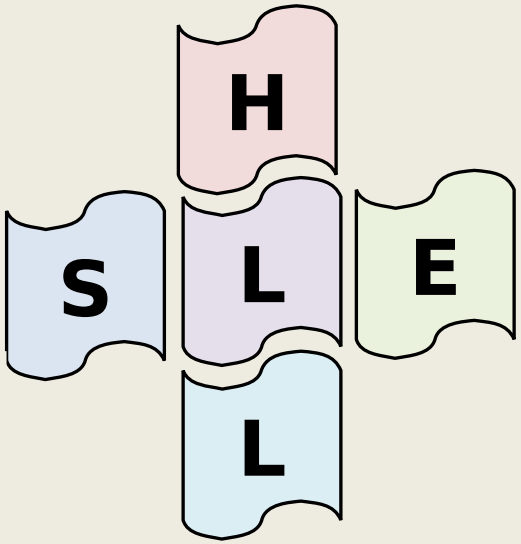
HF–Preconditions for Unsafe Acts



Source: HFACS

Human Factors – Shell Model

The Shell Model Modified by Hawkins.



S = Software (procedures, symbology, etc.)

H=Hardware (machine)

E=Environment

L=Liveware (human)

Source: ICAO Doc 9859, SMM.

HF– Basic Emotions

Basic emotions

- Happiness, panic, anger,
- Anxiety, guilt, shame

Cockpit emotions

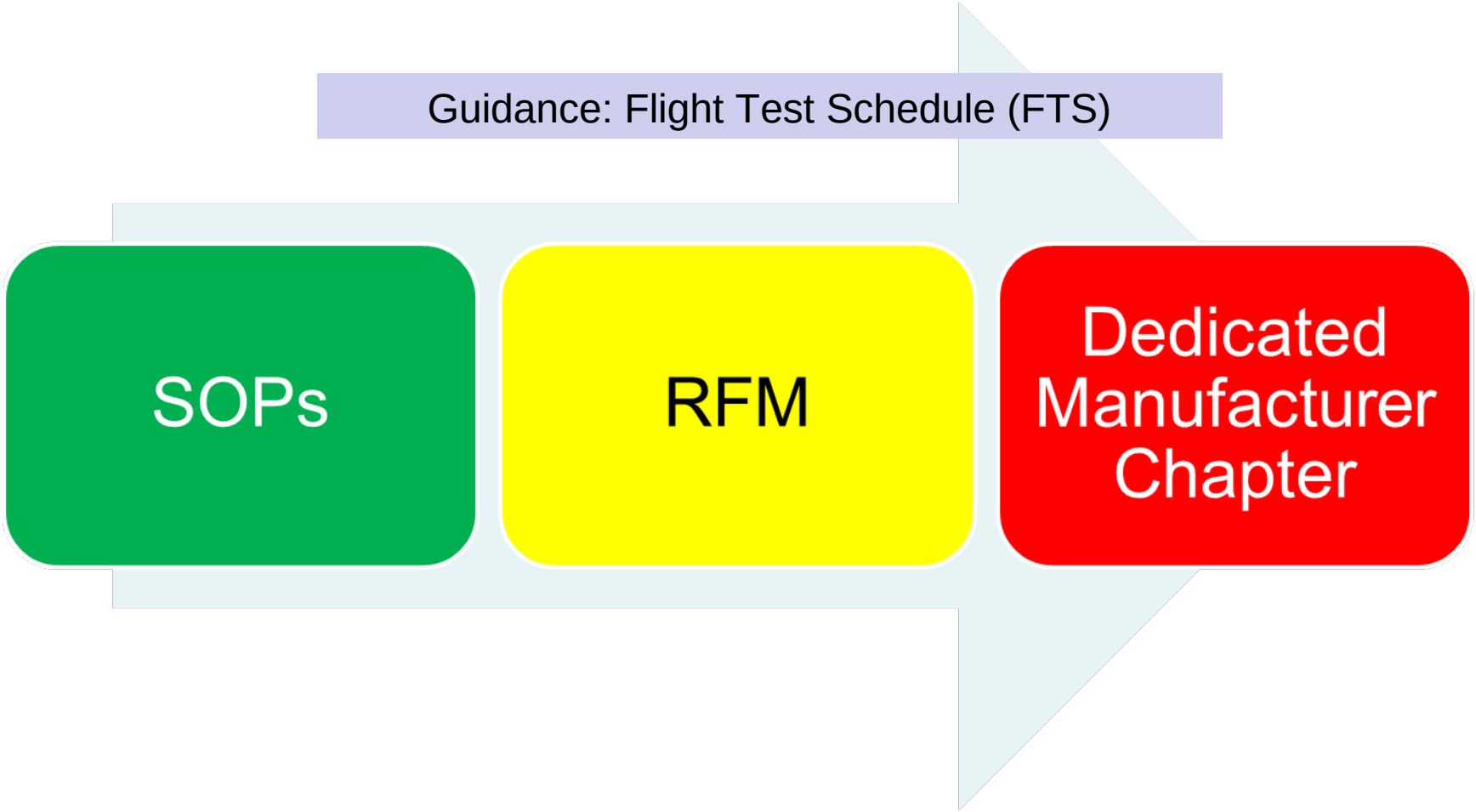
- Admiration, pride, amazement,
- Fear, annoyance, humiliation.

