Network Manager
nominated by
the European Commission

EUROCONTROL

Best Practices in Safety Investigations

How to write a balanced Just Culture investigation report

Tony Licu
Head of Safety Unit
EUROCONTROL Network Manager Directorate
Castelldefels/Barcelona May 2017

Overview

- Background to Safety-II thinking
- S-I and S-II in a nutshell
- Systemic Thinking and its 10 principles
- S-II in Investigations
- Systemic Occurrence Analysis Methodology

Safety-I and Safety-II

In a nutshell

Safety-I in a nutshell

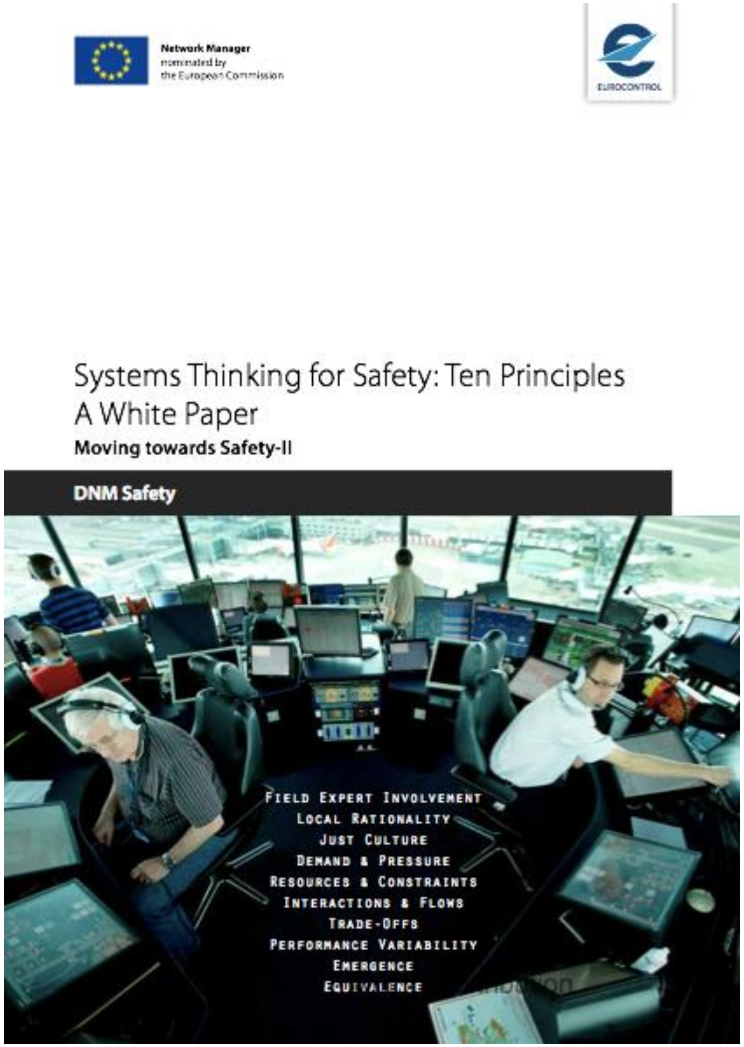
- Definition of safety: As few things as possible go wrong
- Manifestation: Adverse outcomes, ‘unacceptable’ risks
- Mechanism: Causality credo
- Foundation: Bimodality & decomposability
- View of human: Predominantly treated as a liability or hazard
- Safety management principle: Respond to occurrences or unacceptable risks
- Occurrence investigation: Identify causes & contributory factors to adverse outcomes
- Risk assessment: Determine likelihood of adverse outcomes

Safety-II in a nutshell

EUROCONTROL

- Definition of safety: As many things as possible go right
- Manifestation: All possible outcomes, especially typical ones
- Mechanism: Emergence
- Foundation: Performance adjustments & performance variability
- View of human: Resource necessary for system flexibility and resilience
- Safety management principle: Continuously anticipate developments and events
- Occurrence investigation: Understand how things usually go right as a basis for understand how they occasionally go wrong
- Risk assessment: Understand conditions where performance variability can become difficult or impossible to monitor and control

Systems Thinking for Safety



EUROCONTROL

Putting systems thinking in practice

Practical advice structured around 10 Principles

AA2 Systems Thinking for S

Principle 2. L

People do things that
their goals, understan
focus of attention at t

Work needs to be unders
of those doing the work.

Systems Thinking for Safety

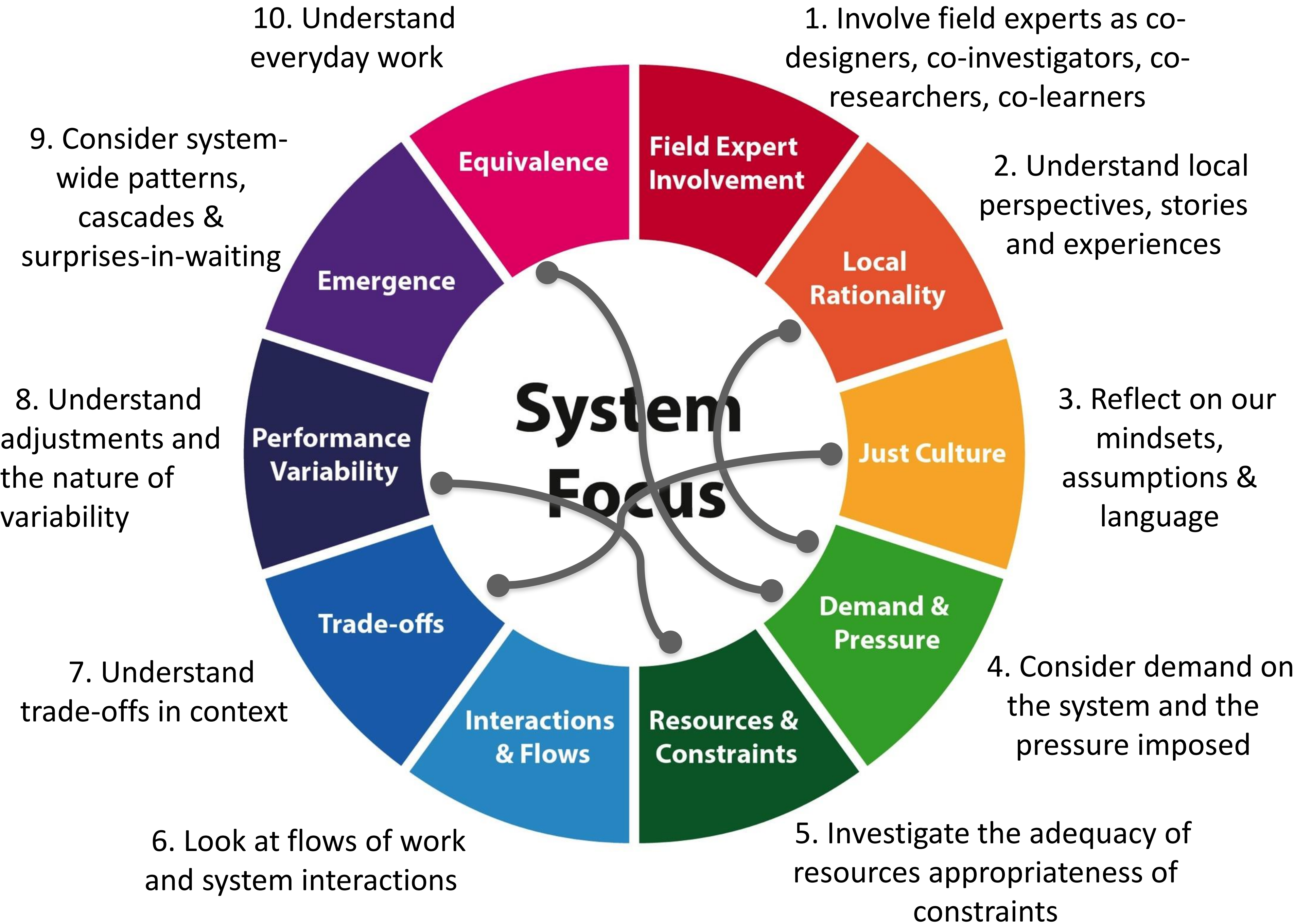
Practical advice

- **Listen to people's stories.** Consider how field experts can best tell their stories from the point of view of how they experienced events at the time. Try to understand the person's situation and world from their point of view, both in terms of the context and their moment-to-moment experience.
- **Understand goals, plans and expectations in context.** Discuss individual goals, plans and expectations, in the context of the flow of work and the system as a whole.
- **Understand knowledge, activities and focus of attention.** Focus on 'knowledge at the time', not your knowledge now. Understand the various activities and focus of attention, at a particular moment and in the general time-frame. Consider how things made sense to those involved, and the system implications.
- **Seek multiple perspectives.** Don't settle for the first explanation; seek alternative perspectives. Discuss different perceptions of events, situations, problems and opportunities, from different field experts and perspectives. Consider the implications of these differential views for the system.

