

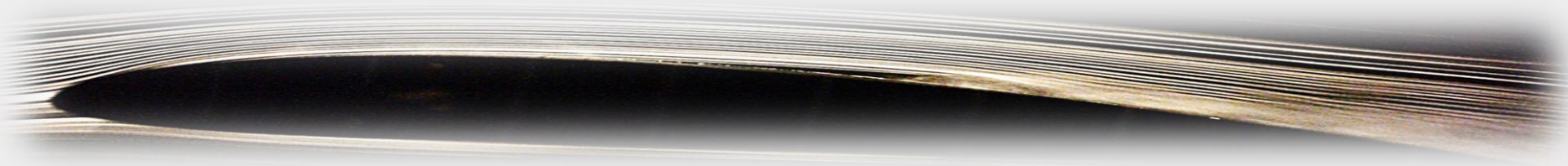


Integrating Human Factors with Safety Management Systems

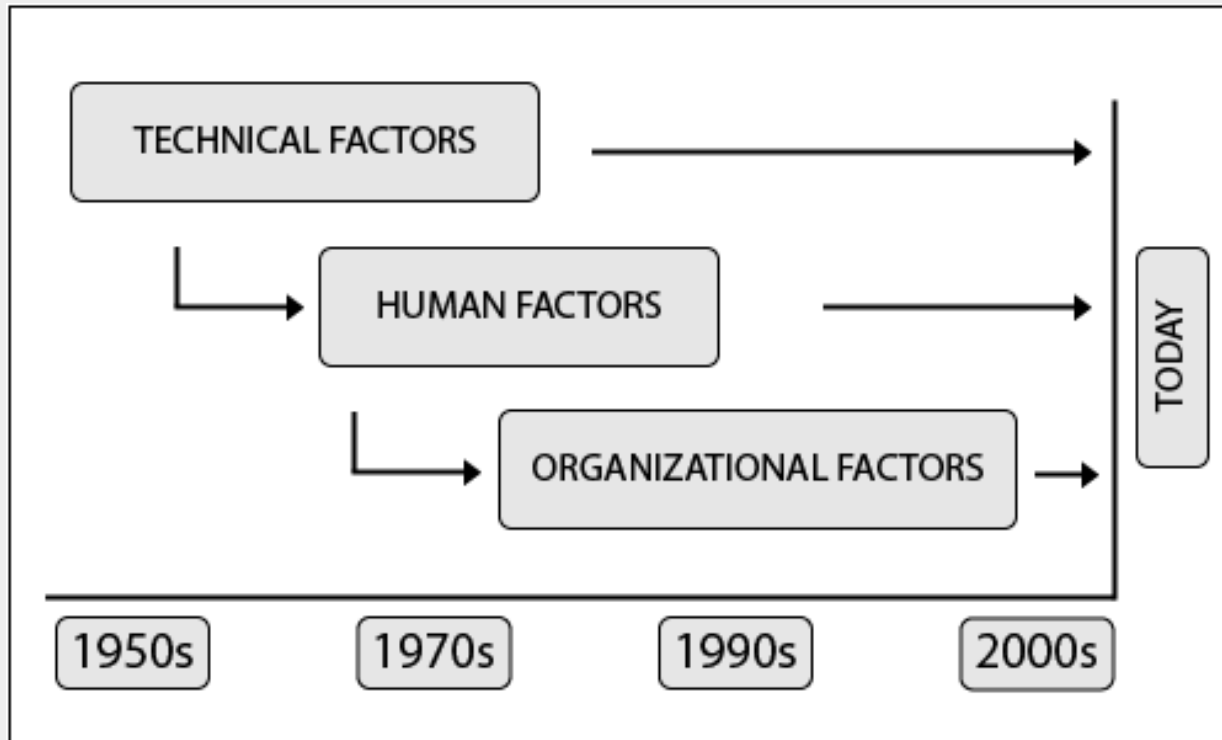


Premise

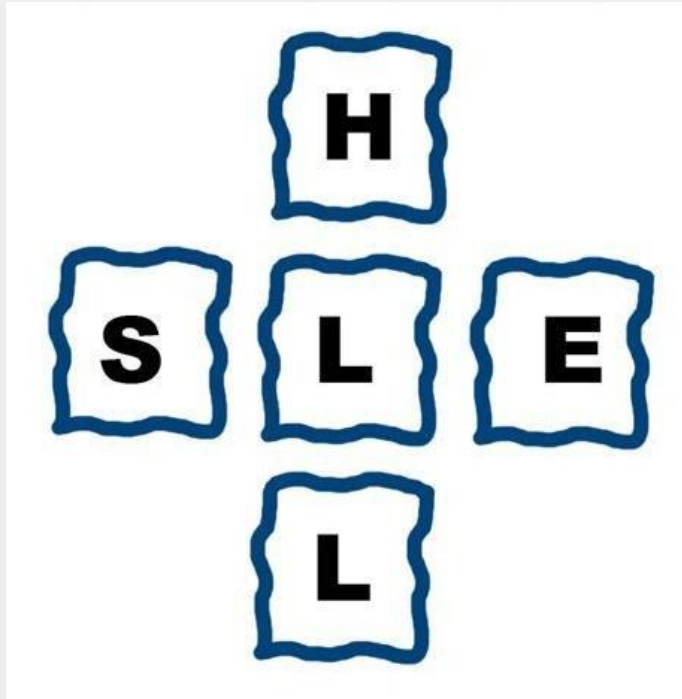
- Considerable advancements have been made in aviation HF and SMS, but the full benefits of these safety initiatives will only be realised if operators and regulators take an integrated approach
- People who are critical to the success of any system or process should have input into its design and implementation



Evolution



Connection



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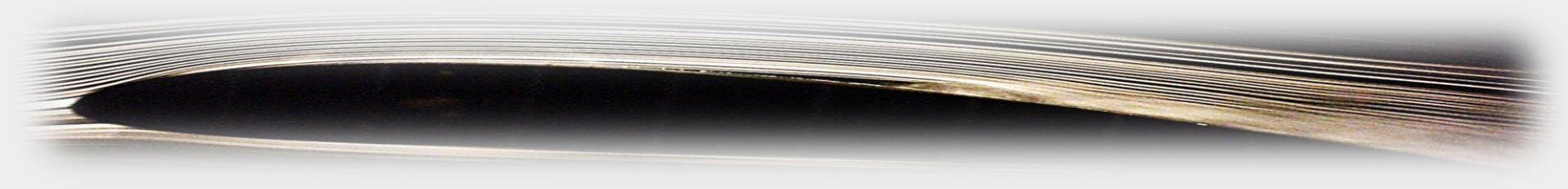


Problem

Factors in Understanding and Adhering to SOPs	Percentage of Events
Omission of action or inappropriate action	72%
Nonadherence to criteria for stabilized approach	66%
Inadequate crew coordination, cross-check and backup	63%
Insufficient horizontal or vertical situational awareness	52%
Inadequate or insufficient understanding of prevailing conditions	48%
Slow or delayed action	45%
Deliberate nonadherence to procedures	40%