Pilot Mental States

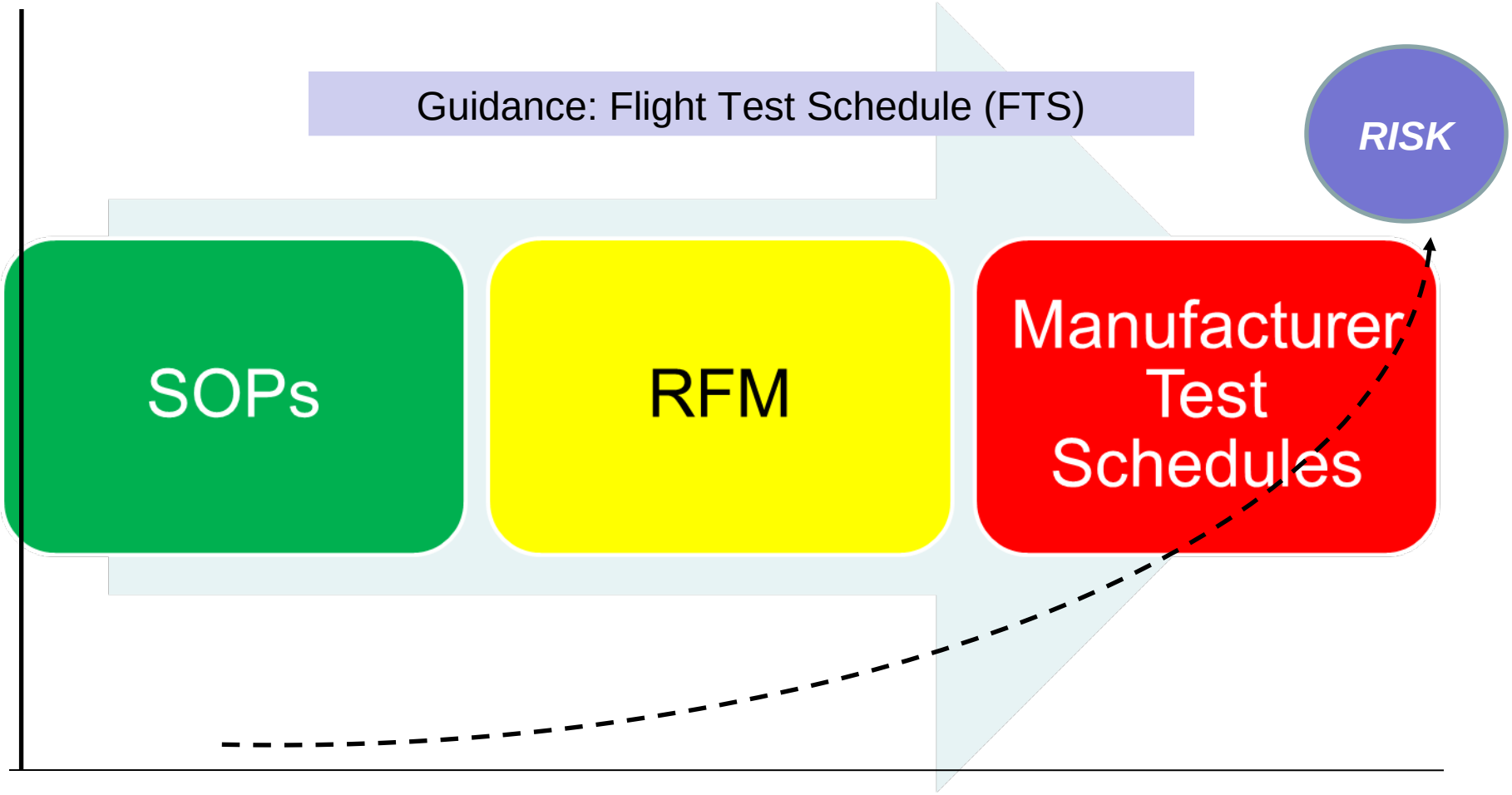
- Impatient, task saturated, confused.
- Distracted, inadequate, excited.