Read more
http://bit.ly/2-LR

Photo: NATS Press Office https://flic.kr/p/cwfK51 CC BY-NC-ND 2.0

Systems Thinking Pri



10. Understand everyday work
1. Involve field experts as co-designers, co-investigators, co-researchers, co-learners
9. Consider system-wide patterns, cascades & surprises-in-waiting
2. Understand local perspectives, stories and experiences
8. Understand adjustments and the nature of variability
3. Reflect on our mindsets, assumptions & language
7. Understand trade-offs in context
4. Consider demand on the system and the pressure imposed
6. Look at flows of work and system interactions
5. Investigate the adequacy of resources appropriateness of constraints
Equivalence
Field Expert Involvement
Emergence
Local Rationality
Performance Variability
Just Culture
Trade-offs
Demand & Pressure
Interactions & Flows
Resources & Constraints
System Focus

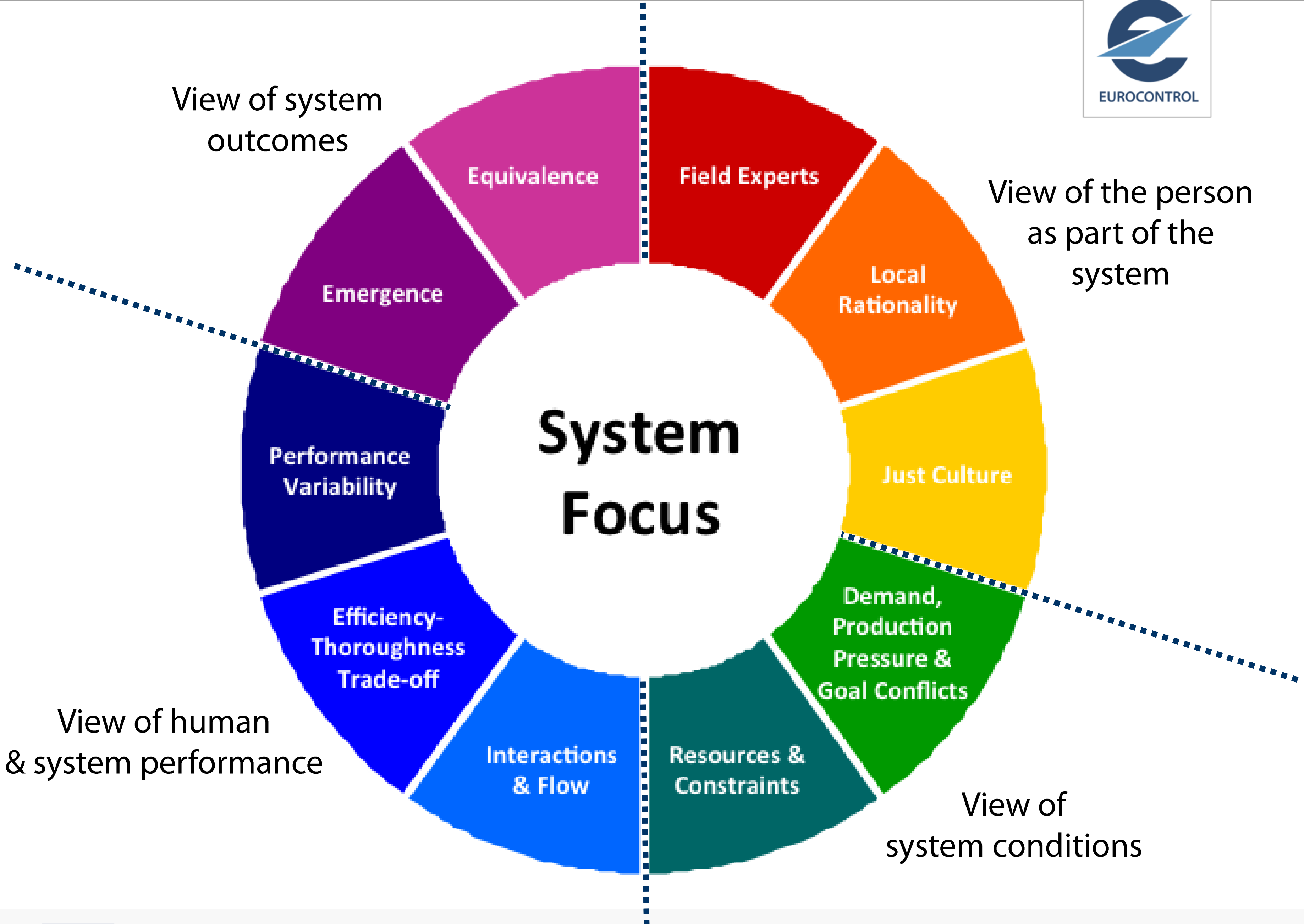
How to find out what goes right…

Safety Investigation

Rationale

- Need to move on from 'human error'
- Reduce fear of considering human performance
- Put human performance in proper system context
- Integrate insights from **systems safety**, **systems human factors**, and **systems thinking**
- Make theory more engaging and memorable
- White Paper available on SKYbrary

http://www.youtube.com/watch?v=CD9YqdWwwdw


View of system outcomes
Equivalence
Field Experts
View of the person as part of the system
Emergence
Local Rationality
System Focus
Performance Variability
Just Culture
Efficiency-Thoroughness Trade-off
Demand, Production Pressure & Goal Conflicts
View of human & system performance
Interactions & Flow
Resources & Constraints
View of system conditions

EUROCONTROL

Enabling co-investigation and co-learning

Flexible tools to encourage communication and creativity

System Safety Learning

Interaction with Equipment

- D-2-1. Working position / console
- D-2-2. Surveillance equipment
- D-2-3. Communication equipment
- D-2-4. Navigation equipment
- D-2-5. Other information display
- D-2-6. Equipment warning device
- D-2-7. Interaction with Mode S
- D-2-8. Interaction with CPDLC
- D-2-9. Interaction with ADS-B

D2 System Safety Learning

EUROCONTROL

Contextual Factors

Interaction with Equipment

Interaction design and usability of the working position and associated equipment such as input devices and output devices. Does not include availability or integrity problems (See "Equipment").

Includes interaction with working position/console, surveillance, communication, navigation, information displays, warnings, Mode S, CPDLC and ADS-B.

Photo: NATS Press Office

The language of investigation

✗ Incorrect decision… Failure to consider side effects

✗ Mis-see… Expectation bias

✗ Misrecall information…Memory capacity overload

✗ Unclear information transmitted… Unclear speech

✗ Unclear procedure

✗ Unreliable equipment

✗ Complacency

✗ Inadequate mentoring

✗ Lack of responsibility

The problem with negative contributory factors

- Apply only to failures (infrequent) in safety occurrences (rare)
- Constant expansion needed as more faults are found
- More categories = fewer data in each category
- Can be seen as blaming
- Do not allow learning about what goes right
- Leads to partial analysis
- Need a focus on **performance variability** of activities, functions & resources

Shifting the language

Neutralising the language of safety investigation

Did the controller fail to detect the information completely?