Incorrect or incomplete pilot/controller communication	33%
Ineffective interaction with automation	20%
Absence of go-around when required	17%

Table 1: Causal Factors Involving SOPs in Approach and Landing Accidents (Flight Safety Foundation 1998-1999)

Practical drift

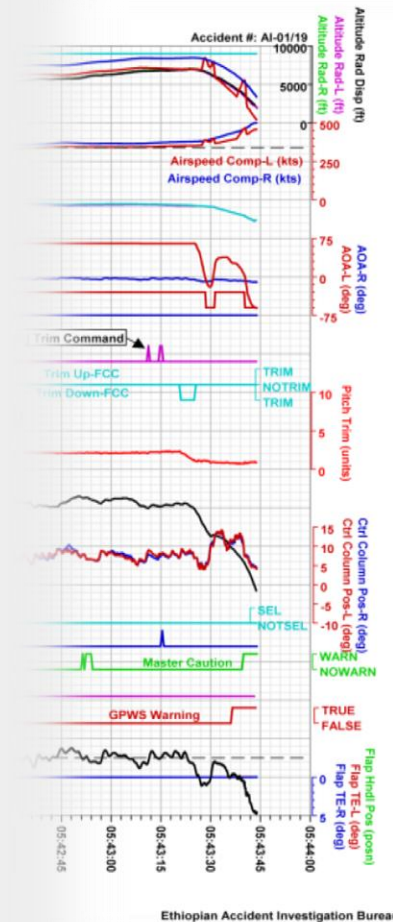


Problem



Ethiopian Airlines Flight 302, B737-8 MAX
157 Fatalities
Accident Investigation Preliminary Report

Reliance on single defence (human)
Understanding context



Viewpoint



TCCA validation of B737 MAX return to service:

Assess the appropriateness of human factors considerations, including crew workload based on crew of 'average piloting skills' and capability to execute procedures with resulting failure considerations



Insight



Video: Captain Sullenberger's presentation to US Congressional Hearing regarding Boeing 737 MAX accidents. *"We must consider all the human factors of these accidents, and how system design determines how many, and what kinds of, errors will be made and how consequential they will be."*

