

# Evolution of Airworthiness Human Factors: Panel Discussion

**25**  
YEARS  
1998 - 2023



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**Disclaimer: Unless clearly cited and referenced, all views presented in the following slides are my opinion and not necessarily reflect the views of any of the organisations I am involved in or associated with or work for.**







# Evolution of Airworthiness Human Factors

Content of the  
Presentation

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**PAST**

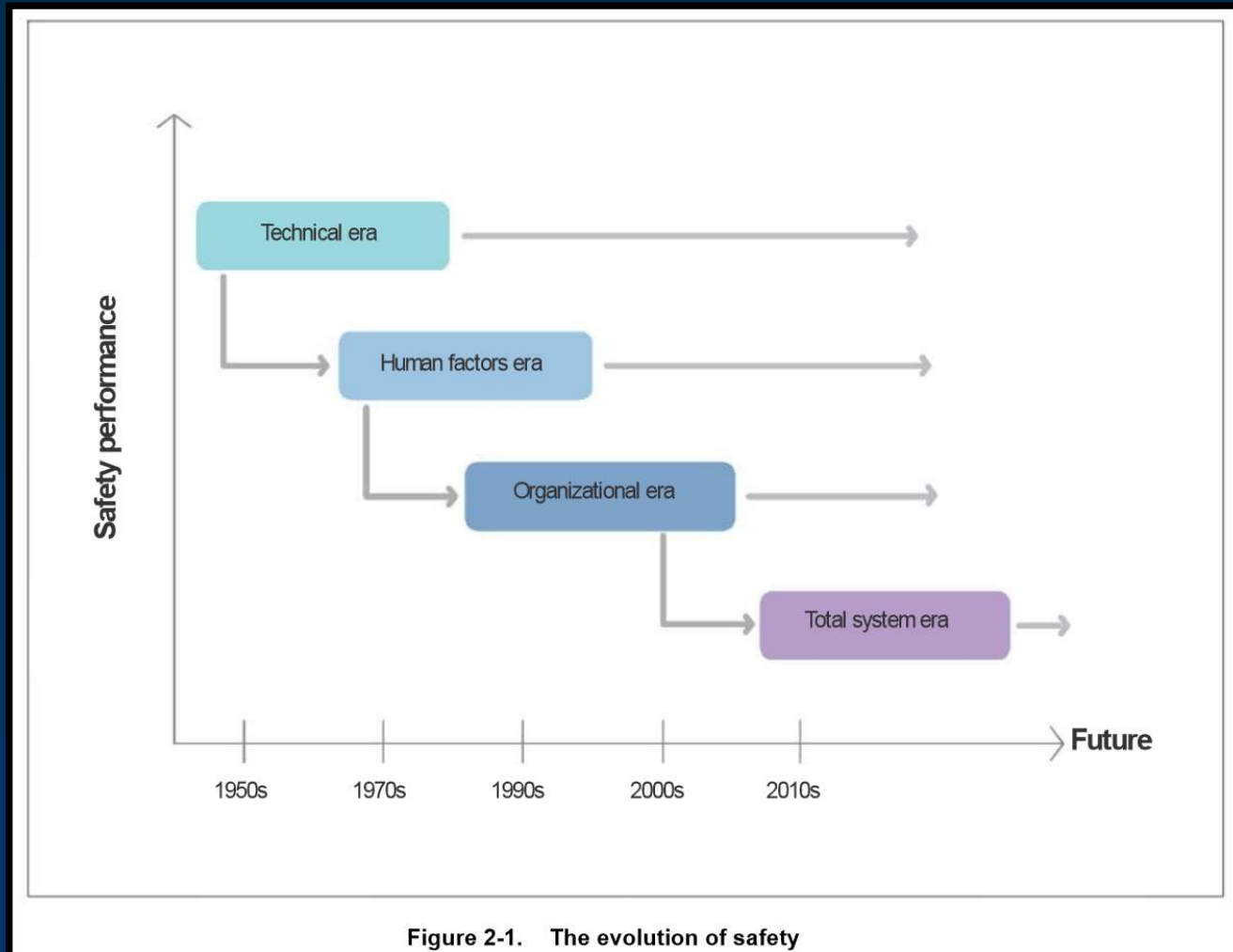
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**PRESENT**


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**FUTURE**

# Evolution of Safety (ICAO SMM)



# Formation of ICAO



## ICAO TECHNICAL COOPERATION

[About ICAO](#)[Global Priorities](#)[Events](#)[Information Resources](#)[Careers](#)[Uniting Aviation](#)[ICAO TV](#)[Subscribe](#)