No detection of visual information

Focuses on the individual & failure.
Hindsight perspective.
Implicitly suggests source of failure.

Does the situation or interaction concern the detection of visual information?

See - detection

Focuses on the situation and context.
Local rationality perspective.
Suggests a starting point for further investigation .

Investigation & Learning Cards

Purpose & Rationale

EUROCONTROL

- Assist training, investigations and other learning activities
- Development ACHIEVED with investigator involvement
- Structured around high-level EUROCONTROL RAT – Risk Analysis/eTOKAI (Tool Kit for ATM Occurrence Investigations) explanatory factors
- Includes 10 principles to help systemic application
- Potential uses:
  - Investigator training
  - Post-discussion/interview/observation summary
  - Analysis and reconstruction
  - Risk assessment
  - Safety refresher training

Produced by EUROCONTROL

EUROCONTROL

System Safety
Investigation & Learning Cards

for understanding safety occurrences and everyday performance

Edition 1

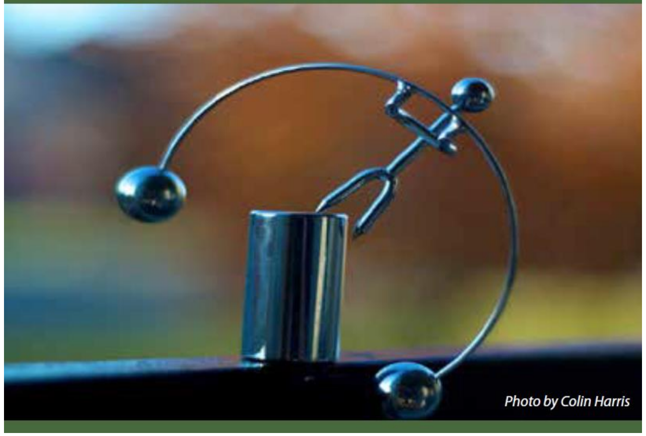


Photo by Colin Harris

0b Safety Culture

EUROCONTROL

Organisation of the Cards

There are several individual cards for each of section of the explanatory factors.

Each card introduces a different issue for analysis, reflection or discussion.

- **Fundamental Principles**
- **Personnel**
- **Interaction with the Environment**
- **Equipment**
- **Contextual Factors**

Cards for each major category within these groups

0h

Fundamental Principles

Principle 9. Efficiency-Thoroughness Trade-Off (ETTO)

People have to balance the thoroughness and efficiency of performance in a complex and uncertain environment

Consider how people balance efficient and thoroughness, from their point of view, and understand the tactics they use to maintain efficiency (e.g. multitasking, recognition) and thoroughness (e.g. checking).

Photo by Haavellla

0e

Fundamental Principles

Principle 6. Demand, Production Pressure & Goal Conflict

Pressures relating to efficiency and capacity have a fundamental effect on performance

Performance needs to be understood in terms of demands, resulting pressures and conflicts between goals of production and protection

Photo by autowitch

Front

A3 Safety Investigation Cards

EUROCONTROL

Personnel

Decision

Judging or projecting the accuracy of spatial or temporal information and forming a decision or plan to achieve an intended outcome

Judgements and decision-making requires continuous adjustments to the context and conditions. Decision making must be considered from the point of the view of the person, including goals, knowledge, understanding of the situation and focus of attention at the time, as well as the context of work.

Photo by Andrew Tarrant

Back

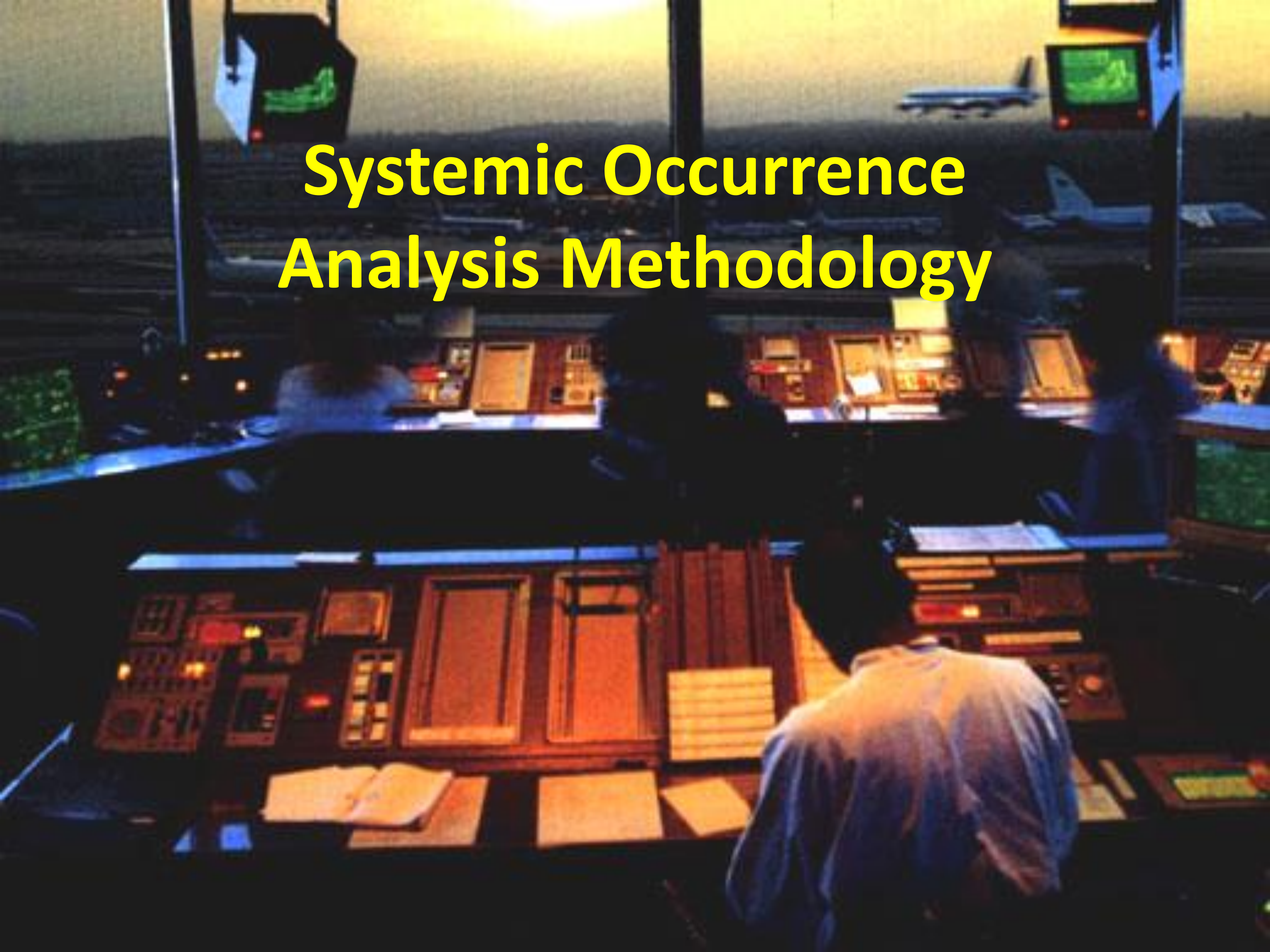
Safety Investigation Cards

A.3. Decision

A3-1. Judge / project
A3-2. Decide / plan ('correctness'/workability)
A3-3. Decide / plan (sufficiency)
A3-4. Decide / plan (timing)
A3-5. Decide / plan (presence of decision/plan)