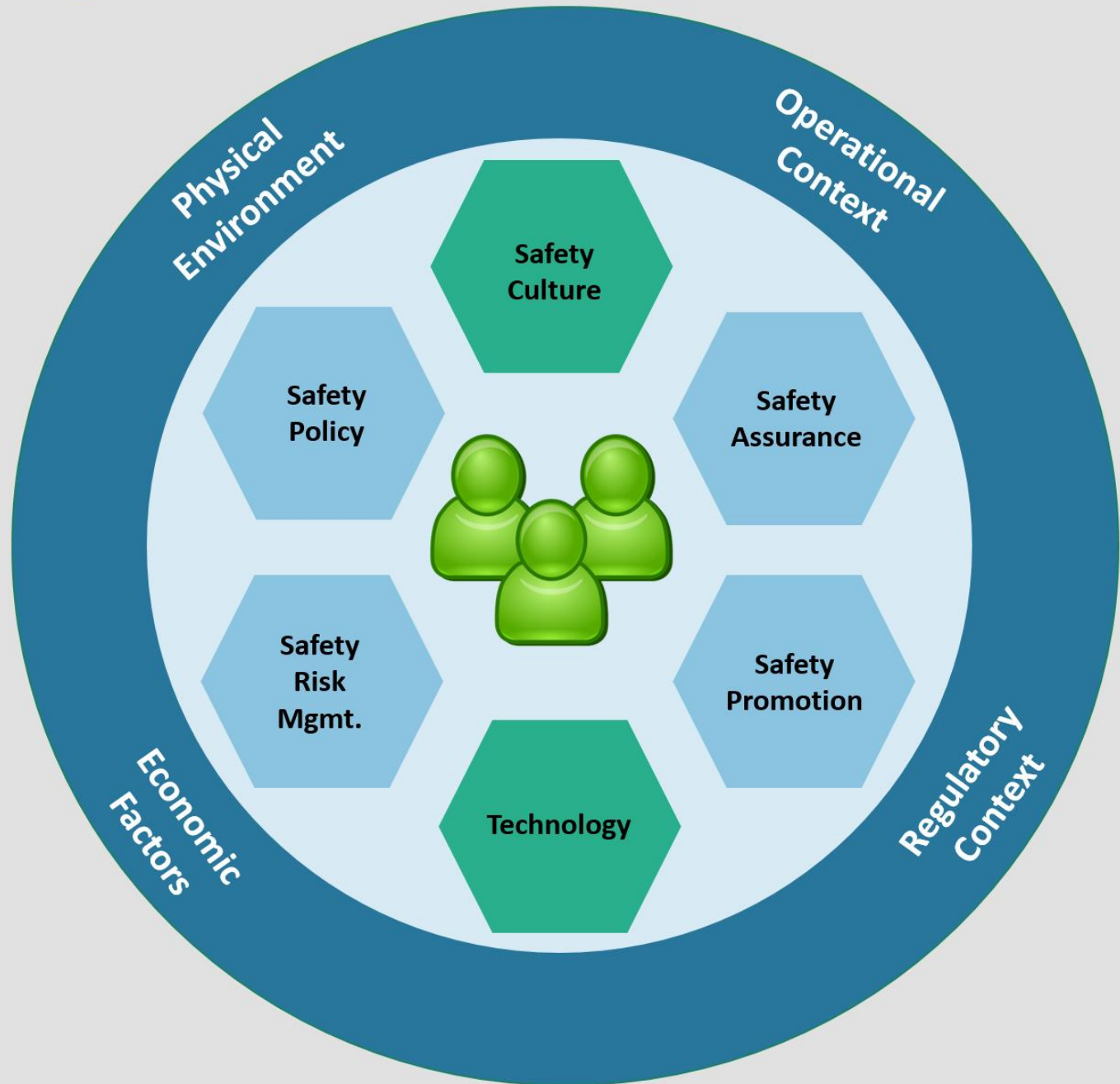


Limits of SMS (without HF)