HF – FAA's 5 Hazardous Attitudes

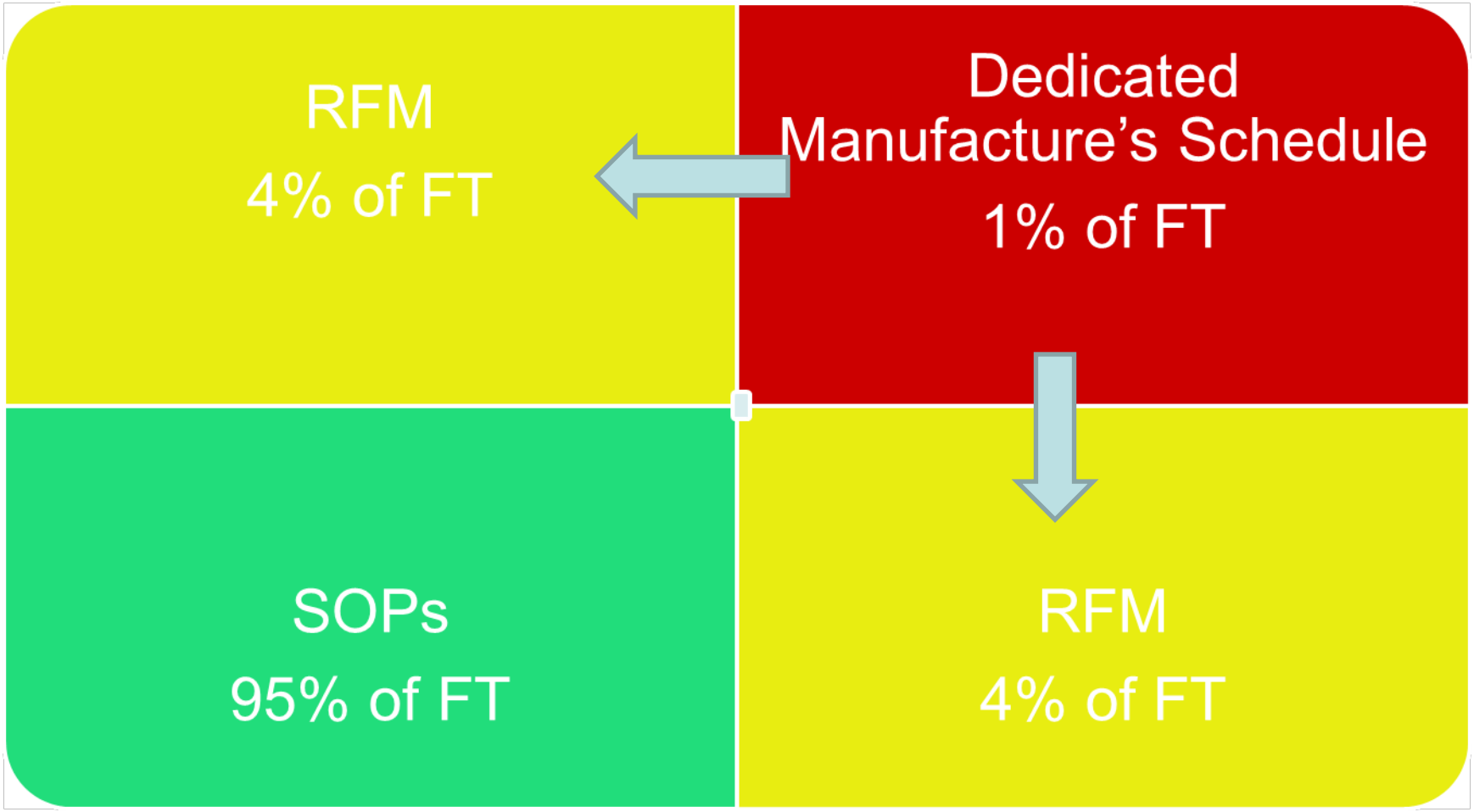
Pilots: The Flight Test Rules



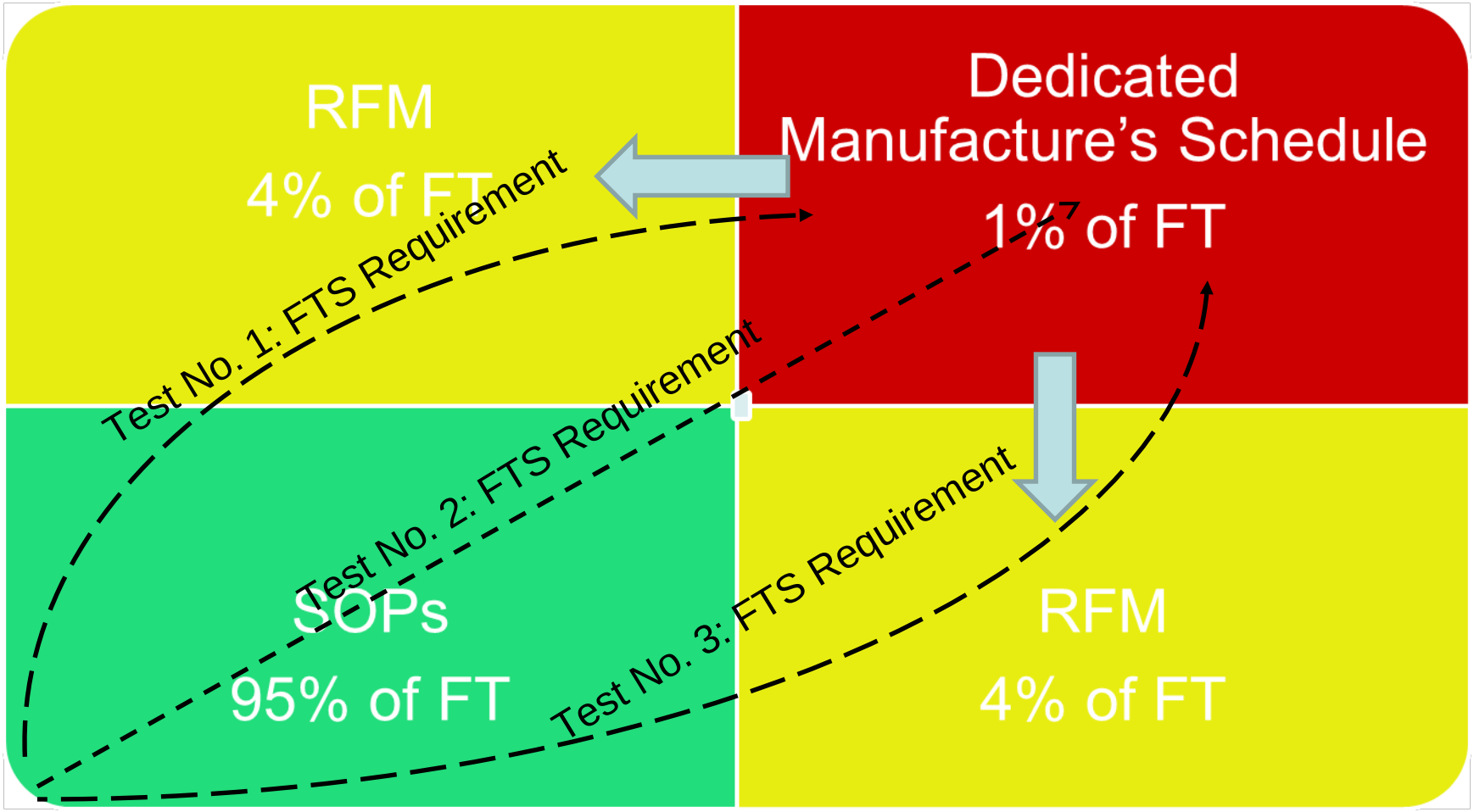
Flight Test Schedule - Risk



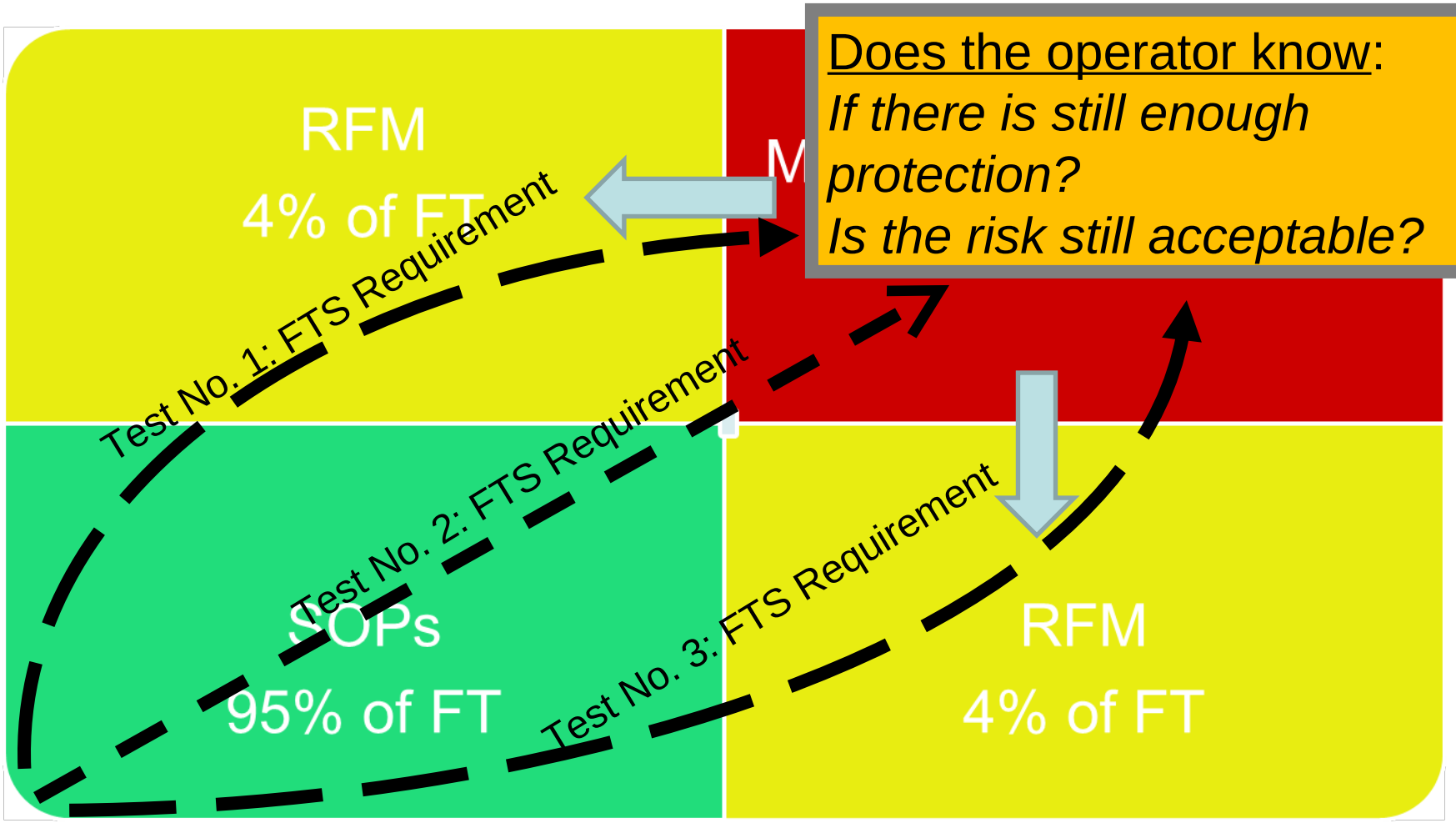
Risk Assessment: Task – Rule boundary



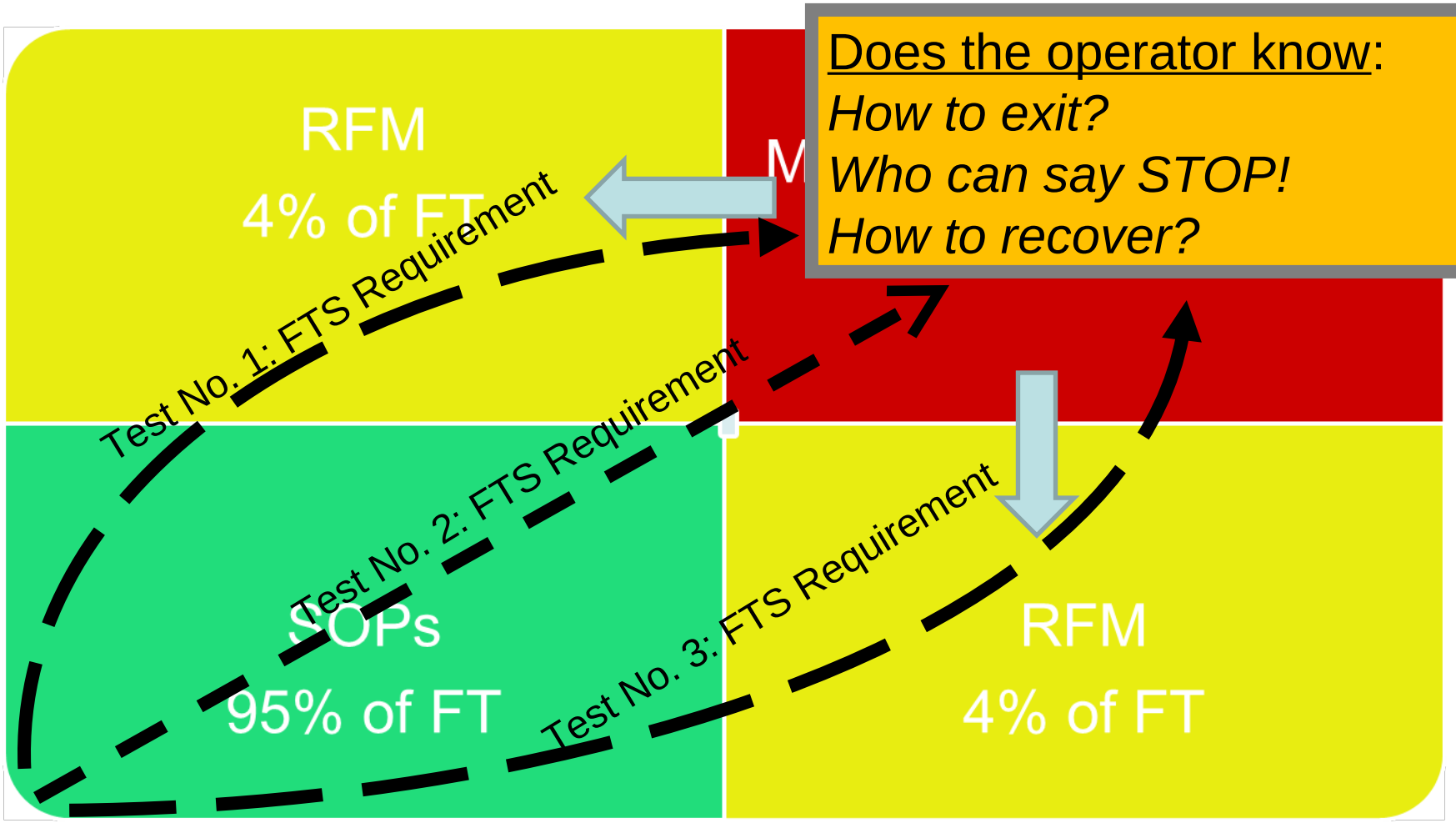
Risk Assessment – Time factor



Risk Assessment – Severity



Risk Assessment – Policy



Manoeuvre & control measure

Normal	• SOPs – Flight Crew is Familiar
Close to rotorcraft limitations	• RFM – Flight Crew Self familiarization required • (NOTE: Often RFM is not OM Part B)
Beyond rotorcraft limitations	• Dedicated Manufacturer's Chapter in RFM • Provision to Flight Crew of a dedicated training/SIM session

Survey Questionnaire

Questionnaire sent to 57 aircraft AOC's Italian Operators:

- 10 responded
- 1 declined to participate
- 1 provided informal data
- After a cleaning procedure the assessment is based on No. 8 Operators