ICAO / Secretariat / Technical Cooperation Bureau / History

### Who we are

TCB at a glance

**History**

### What we do

Portfolio of Products and Services

Implementation Packages (iPacks)

Fellowships

Field Personnel

Field Operations

Global Aviation Training (GAT)

Projects

### The TCB Advantage

ICAO Programme for Aviation Volunteers (IPAV)

### Important Links

Vacancies

Contact TCB

## History

The *Convention on International Civil Aviation* (also known as *Chicago Convention*), was signed on 7 December 1944 by 52 States. Pending ratification of the Convention by 26 States, the Provisional International Civil Aviation Organization (PICAO) was established. It functioned from 6 June 1945 until 4 April 1947. By 5 March 1947 the 26th ratification was received. ICAO came into being on 4 April 1947. In October of the same year, ICAO became a specialized agency of the United Nations linked to Economic and Social Council (ECOSOC).

The Convention on International Civil Aviation set forth the purpose of ICAO:


*"WHEREAS the future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world, yet its abuse can become a threat to the general security; and*

*"WHEREAS it is desirable to avoid friction and to promote that cooperation between nations and peoples upon which the peace of the world depends;*

*"THEREFORE, the undersigned governments having agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically;*

*"Have accordingly concluded this Convention to that end."*

- [Certificate of Authenticity](#). 13 April 1948
- [Original version](#). Signed at Chicago on 7 December 1944



Source: <https://www.icao.int/secretariat/technicalcooperation/pages/history.aspx>

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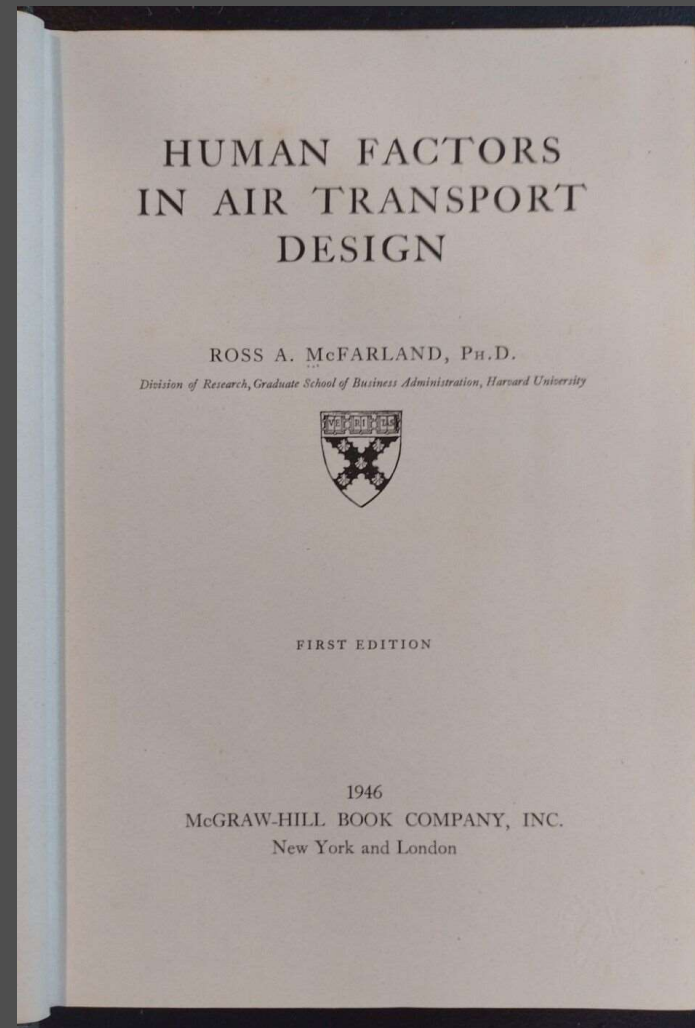
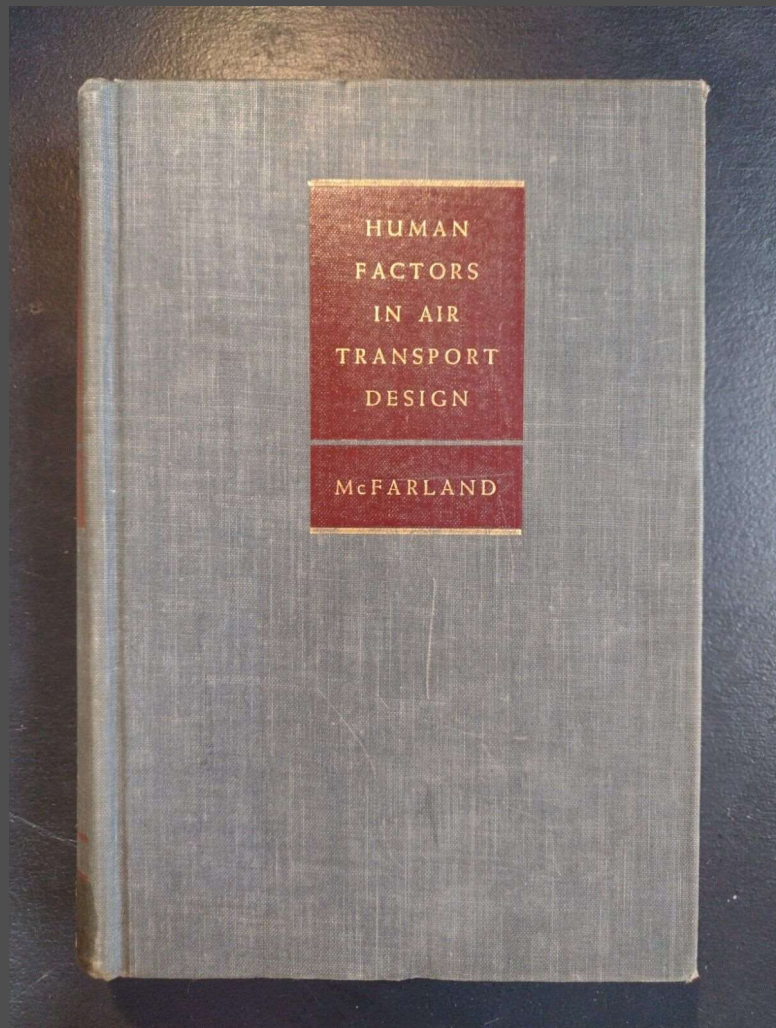
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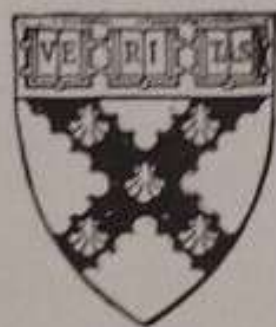