RAT explanatory factors

Systemic Occurrence Analysis Methodology



SOAM Antecedents

EUROCONTROL

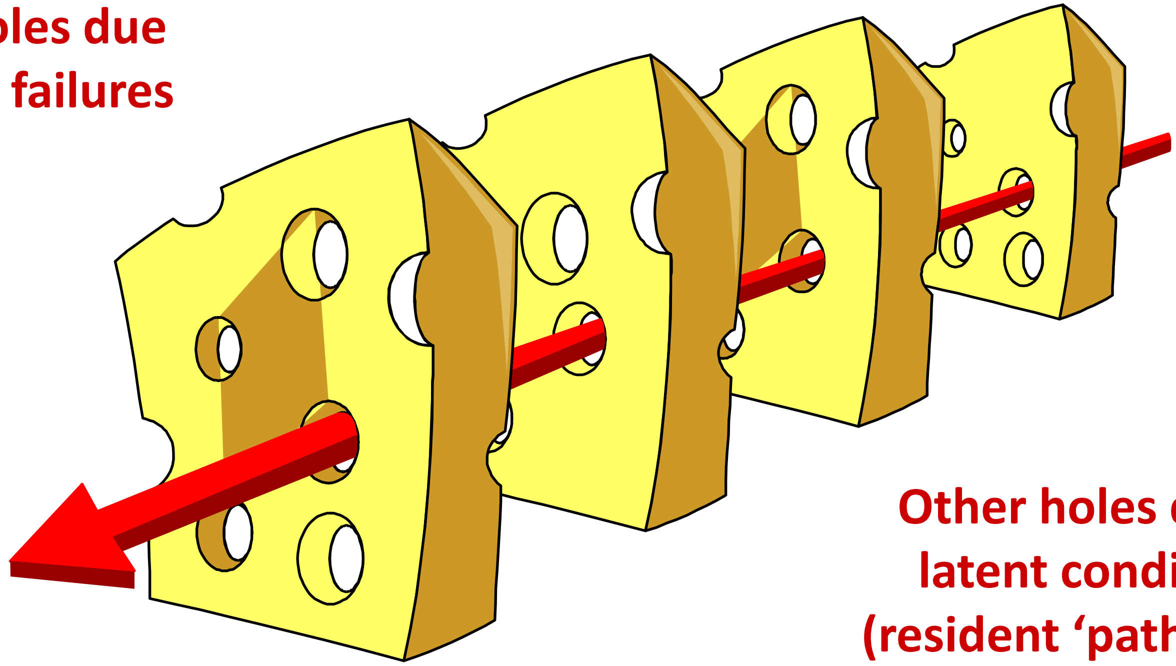
- The Reason Model ~ circa 1990
  - **Developed from Professor James Reason's work on human error and "organisational accidents"**
- Tripod Delta ~ circa 1994
  - **Developed for Shell Petroleum, based on Reason Model**
- ICAM ~ circa 2000
  - **Developed for BHP Billiton, based on Reason Model and Tripod Delta**

How SOAM can help

- A methodology that includes structured processes to:
  - identify and classify a range of contributing factors
  - sort out irrelevant, non-contributing facts
  - move from a focus on human error/s to identify systemic causes ~ support for 'Just Culture'
  - analyse simple events through to high severity incidents and accidents
  - clearly link recommendations to the facts of the analysis

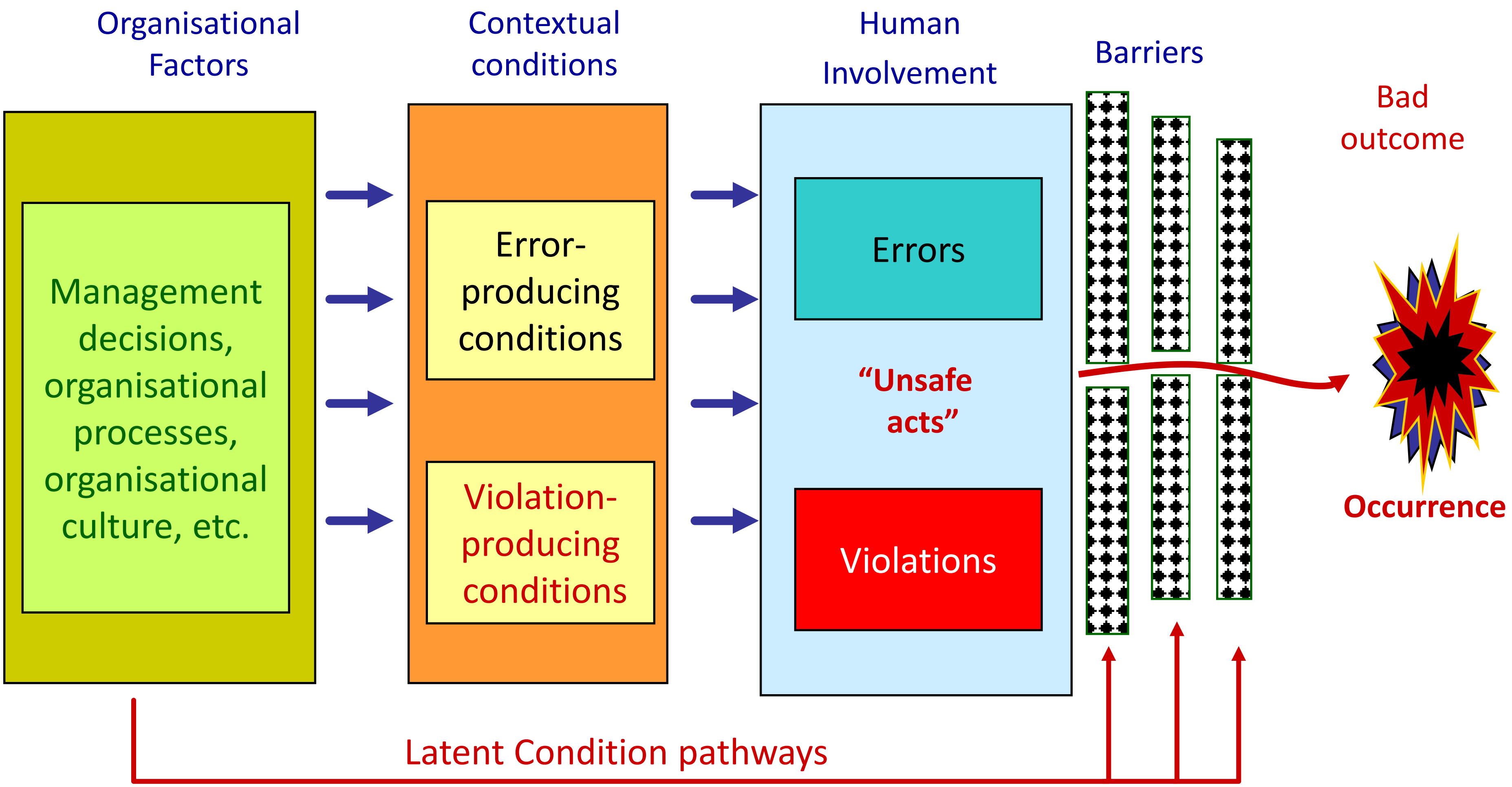
The "Swiss Cheese" model of accident causation

Resilient systems have successive layers of defences, barriers, & safeguards



(After Reason, 2000)