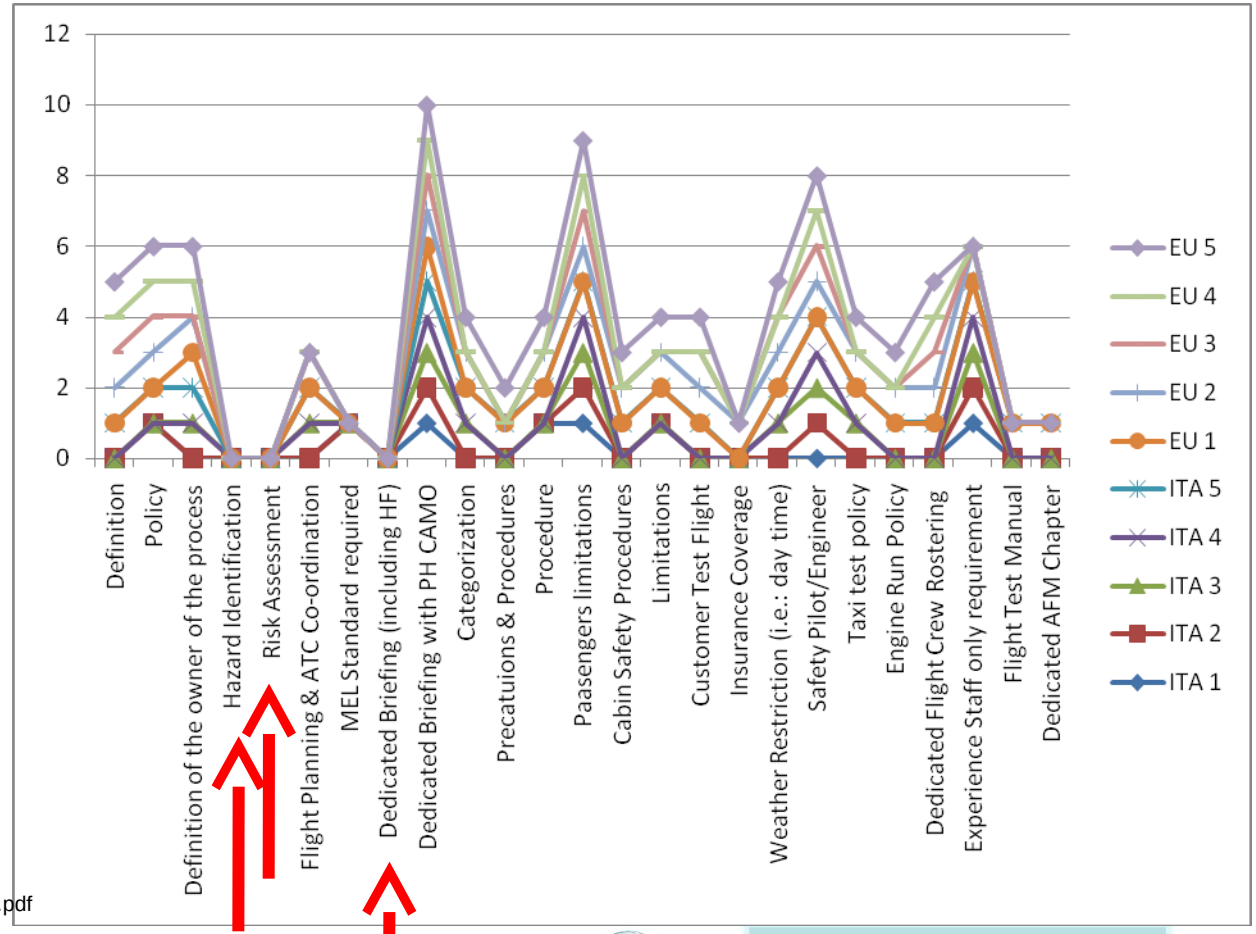
Question Number	Yes	No	N/A
No. 1 (*Policy for flight tests*)	6 (75%)	2 (25%)	0
No. 2 (*If it includes Human Factors aspects*)	3 (37,5%)	5 (62,5%)	0
No. 3 (*Identification of Risks*)	4 (50%)	4 (50%)	0
No. 4 (*Involvement in Safety occurrences*)	4 (50%)	4 (50%)	0
No. 5 (*Implementation of corrective action*)	4 (50%)	3 (37,5%)	1
No. 6 (*Monitoring of effectiveness of the corrective actions*)	5 (62,5%)	3 37,5%)	1