# HUMAN FACTORS IN AIR TRANSPORT DESIGN

ROSS A. McFARLAND, PH.D.

*Division of Research, Graduate School of Business Administration, Harvard University*



FIRST EDITION

1946

McGRAW-HILL BOOK COMPANY, INC.

New York and London



SEARCH ▶

BROWSE ▶

## Human factors in air transport design.

 EXPORT    Add To My List         

McFarland, R. A.

### Citation

McFarland, R. A. (1946) *Human factors in air transport design*. McGraw-Hill.

McFarland, R. A. (1946). *Human factors in air transport*

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## Abstract

The present volume is the first complete treatise on the ground-crew maintainance and air-crew efficiency to provide proper engineering setting, extensive information is presented on the design and operation of aircraft. The chief topics considered are: temperature and humidity; the control of insects and air

**HALF A CENTURY LATER**



# HUMAN FACTORS TRAINING MANUAL

Doc 9683-AN/950

FIRST EDITION – 1998

## **RISK MANAGEMENT LOGIC**

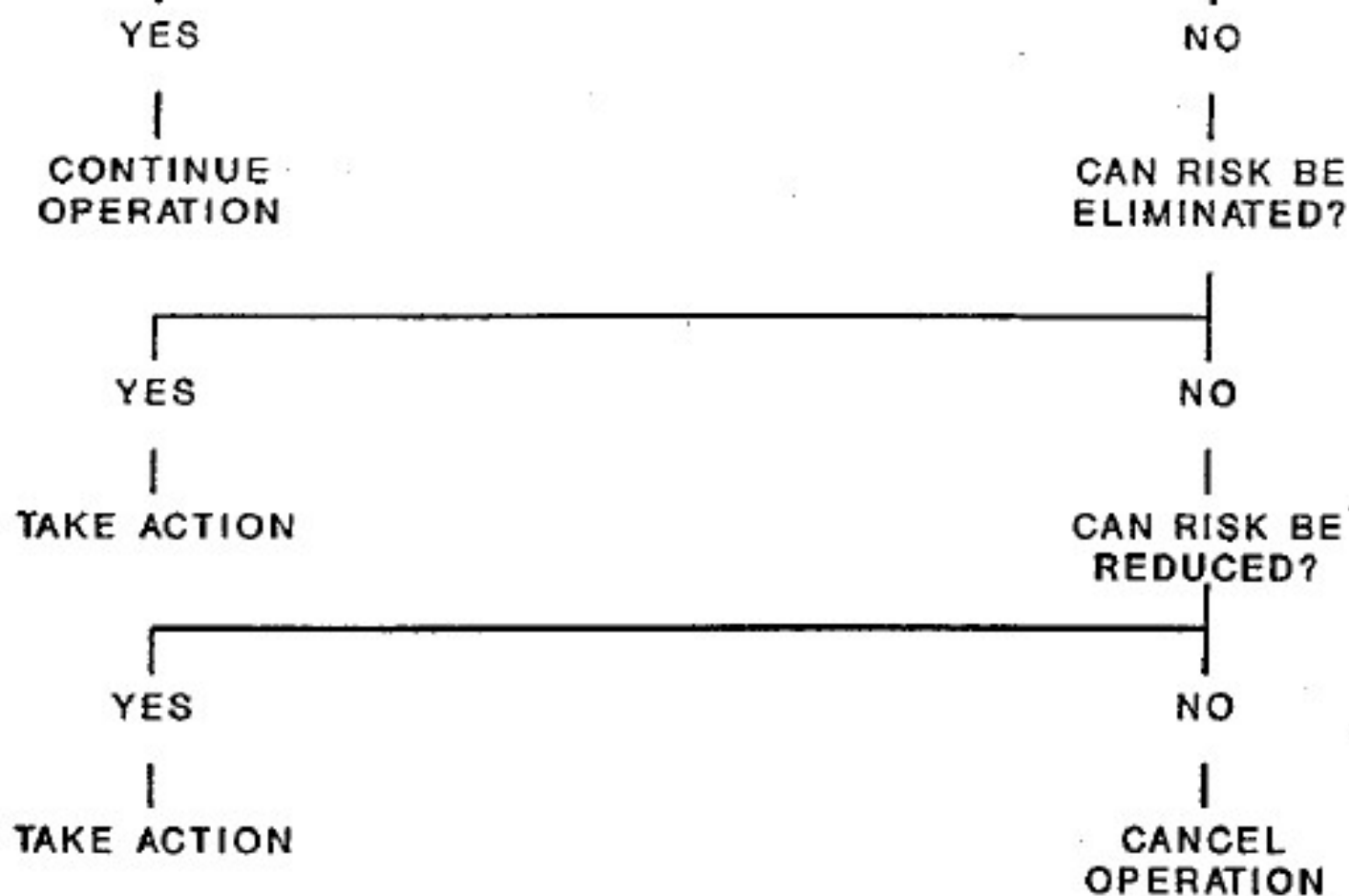
WHAT ARE THE HAZARDS  
IN THIS OPERATION?

WHAT IS THE  
PROBABILITY  
OF AN  
ACCIDENT?

HOW SEVERE  
WILL THE  
ACCIDENT BE?

WHAT IS THE  
EXPOSURE  
TO THAT  
ACCIDENT?

WHAT IS THE  
LEVEL OF RISK?



Source: Richard H. Wood. 1991. *Aviation Safety Programs — A Management Handbook*. IAP Incorporated, Casper, Wyoming, USA.

Figure 2-6. Risk management logic

# Evolution of Airworthiness Human Factors

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PAST

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Content of the  
Presentation