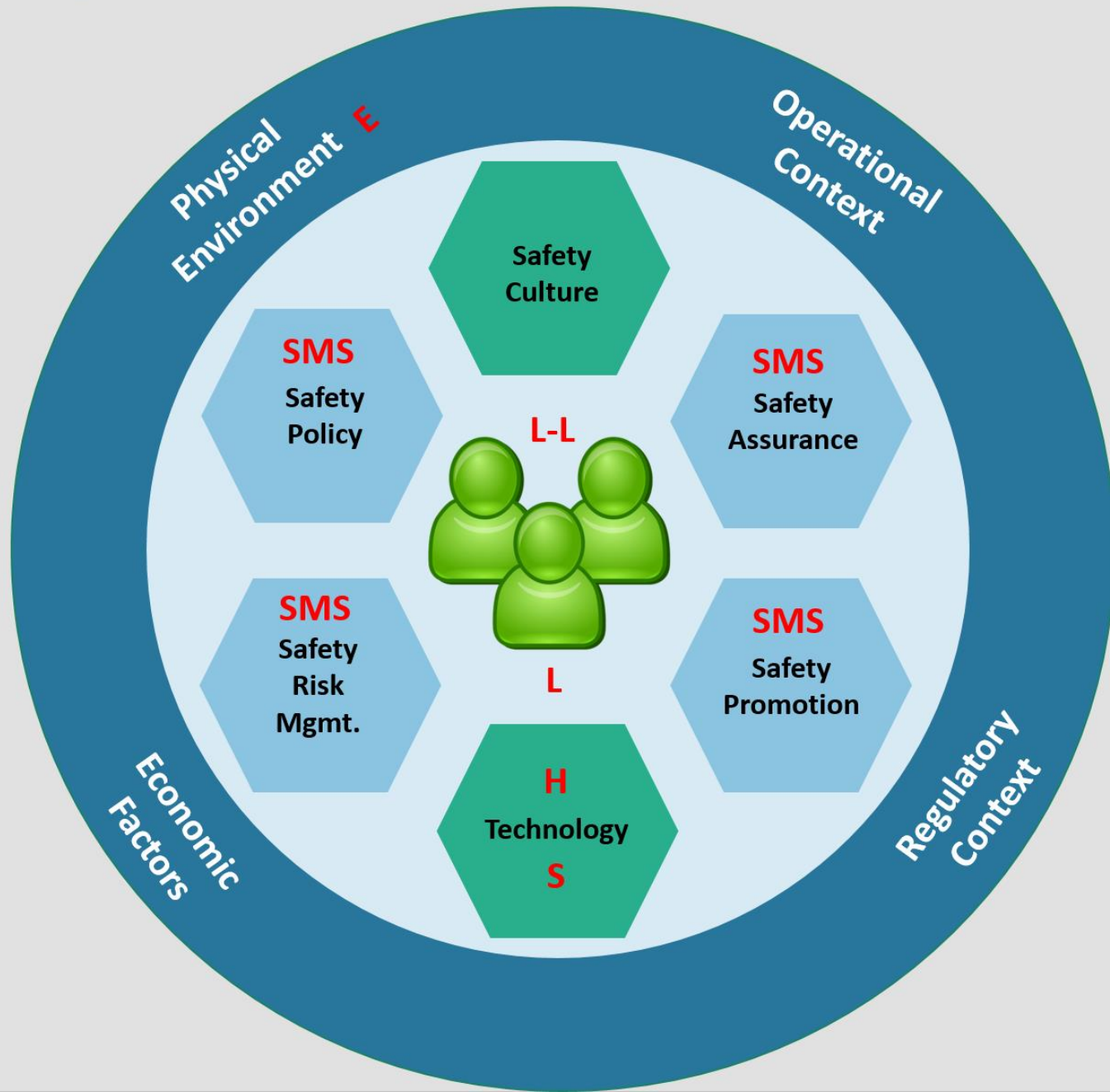
- SMS cannot plan for, control, and defend against all potential error-prone situations
- SMS processes/policies/procedures are not easily adaptable to variations in the operational environment
- Many employees work without direct supervision
- 90% of organisational knowledge is tacit in nature: it is contained in the minds and experience of its employees. Suppiah, Sandhu, (2015)
- Systems serve humans, not humans serve systems



A people-centred approach

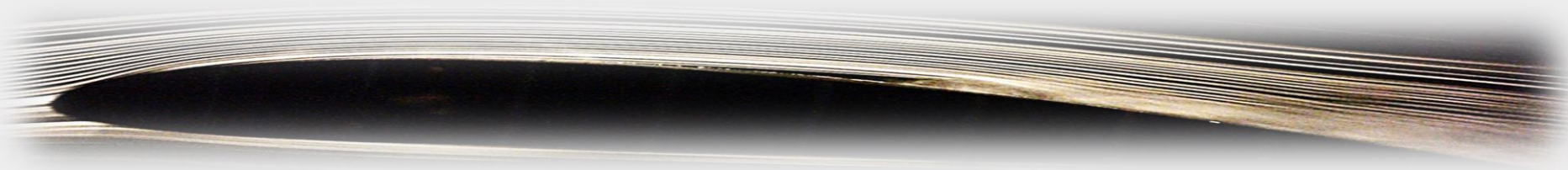


A people-centred approach



A people-centred approach

- Technology
- Management systems
- Process and procedure
- Job and task design
- Training and competency
- Information
- Risk management
- Culture