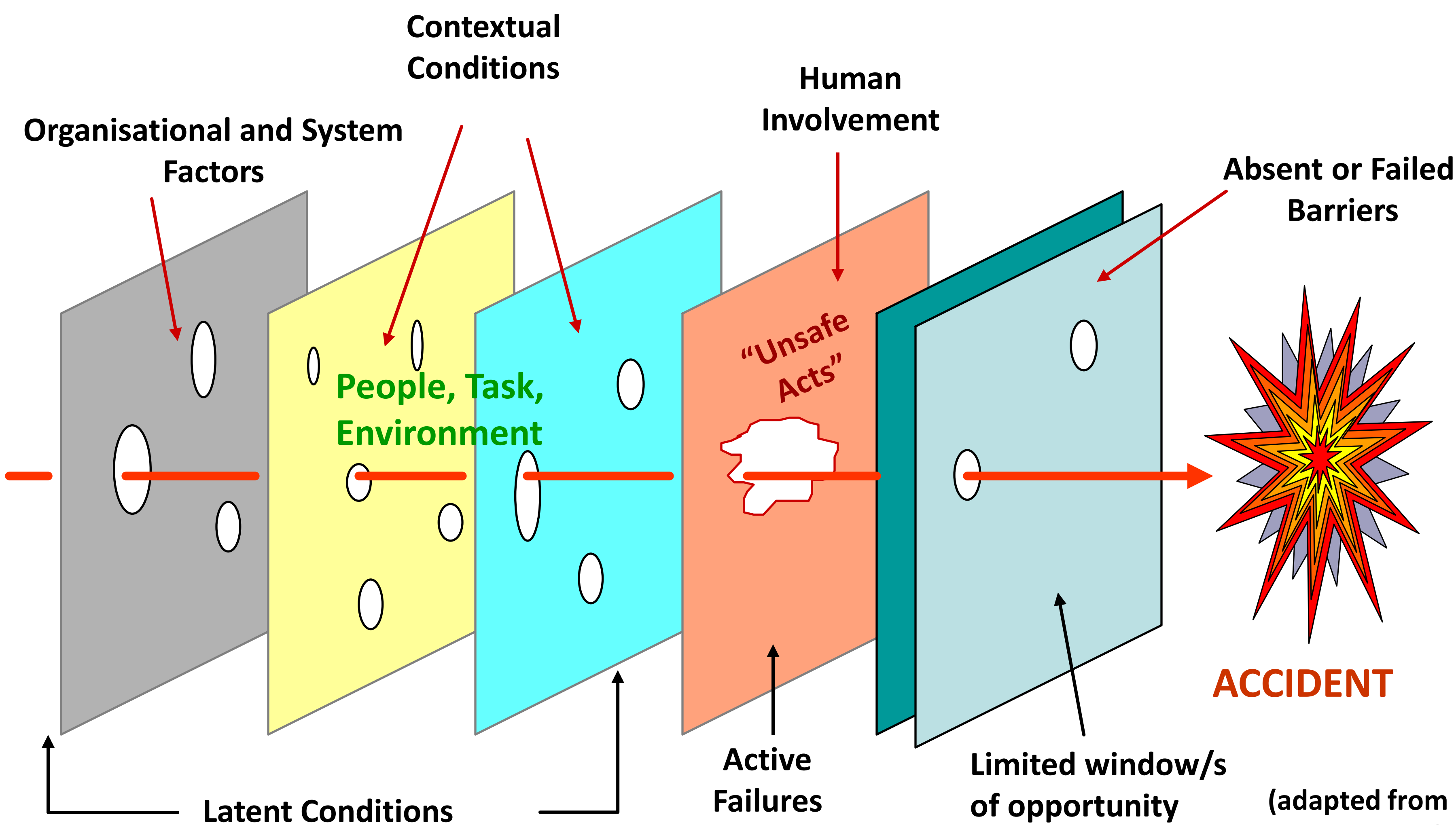
Modelling Organisational Occurrences



(after Reason, 1991)

The Reason Model

Organisational Error Chain



(adapted from Reason, 1990)

SOAM Worked Example

Accident Summary

EUROCONTROL

On 23 September 1999, at about 2247 local time, a Boeing 747-438 aircraft overran runway 21 Left (21L) while landing at Bangkok International Airport, Thailand.

Accident Summary

The overrun occurred after the aircraft landed long and aquaplaned on a runway which was affected by water following very heavy rain.

The aircraft sustained substantial damage during the overrun. None of the three flight crew, 16 cabin crew or 391 passengers reported any serious injuries.

SOAM analysis key steps

Review the Facts

↓

Identify the Absent or Failed Barriers

↓

Identify the Human Involvement

↓

Identify the Contextual Conditions

↓

Identify the Organisational Factors

↓

Validate the OFs against the Occurrence

Raw Data Collection

AC1 overruns runway at Bangkok after landing long, recent heavy rainfall, and water on runway.

PEOPLE	HARDWARE	SOFTWARE	ENVIRONMENT	ORGANISATION
Crew employed flaps 25/ idle reverse landing configuration	Normal practice to use flaps 25/idle reverse	Revised approach/ landing procedure introduced in 1996: flaps 25, idle reverse thrust	Very heavy rainfall, runway surface affected by water	Introduction of new landing procedure poor
FO did not fly the aircraft accurately during final approach	Importance of reverse thrust as stopping force on water-affected runways not known	No appropriately documented info, procedures regarding operations on water-affected runways	Reduced visibility & distraction: rain and windscreen wipers	No formal risk assessment conducted when changed landing procedure researched
Captain cancelled go-around decision by retarding thrust levers	Most pilots not fully aware about 'aquaplaning'	No policies, procedures on duty or work limits for pilots with flying & non-flying duties	Qantas B747s generally operated in good weather & to aerodromes with long, good quality runways	Cost-benefit analysis of new landing procedure was biased
FO awake for 19 hours at the time of the accident	Confusion after thrust levers retarded, in high workload situation	Documents unclear (eg., key terms not well defined)	Bangkok runway was resurfaced in 1991	Contaminated runway issues not covered in recent years during crew endorsement, promotional or recurrent training
Captain did not order a go-around earlier	Boeing advised that if idle reverse technique is adopted, it should be the exception rather than the rule	Most pilots disagreed they had adequate training on landing on contaminated runways	High workload situation, distraction or inexperience	"Landing on Slippery Runways" (Boeing doc) not distributed in Qantas since 1977
Recent crew experience using full reverse thrust lacking	Absence of reverse thrust during landing roll not noticed, not used	No policies or procedures for maintenance of recency for management pilots	Partial loss of external visual reference due to heavy rain	No formal review of new procedures after 'trial' period
Crew did not use an adequate risk mgt strategy for approach and landing				
Captain awake 21 hours at time of accident				
Captain & FO quite low levels of flying prior 30 days				

Gather data relevant to the occurrence

Raw Data Refinement

AC1 overruns runway at Bangkok after landing long, recent heavy rainfall, and water on runway.

PEOPLE	HARDWARE	SOFTWARE	ENVIRONMENT	ORGANISATION
Crew employed flaps 25/ idle reverse landing configuration	Normal practice to use flaps 25/idle reverse	Revised approach/ landing procedure introduced in 1996: flaps 25, idle reverse thrust	Very heavy rainfall, runway surface affected by water	Introduction of new landing procedure poor
FO did not fly the aircraft accurately during final approach	Importance of reverse thrust as stopping force on water-affected runways not known	No appropriately documented info, procedures regarding operations on water-affected runways	Reduced visibility & distraction: rain and windscreen wipers	No formal risk assessment conducted when changed landing procedure researched
Captain cancelled go-around decision by retarding thrust levers	Most pilots not fully aware about 'aquaplaning'	No policies, procedures on duty or work limits for pilots with flying & non-flying duties	Qantas B747s generally operated in good weather & to aerodromes with long, good quality runways	Cost-benefit analysis of new landing procedure was biased
FO awake for 19 hours at the time of the accident	Confusion after thrust levers retarded, in high workload situation	Documents unclear (eg., key terms not well defined)	Bangkok runway was resurfaced in 1991	Contaminated runway issues not covered in recent years during crew endorsement, promotional or recurrent training
Captain did not order a go-around earlier	Boeing advised that if idle reverse technique is adopted, it should be the exception rather than the rule	Most pilots disagreed they had adequate training on landing on contaminated runways	High workload situation, distraction or inexperience	"Landing on Slippery Runways" (Boeing doc) not distributed in Qantas since 1977
Recent crew experience using full reverse thrust lacking	Absence of reverse thrust during landing roll not noticed, not used	No policies or procedures for maintenance of recency for management pilots	Partial loss of external visual reference due to heavy rain	No formal review of new procedures after 'trial' period
Crew did not use an adequate risk mgt strategy for approach and landing				
Captain awake 21 hours at time of accident				
Captain & FO quite low levels of flying prior 30 days				

Sort out the non-contributing facts of the investigation

Raw Data Refinement

AC1 overruns runway at Bangkok after landing long, recent heavy rainfall, and water on runway.