**PRESENT**

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FUTURE

DESPITE SOME FANTASTIC TRAINING PROGRAMMES DEVELOPED OVER THE  
YEARS AND DECADES AND STILL CURRENTLY DELIVERED TODAY,

NOWADAYS SOME ORGANISATIONS SEEM TO HAVE CONTRACTED A  
**DEADLY DISEASE!**

IT'S CALLED **"SELF-PASED ONLINE/CBT FOR HF TRAINING"**

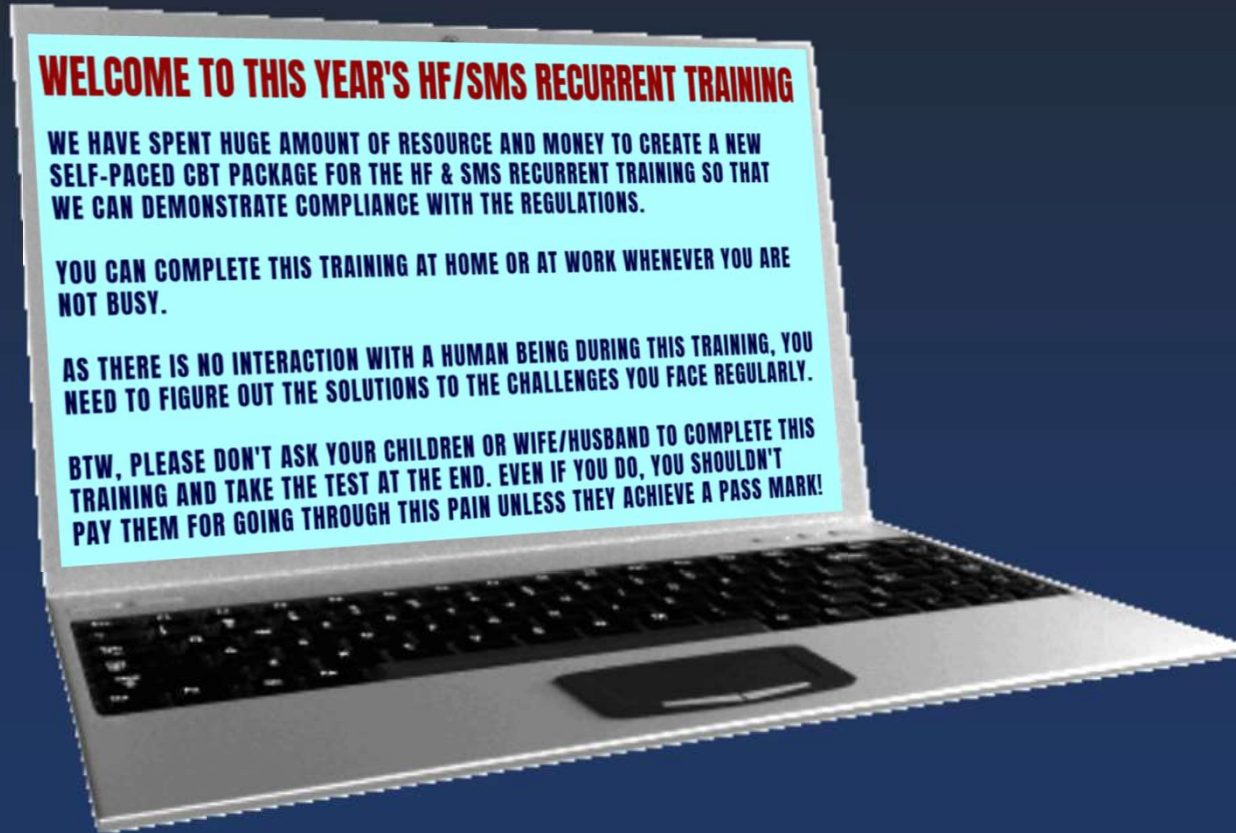
## **WELCOME TO THIS YEAR'S HF/SMS RECURRENT TRAINING**

**WE HAVE SPENT HUGE AMOUNT OF RESOURCE AND MONEY TO CREATE A NEW SELF-PACED CBT PACKAGE FOR THE HF & SMS RECURRENT TRAINING SO THAT WE CAN DEMONSTRATE COMPLIANCE WITH THE REGULATIONS.**

**YOU CAN COMPLETE THIS TRAINING AT HOME OR AT WORK WHENEVER YOU ARE NOT BUSY.**

**AS THERE IS NO INTERACTION WITH A HUMAN BEING DURING THIS TRAINING, YOU NEED TO FIGURE OUT THE SOLUTIONS TO THE CHALLENGES YOU FACE REGULARLY.**

**BTW, PLEASE DON'T ASK YOUR CHILDREN OR WIFE/HUSBAND TO COMPLETE THIS TRAINING AND TAKE THE TEST AT THE END. EVEN IF YOU DO, YOU SHOULDN'T PAY THEM FOR GOING THROUGH THIS PAIN UNLESS THEY ACHIEVE A PASS MARK!**



# Evolution of Airworthiness Human Factors

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PAST

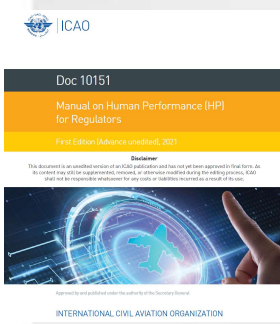
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**FUTURE**



## ICAO's 5 HP PRINCIPLES

- HP is shaped by their capabilities and limitations;
- People interpret situations differently and perform in ways that make sense to them
- People adapt to meet the demands of a complex and dynamic work environment
- People assess risks and make trade-offs; and
- HP is influenced by working with other people, technology, and the environment.