Technology

- Focus on 'capability' rather than 'product' when determining needs
- Designing, where possible, systems and equipment to be tolerable of human error
- Integrating ergonomics/HMI when designing or modifying systems
- Develop automation policies and related procedures with the above in mind



Management systems

SMS

- Safety leadership - selection and appointment of safety critical personnel
- Allocation of sufficient resources
- Involve HF subject matter experts
- Consider HF when designing/implementing:
 - Change management
 - Risk management
 - Safety reporting
 - Safety investigation (HFACS)
 - Training
 - Performance monitoring



Process and procedure

- Involve employees - value their input
- Understand the operational context
- Communicate the 'why'
- Assess type of training required
- Periodic reassessments
- Understand and manage drift
- Provide information and feedback



Rules

NZ Civil Aviation Rules for air transport operations

121.77 Flight check system

(a) A holder of an air operator certificate must ensure that flight crew members have available for use a flight check system that includes—

- (1) instructions and guidelines for the safe and efficient management of the flight crew compartment; and
- (2) methods used to conduct the flight safely.

(b) The certificate holder must ensure that the system enables safe real-time decision making and aeroplane management by conforming with the principles—

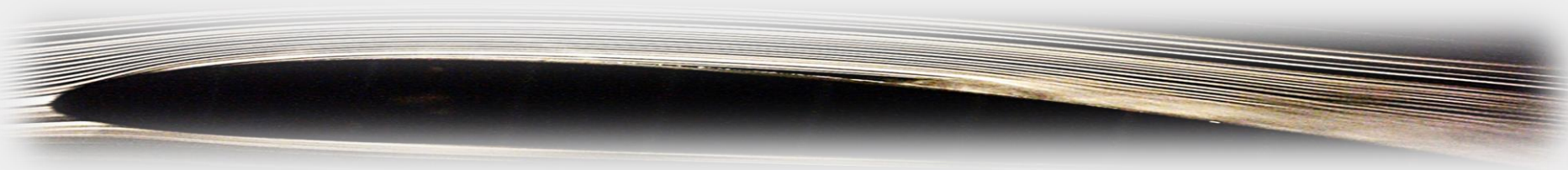
- (1) contained in the aeroplane flight manual; and
- (2) contained in the manufacturer's technical and safety instructions; and
- (3) of crew resource management; and
- (4) of human factors and psychology; and
- (5) of ergonomics.

(c) The certificate holder must ensure that the system includes—

- (1) an expanded checklist in the operations manual; and
- (2) scan checks; and
- (3) a quick reference handbook; and
- (4) a checklist for procedures, including emergency procedures.

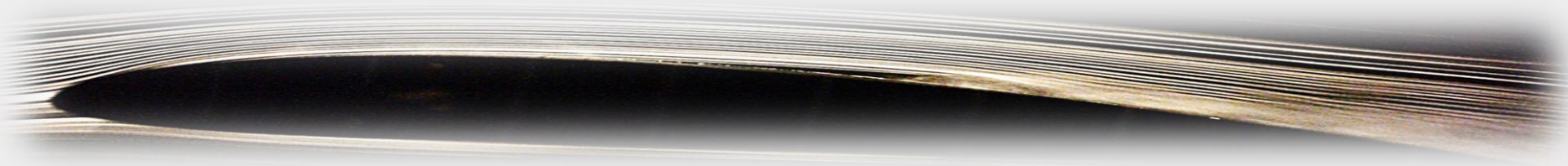
Regulations / Rules

- **Performance Based Regulations** give operators the flexibility to determine *how* they achieve the desired outcome
- Allows adaptive approaches tailored to operating context and focused on optimising human performance
- Less prescription and ‘bureaucracy’
- A effective SMS should facilitate clear demonstration of safety performance



Job and task design

- Involve employees in design, build ownership
- Attention to HF (e.g. workload, fatigue)
- Account for human performance variability
- Identify critical tasks and those who perform them
- Revisit periodically and during change
- Be prepared to ask: *What's the stupidest rule you have to follow and why?*