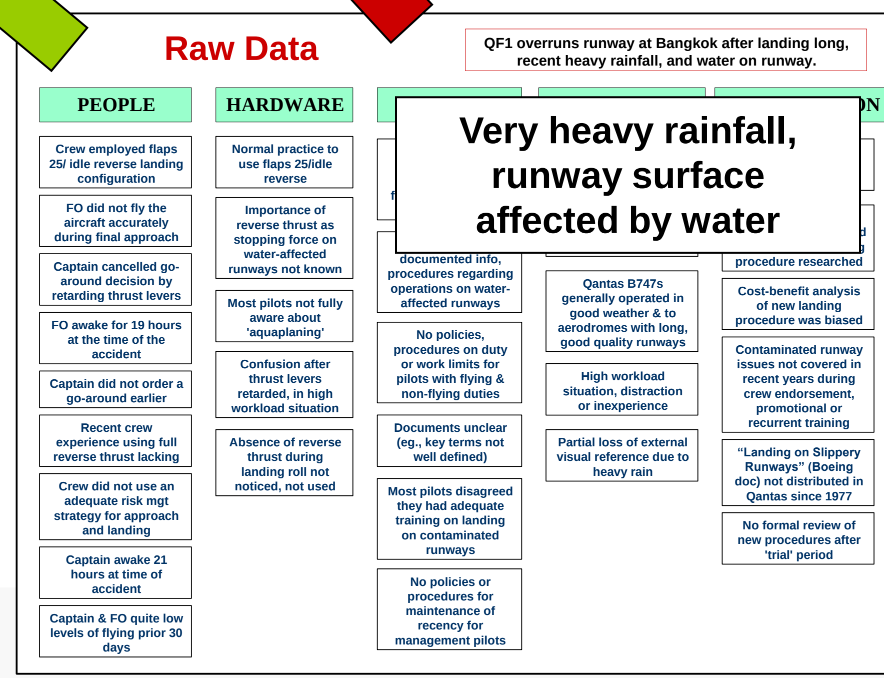
PEOPLE	HARDWARE	SOFTWARE	ENVIRONMENT	ORGANISATION
Crew employed flaps 25/ idle reverse landing configuration	Normal practice to use flaps 25/idle reverse	Revised approach/ landing procedure introduced in 1996: flaps 25, idle reverse thrust	Very heavy rainfall, runway surface affected by water	Introduction of new landing procedure poor
FO did not fly the aircraft accurately during final approach	Importance of reverse thrust as stopping force on water-affected runways not known	No appropriately documented info, procedures regarding operations on water-affected runways	Reduced visibility & distraction: rain and windscreen wipers	No formal risk assessment conducted when changed landing procedure researched
Captain cancelled go-around decision by retarding thrust levers	Most pilots not fully aware about 'aquaplaning'	No policies, procedures on duty or work limits for pilots with flying & non-flying duties	Qantas B747s generally operated in good weather & to aerodromes with long, good quality runways	Cost-benefit analysis of new landing procedure was biased
FO awake for 19 hours at the time of the accident	Confusion after thrust levers retarded, in high workload situation	Documents unclear (eg., key terms not well defined)	High workload situation, distraction or inexperience	Contaminated runway issues not covered in recent years during crew endorsement, promotional or recurrent training
Captain did not order a go-around earlier	Absence of reverse thrust during landing roll not noticed, not used	Most pilots disagreed they had adequate training on landing on contaminated runways	Partial loss of external visual reference due to heavy rain	"Landing on Slippery Runways" (Boeing doc) not distributed in Qantas since 1977
Recent crew experience using full reverse thrust lacking		No policies or procedures for maintenance of recency for management pilots		No formal review of new procedures after 'trial' period
Crew did not use an adequate risk mgt strategy for approach and landing				
Captain awake 21 hours at time of accident				
Captain & FO quite low levels of flying prior 30 days				

Use the remaining factors to build the Analysis chart

Building the Analysis Chart

ORGANISATIONAL FACTORS	CONTEXTUAL CONDITIONS	HUMAN INVOLVEMENT	ABSENT OR FAILED BARRIERS	ACCIDENT
	Very heavy rainfall, runway surface affected by water	Very heavy rainfall, runway surface affected by water	Very heavy rainfall, runway surface affected by water	

✓ ? ?



Contextual Conditions

EUROCONTROL

- Describe the context of the event ~ the conditions existing immediately prior to, or at the time of the accident
- Check Question:

  "Does the item describe an aspect of the workplace, local organisational climate, or a person's attitudes, personality, performance limitations, physiological or emotional state that helps explain their actions?"

Human Involvement

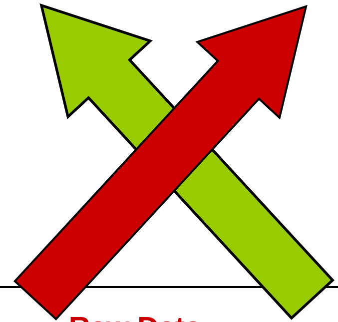
- Describe the errors or violations (actions or omissions) by operators at the scene which "triggered" the accident

- Check Question:

  "Does the item describe an action or non-action (error or violation) that immediately contributed to the occurrence?"

Building the Analysis Chart

ORGANISATIONAL FACTORS	CONTEXTUAL CONDITIONS	HUMAN INVOLVEMENT	ABSENT OR FAILED BARRIERS	ACCIDENT
	Very heavy rainfall, runway surface affected by water	Crew employed flaps 25/ idle reverse landing configuration	Crew employed flaps 25/ idle reverse landing configuration	



Raw Data

QF1 overruns runway at Bangkok after landing long, recent heavy rainfall, and water on runway.

Crew employed flaps 25/ idle reverse landing configuration

		SOFTWARE	ENVIRONMENT	ORGANISATION
during final approach	stopping force on water-affected runways not known	Revised approach/ landing procedure introduced in 1996: flaps 25, idle reverse thrust	Reduced visibility & distraction: rain and windscreen wipers	Introduction of new landing procedure poor
Captain cancelled go-around decision by retarding thrust levers	Most pilots not fully aware about 'aquaplaning'	No appropriately documented info, procedures regarding operations on water-affected runways	Qantas B747s generally operated in good weather & to aerodromes with long, good quality runways	No formal risk assessment conducted when changed landing procedure researched
FO awake for 19 hours at the time of the accident	Confusion after thrust levers retarded, in high workload situation	No policies, procedures on duty or work limits for pilots with flying & non-flying duties	High workload situation, distraction or inexperience	Cost-benefit analysis of new landing procedure was biased
Captain did not order a go-around earlier	Absence of reverse thrust during landing roll not noticed, not used	Documents unclear (eg., key terms not well defined)	Partial loss of external visual reference due to heavy rain	Contaminated runway issues not covered in recent years during crew endorsement, promotional or recurrent training
Recent crew experience using full reverse thrust lacking		Most pilots disagreed they had adequate training on landing on contaminated runways		“Landing on Slippery Runways” (Boeing doc) not distributed in Qantas since 1977
Crew did not use an adequate risk mgt strategy for approach and landing		No policies or procedures for maintenance of recency for management pilots		No formal review of new procedures after 'trial' period
Captain awake 21 hours at time of accident				
Captain & FO quite low levels of flying prior 30 days				

Absent or Failed Barriers

- Describe the “last minute” measures which failed or were missing, and therefore did not prevent the accident

- Check Question:

  “Does the item describe a work procedure, aspect of human awareness, physical obstacle, warning or control system, or protection measure designed to prevent an occurrence or lessen its consequences?”