## TECHNOLOGY

- Use of AR/VR/MR etc.
- Cybersecurity, Electrification, Hydrogen Powered Aircraft etc.



## COMPETENCY BASED TRAINING

- ICAO Doc. 10098
- Competency Framework with new knowledge and skills such as 'Systems Thinking' and 'Risk Management' etc.

# Recently Analysed Safety Issue in Europe

## THE EUROPEAN PLAN FOR **AVIATION SAFETY** (EPAS 2022-2026)



### Senior management knowledge, competence and commitment to HF/HP (SI-3001)

Operators, maintenance organisations, manufacturers, national aviation authorities, and other entities that contribute to continuing safety and efficiency strive to promote the process of positive organisational cultural change. Positive cultural evolution requires cooperation and shared values across all levels of management and staff. Corporate safety culture is significantly affected by the values and actions of senior management. Those senior leaders need to understand and communicate the critical significance of HF and human performance to all members of staff.

### Staff support programmes (SI-3012)

The EASA-led Task Force on Germanwings Flight 9525 identified a number of safety risks, including the need for pilot support programmes. However, humans throughout the aviation system need such support programmes. This has been highlighted in particular throughout the COVID-19 pandemic, when aviation professionals have worked under high pressure and often in isolating circumstances.

### Startle and surprise (SI-3010)

Surprise and its consequent reaction, startle, is a significant impediment to managing safety-critical situations but not enough is known about how to mitigate it. Research shows that cognitive impairment, particularly in the working memory, can be significant. Narrowed attention, decreased search behaviour, longer reaction time to peripheral cues, decreased vigilance, degraded problem-solving, performance rigidity, degraded working memory function and critical effects on psychomotor skills are just some of the impairments noted under the effects of startle and surprise.

### Training effectiveness and competence (SI-3011) (Amended)

Despite the obvious technological advances that have made the aviation industry safer and more efficient in the last few decades, the way that those working in the industry are trained has not changed significantly. Recently, ICAO has sought to address this through the development of competency frameworks; however, organizations and States should obtain assurance that competency frameworks are utilised to their best advantage, whilst striving for a shared understanding of terms and concepts.

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**BEFORE I FINISH, ONE SIMPLE IDEA TO ADDRESS THREE CHALLENGES**





*three separate safety issues*  
*one potential solution*

# Hazards/contributing factors/root cause analysis

➔ **REMINDER - Hazard:** A condition or an object with the potential to cause or contribute to an aircraft incident or accident. (ICAO Annex 19)

HAZARDS	CONTRIBUTING FACTORS	ROOT CAUSE ANALYSIS
Under-reporting	Lack of fear (Just Culture) Ease of reporting Nothing happens, why should I bother?	Organisational Culture Peer pressure Leadership's attitude
Lack of monitoring weak signals in an organisation	Too much driven by compliance Too much focus on significant events	Inevitable pressure to maintain approvals Risk perception (Risk Homeostasis)
Ineffective recurrent training due to minimal or lack of interaction (i.e. computer based training becoming norm)	Achieve compliance (following syllabus)	Training seen as a non-productive activity rather than opportunity to capture feedback from employees

# THREE KEY CHALLENGES



“Weak Signal Detection”  
‘Learning from All Operations’

## CONTINUOUS MONITORING OF SAFETY/RISK CULTURE IN THE ORGANISATION

- CONTINUALLY CAPTURE 'LIVED EXPERIENCES' OF FRONTLINE OPERATORS DURING RECURRENT TRAINING SESSIONS
- ENABLE THE PARTICIPANTS TO ANALYSE THEIR OWN STORIES (CRUCIALLY IMPORTANT!) AND USE THE ORGANISATIONAL RISK BEHAVIOUR FRAMEWORK
- FEED THAT SAFETY INTELLIGENCE TO SMS TO ACHIEVE ORGANISATIONAL LEARNING

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**TRANSFORM YOUR RECURRENT TRAINING SESSIONS  
TO MONITOR YOUR SAFETY/RISK CULTURE &  
ENABLE ORGANISATIONAL LEARNING**

# THANK YOU FOR YOUR ATTENTION