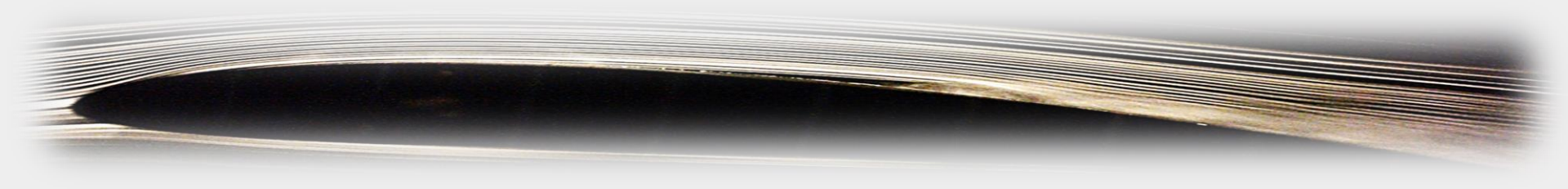


Training and competency

- Focus on *optimising* human performance
- Selection of training and assessment personnel
- Establish competencies required based on operational and technological contexts
- Tailor training whenever possible (TNA)
- Create a culture of learning (use safety data, training data, LOSA and FOQA)
- Consider new training initiatives

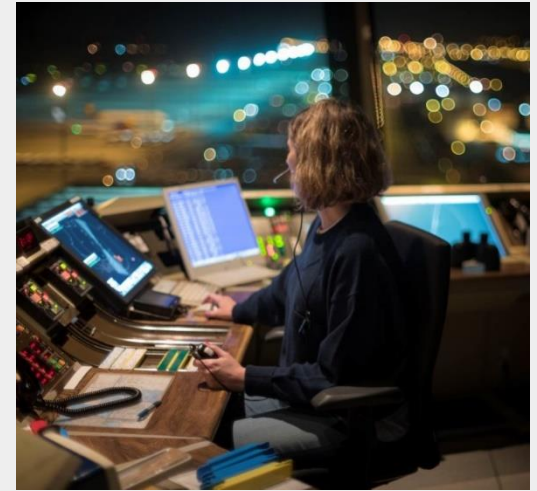
EBT

“EBT allows us to train our pilots for real life scenarios, with easing regulatory constraints and the freedom to use our Safety Management System and wider industry trends to redefine and constantly evolve our training curriculums.”
NZ operator



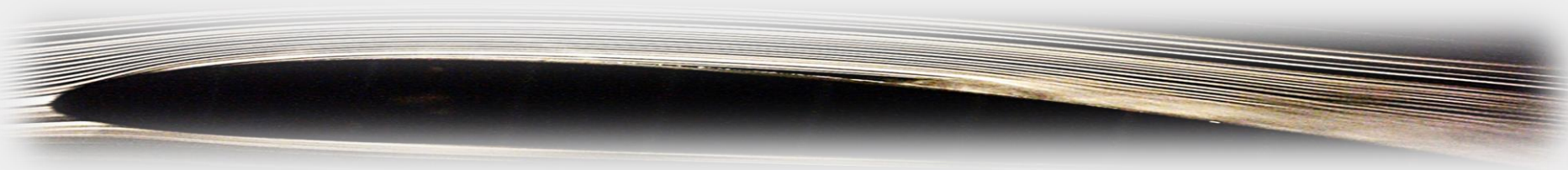
Information

- Systems to encourage open reporting
 - Just culture (building trust)
 - Confidential reporting system
 - User-friendly reporting tools
 - Participation in safety meetings
 - Informal discussions
 - Surveys
 - Feedback
- Encourage reporting of hazards and 'near misses', not just events
- Use the information to promote:
 - assurance, risk awareness, proactive risk management, good decision-making, and learning and improvement



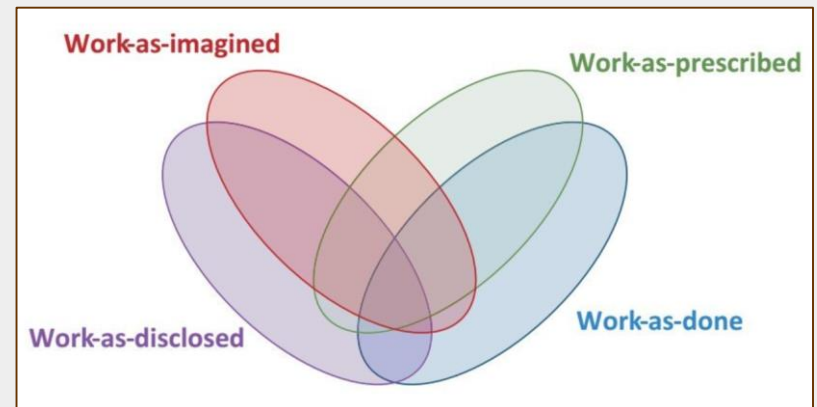
Risk Management

- Diverse input into risk assessments
- See people as risk controls - empower and support them
- Identify risk to human performance associated with change, including resistance
- Assess the effectiveness of human control measures