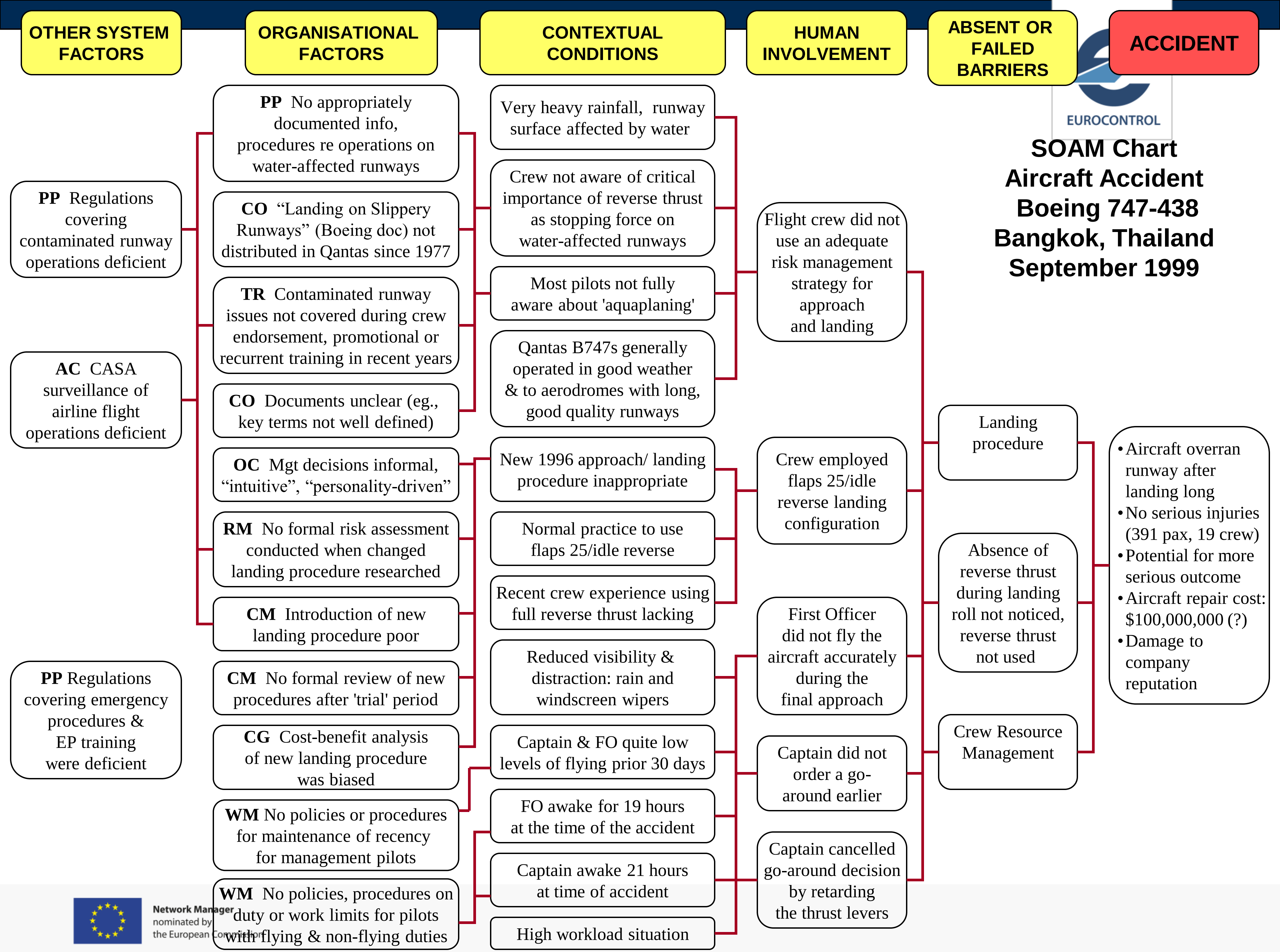
Organisational Factors

EUROCONTROL

- Describe the organisational and system factors (failures) which created, or allowed, the prevailing contextual conditions

- Check Question:

  "Does the item describe an aspect of an organisation's culture, systems, processes or decision-making that existed before the occurrence and which resulted in the contextual conditions or allowed those conditions to continue?"