Findings from Docs assessment

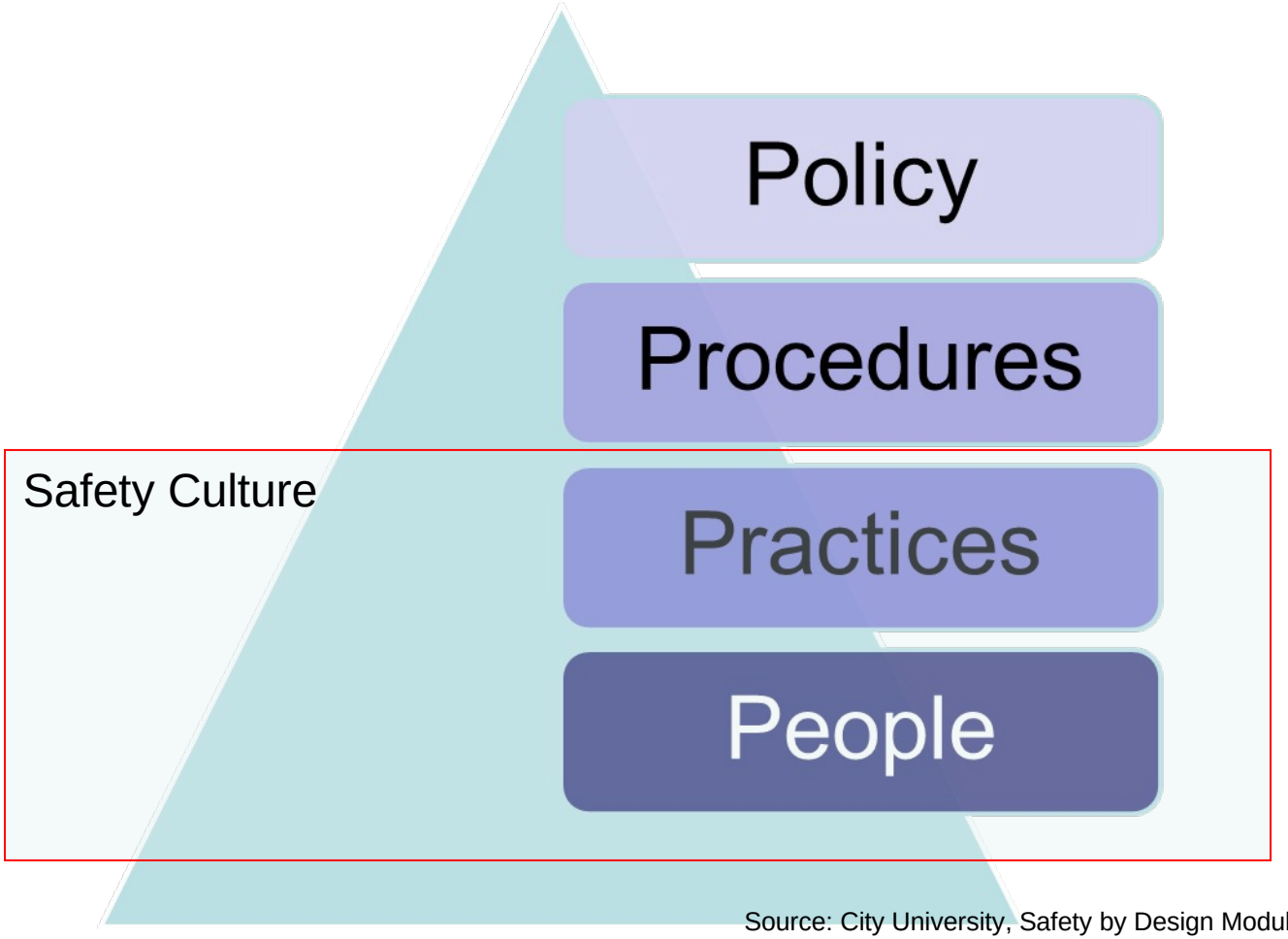
Confidentially the author reviewed No. 10 OM Part A/Ch. 8.7 AOC's Holders

- 5 were Italian AOC
- 5 were EU AOC

bea.aero/docspa/2008/d-la081127.en/pdf/d-la081127.en.pdf

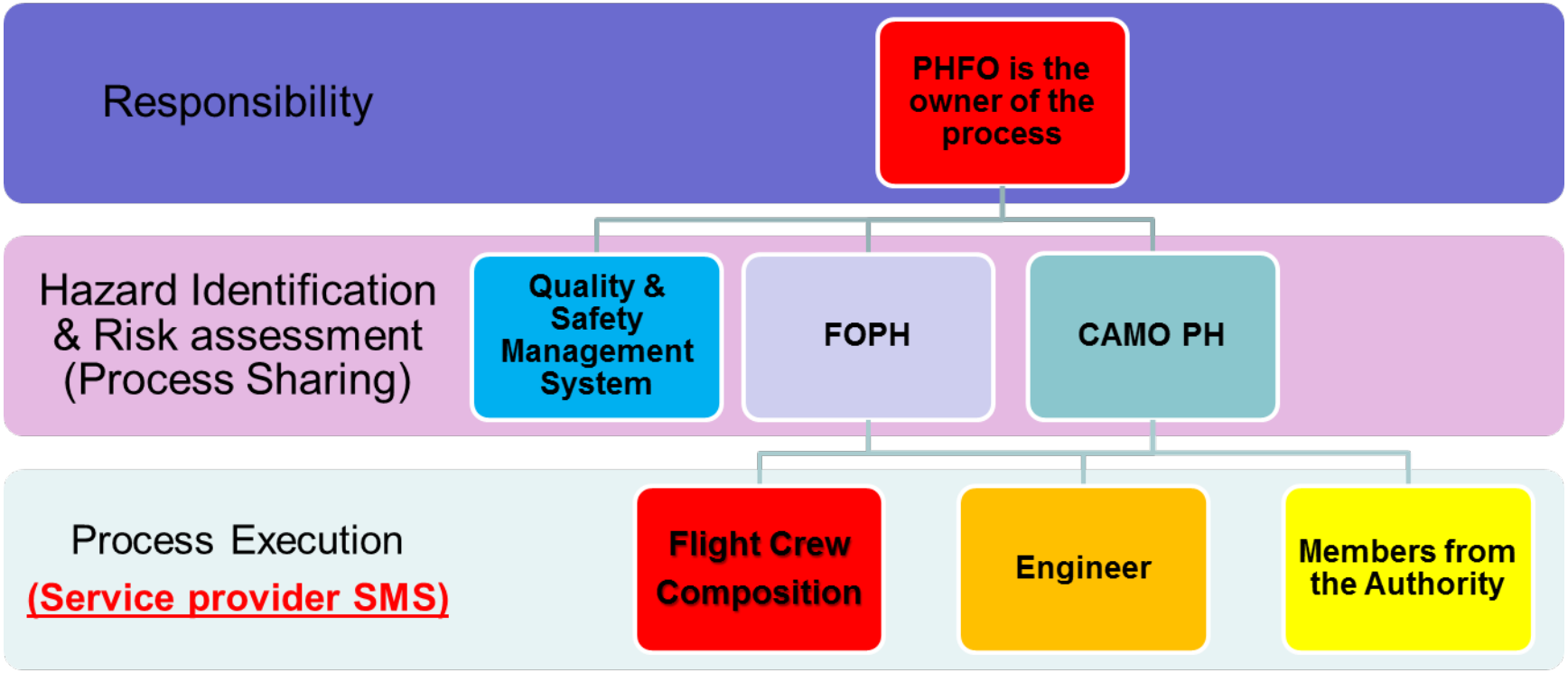


The organization must provide



Source: City University, Safety by Design Module Course notes.