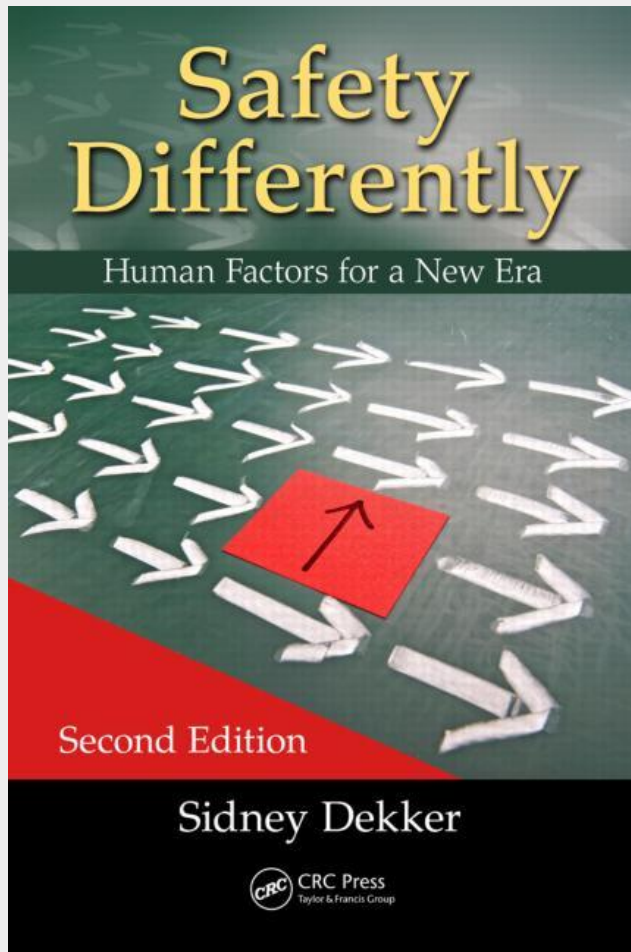


Culture

- **SMS + Safety Culture = Performance**
- Safety Culture can be influenced, fostered
- Understand motivations and influencers/incentives
 - Cognitive and emotional safety engagement
- Create an inclusive working environment
- Safety seen as a value
- Effective communication
- Monitor & measure



Operator and regulator mind-set



- People are the problem
- Tell them what to do
- Success is the absence of negative events



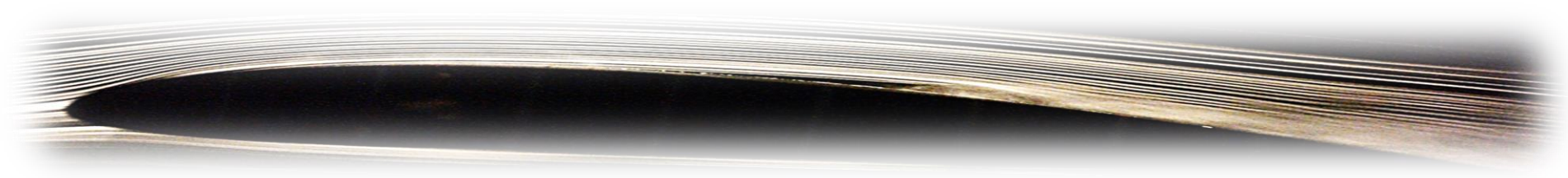
- People are problem solvers
- Ask them what they need
- Enhance positive capacities

Benefits

- Optimises safety performance of people and organisation
- Improves efficiency and resilience
- Employee empowerment, ownership, motivation and satisfaction
- Timely and relevant information for improved decision-making
- Helps keep SMS 'alive' (adaptive, relevant, effective)



SYNERGY



Positive signs

AUG 26 **Daily Digest**

A selection of content from across the Aviation Week Network

AVIATION
WEEK
NETWORK



MAX Saga Signals Changes In How FAA Seeks Pilot Feedback

Sean Broderick

The FAA's plan for pilot evaluations of changes to the Boeing 737 MAX and new training materials signals a shift from a focus primarily on the carriers the agency regulates to one that accounts for variations in pilot experience around the world.