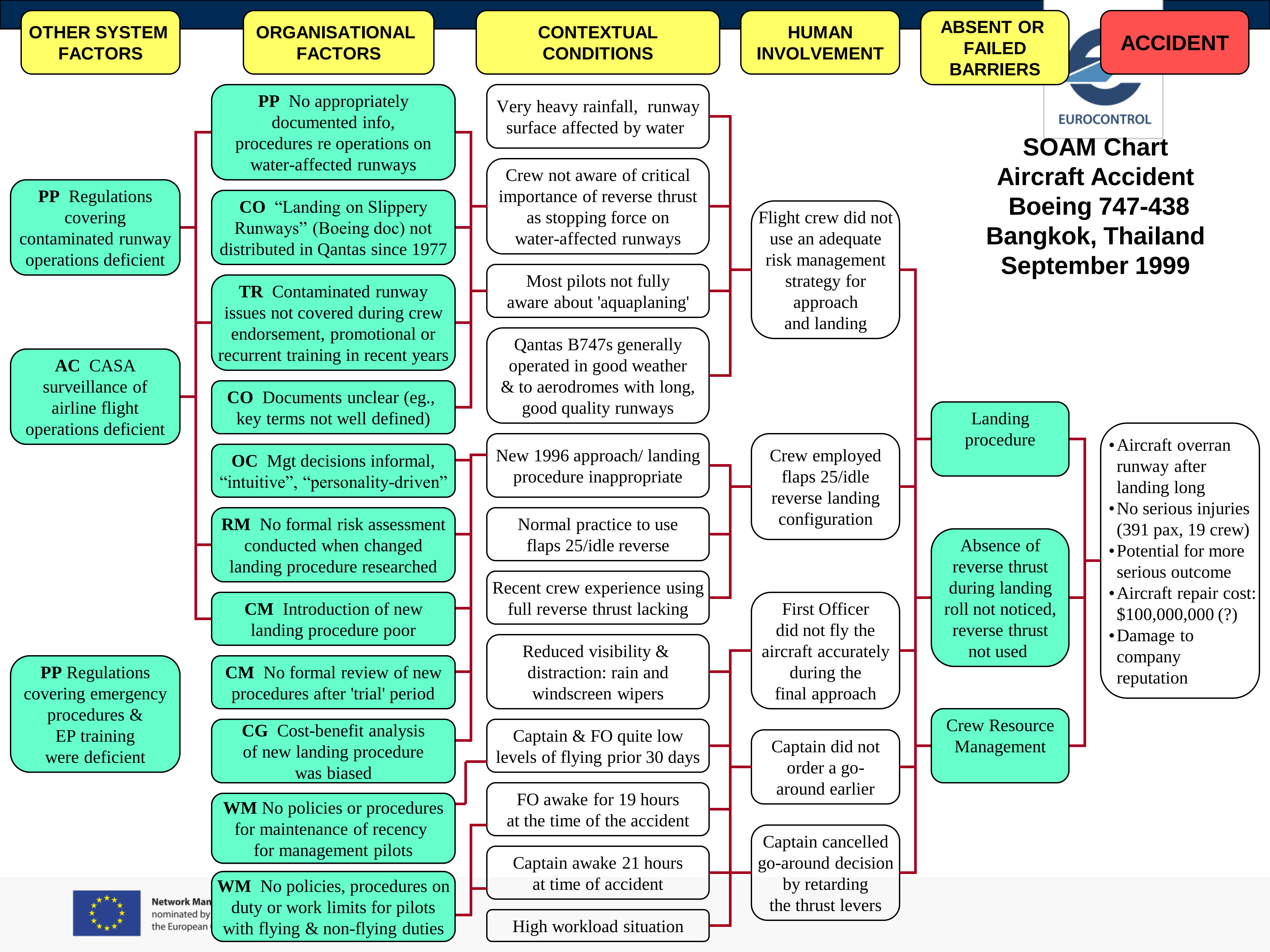

OTHER SYSTEM FACTORS
ORGANISATIONAL FACTORS
CONTEXTUAL CONDITIONS
HUMAN INVOLVEMENT
ABSENT OR FAILED BARRIERS
ACCIDENT
EUROCONTROL
SOAM Chart
Aircraft Accident
Boeing 747-438
Bangkok, Thailand
September 1999
PP Regulations covering contaminated runway operations deficient
AC CASA surveillance of airline flight operations deficient
PP Regulations covering emergency procedures & EP training were deficient
PP No appropriately documented info, procedures re operations on water-affected runways
CO "Landing on Slippery Runways" (Boeing doc) not distributed in Qantas since 1977
TR Contaminated runway issues not covered during crew endorsement, promotional or recurrent training in recent years
CO Documents unclear (eg., key terms not well defined)
OC Mgt decisions informal, "intuitive", "personality-driven"
RM No formal risk assessment conducted when changed landing procedure researched
CM Introduction of new landing procedure poor
CM No formal review of new procedures after 'trial' period
CG Cost-benefit analysis of new landing procedure was biased
WM No policies or procedures for maintenance of recency for management pilots
WM No policies, procedures on duty or work limits for pilots with flying & non-flying duties
Very heavy rainfall, runway surface affected by water
Crew not aware of critical importance of reverse thrust as stopping force on water-affected runways
Most pilots not fully aware about 'aquaplaning'
Qantas B747s generally operated in good weather & to aerodromes with long, good quality runways
New 1996 approach/ landing procedure inappropriate
Normal practice to use flaps 25/idle reverse
Recent crew experience using full reverse thrust lacking
Reduced visibility & distraction: rain and windscreen wipers
Captain & FO quite low levels of flying prior 30 days
FO awake for 19 hours at the time of the accident
Captain awake 21 hours at time of accident
High workload situation
Flight crew did not use an adequate risk management strategy for approach and landing
Crew employed flaps 25/idle reverse landing configuration
First Officer did not fly the aircraft accurately during the final approach
Captain did not order a go-around earlier
Captain cancelled go-around decision by retarding the thrust levers
Landing procedure
Absence of reverse thrust during landing roll not noticed, reverse thrust not used
Crew Resource Management
• Aircraft overran runway after landing long
• No serious injuries (391 pax, 19 crew)
• Potential for more serious outcome
• Aircraft repair cost: $100,000,000 (?)
• Damage to company reputation
Network Manager nominated by the European Commission

Recommendations

- Provide recommendations that will prevent recurrence of this scenario
- Recommendations should be directed to the responsible position, and must address all identified:

1 Absent or Failed Barriers

2 Organisational Factors

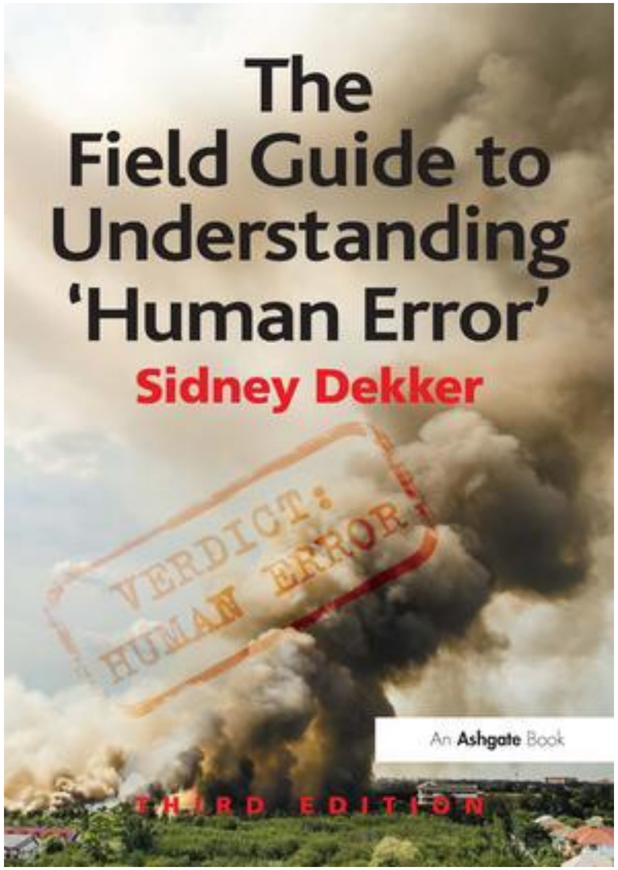

OTHER SYSTEM FACTORS
ORGANISATIONAL FACTORS
CONTEXTUAL CONDITIONS
HUMAN INVOLVEMENT
ABSENT OR FAILED BARRIERS
ACCIDENT
EUROCONTROL
SOAM Chart
Aircraft Accident
Boeing 747-438
Bangkok, Thailand
September 1999
PP Regulations covering contaminated runway operations deficient
AC CASA surveillance of airline flight operations deficient
PP Regulations covering emergency procedures & EP training were deficient
PP No appropriately documented info, procedures re operations on water-affected runways
CO "Landing on Slippery Runways" (Boeing doc) not distributed in Qantas since 1977
TR Contaminated runway issues not covered during crew endorsement, promotional or recurrent training in recent years
CO Documents unclear (eg., key terms not well defined)
OC Mgt decisions informal, "intuitive", "personality-driven"
RM No formal risk assessment conducted when changed landing procedure researched
CM Introduction of new landing procedure poor
CM No formal review of new procedures after 'trial' period
CG Cost-benefit analysis of new landing procedure was biased
WM No policies or procedures for maintenance of recency for management pilots
WM No policies, procedures on duty or work limits for pilots with flying & non-flying duties
Very heavy rainfall, runway surface affected by water
Crew not aware of critical importance of reverse thrust as stopping force on water-affected runways
Most pilots not fully aware about 'aquaplaning'
Qantas B747s generally operated in good weather & to aerodromes with long, good quality runways
New 1996 approach/ landing procedure inappropriate
Normal practice to use flaps 25/idle reverse
Recent crew experience using full reverse thrust lacking
Reduced visibility & distraction: rain and windscreen wipers
Captain & FO quite low levels of flying prior 30 days
FO awake for 19 hours at the time of the accident
Captain awake 21 hours at time of accident
High workload situation
Flight crew did not use an adequate risk management strategy for approach and landing
Crew employed flaps 25/idle reverse landing configuration
First Officer did not fly the aircraft accurately during the final approach
Captain did not order a go-around earlier
Captain cancelled go-around decision by retarding the thrust levers
Landing procedure
Absence of reverse thrust during landing roll not noticed, reverse thrust not used
Crew Resource Management
• Aircraft overran runway after landing long
• No serious injuries (391 pax, 19 crew)
• Potential for more serious outcome
• Aircraft repair cost: $100,000,000 (?)
• Damage to company reputation
Network Man
nominated by
the European

And finally a new technique in the making…

SAT – Situation Analysis Toolkit

SAT in conjunction with *The Field Guide to Understanding "Human Error"*

- Step 1 – Getting HF Data
- Step 2 – Building a Timeline
- Step 3 - Leaving a trace
- Step 4 – Constructing influences and interactions
- Step 5 – making recommendations



Thanks for listening. Any questions?