Finding No. 1:
Define the owner of the process



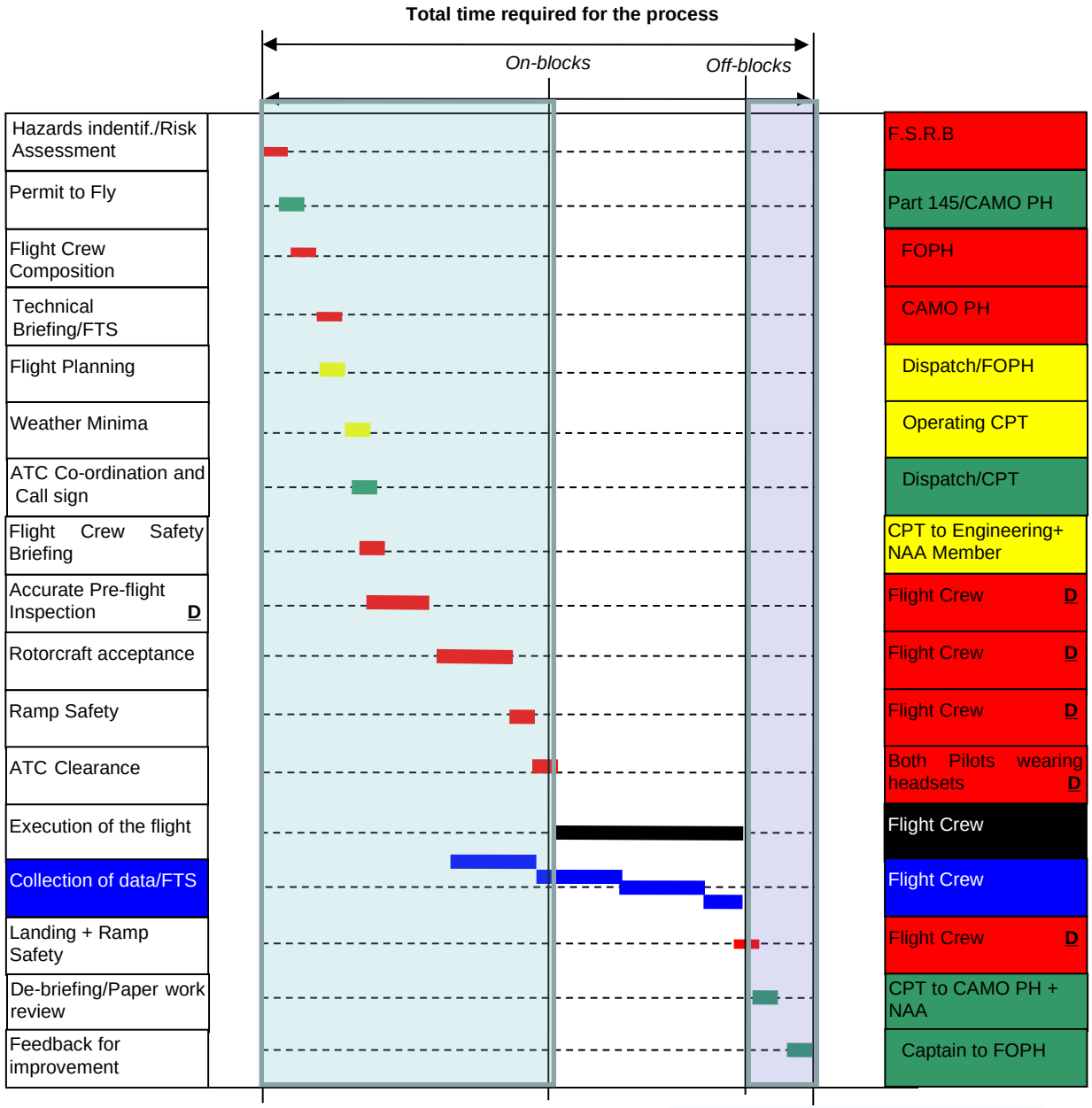
WARNING: No one cannot "add" tests in flight

Six varieties of rule-related performance

	Good Rules	Bad Rules	No Rules
Correct Performance	*Correct compliance*	*Correct violation*	*Correct Improvisation*
Erroneous Performance	*Misvention*	*Mispliance*	*Mistake*

Source: J. Reason (1997).

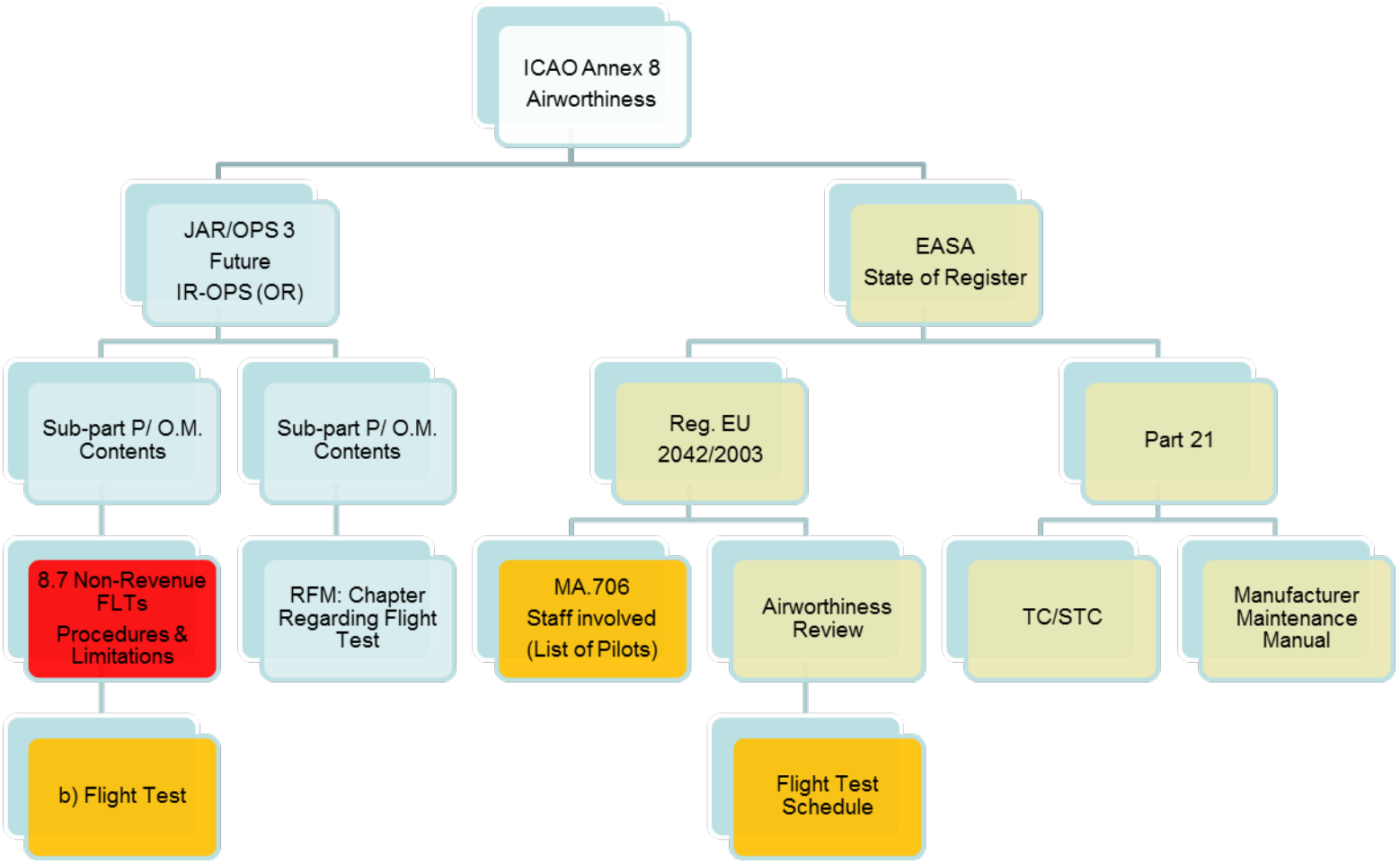
A generic example of Risk assessment in the Process of F.T.