Australian Government
Civil Aviation Safety Authority

Independent review of aviation fatigue rules for operators and pilots

In April 2013, CASA introduced new fatigue rules for operators and pilots set out in Civil Aviation Order (CAO) 48.1 Instrument 2013. The rules sought to align Australia with international standards, improve aviation safety, address known risks, and maintain our reputation for safety in aviation.

In 2017 the CASA Board directed an independent review of the new fatigue rules be undertaken as a result of feedback received from various sections of the aviation industry and endorsed the [Terms of Reference](#).

The review was steered by Dédale Asia Pacific, a Melbourne-based human factors and safety consultancy. Learn more about the expertise of the [independent review team and expert advisory panel](#).



Aviation Community Advisory Group (ACAG)

ACAG is a representative industry body that provides advice to the CAA on issues affecting aviation safety and the aviation operating environment. ACAG functions include:

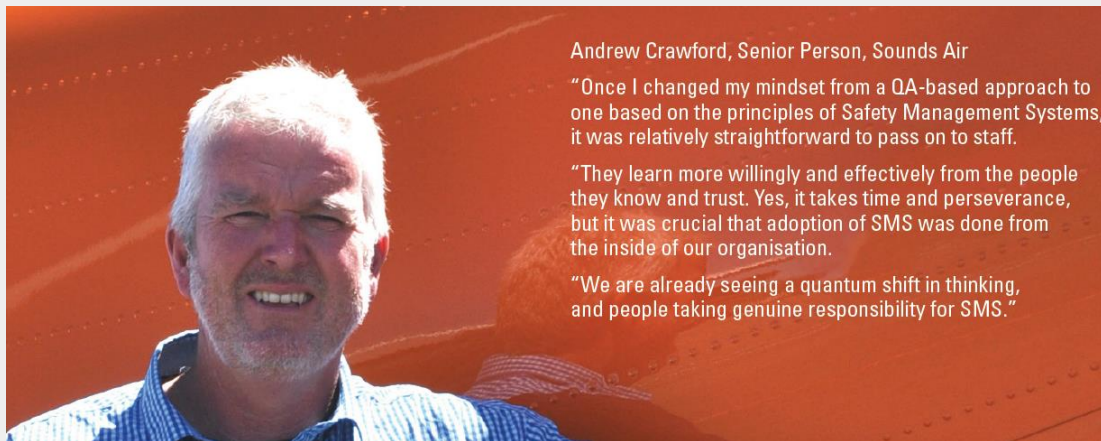
- Identification of regulatory issues that need to be addressed
- Advice on issue priorities
- Technical expertise and input during the issue assessment process
- Advice on implementation of both regulatory and non-regulatory options and solutions to issues

Andrew Crawford, Senior Person, Sounds Air

"Once I changed my mindset from a QA-based approach to one based on the principles of Safety Management Systems, it was relatively straightforward to pass on to staff.

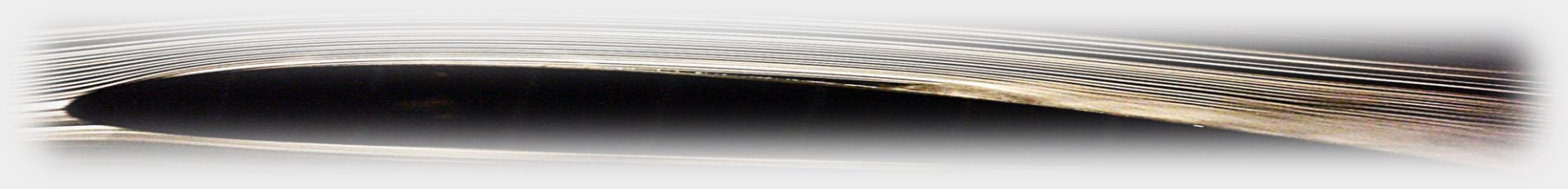
"They learn more willingly and effectively from the people they know and trust. Yes, it takes time and perseverance, but it was crucial that adoption of SMS was done from the inside of our organisation.

"We are already seeing a quantum shift in thinking, and people taking genuine responsibility for SMS."



Further reading

- CAAP SMS-2(0) Integration of Human Factors (HF) into Safety Management Systems (SMS) - CASA
- *'A system of safety management practices and worker engagement for reducing and preventing accidents: An empirical and theoretical investigation'* - Wachter, Yorio (2014)
- *'Dynamic Capabilities for People-Centric Management in Turbulent times'* – Nold (2018)
- *'A Human Factors Perspective on Safety Management Systems'* – Lowe
- *'Missing focus on Human Factors – organizational and cognitive ergonomics – in the safety management for the petroleum industry'* – Johnsen, Kilskar, Fossum (2017)



Thank You