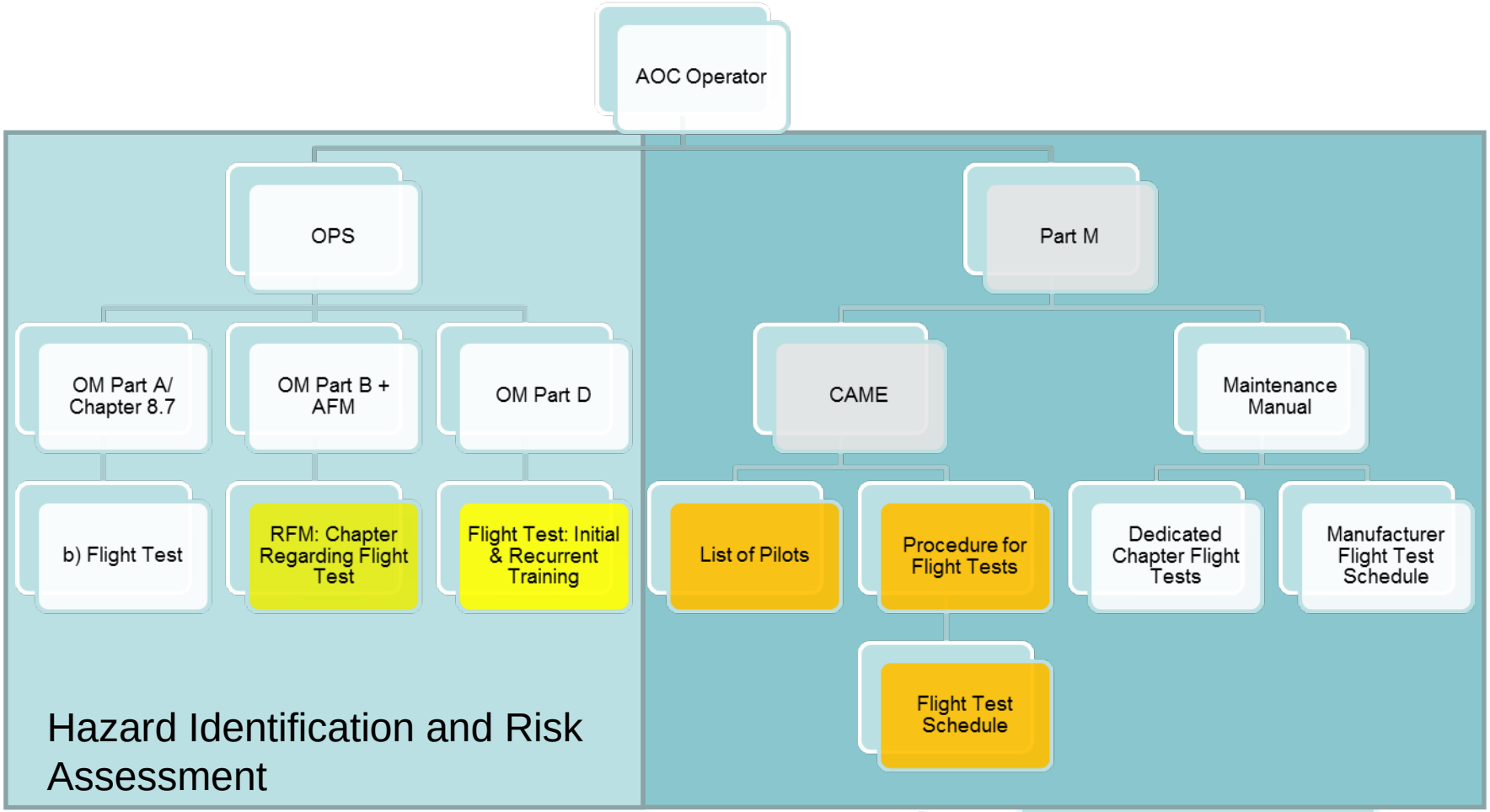
Which could be the main risks?

- HF of staff: exposure to emotional triggers
- The combination of an error + a violation
- Ramp activity
- ATC
- Working area
- Other FT crew or members
- Secondary failures

Actual Legislation



Actual AOC Holder Documentation



Recommendations

Finding	Action
Define clear policy on FT	Part A, 8.7 – Policy
Define clear FT Procedures	Part A, 8.7 – Procedures
Define a FT pilot qualification process	Part D – Qualification & Training
Define a list of pilots (EASA/M.A.706)	CAME – FT Chapter
Define clear FT Practices	Part A, 8.7 – Mandatory briefing
Consider HF aspects of FT	Part A, 8,7 – HF aspects during FT
Review Instructions to FT crew	CAME – Flight Test Schedule (FTS)
Define possible FT fleet wise	CAME – FT Requirement
Review & up-to-date risk assessment	F.S.R.B.: FOPH, CAMO PH, QM, SM
Define recurrent training	Part D – FT Recurrent training

caa.co.uk/docs/1455/CheckFlightHandbookIssue2Point2-April2009.pdf

Summary

- Key points to deliver a safe post-M.F.T.
- The requirement to establish documented procedures for F.T.
- The H.F. aspects during post-M.F.T.
- The hazard and risk assessment approach
- Safety aspects that can help the organisation in delivering safer post-M.F.T.

Thank you!

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