



CANSO GLOBAL SAFETY CONFERENCE 2025

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HOSTED BY **AIRWAYS**



KEYNOTE ADDRESS

PRESENTER

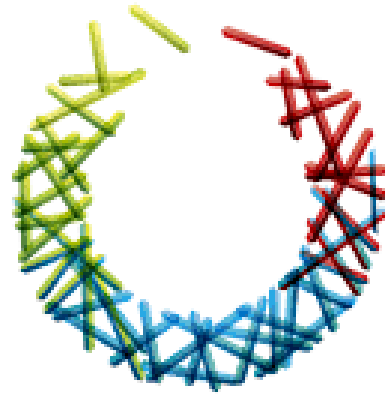


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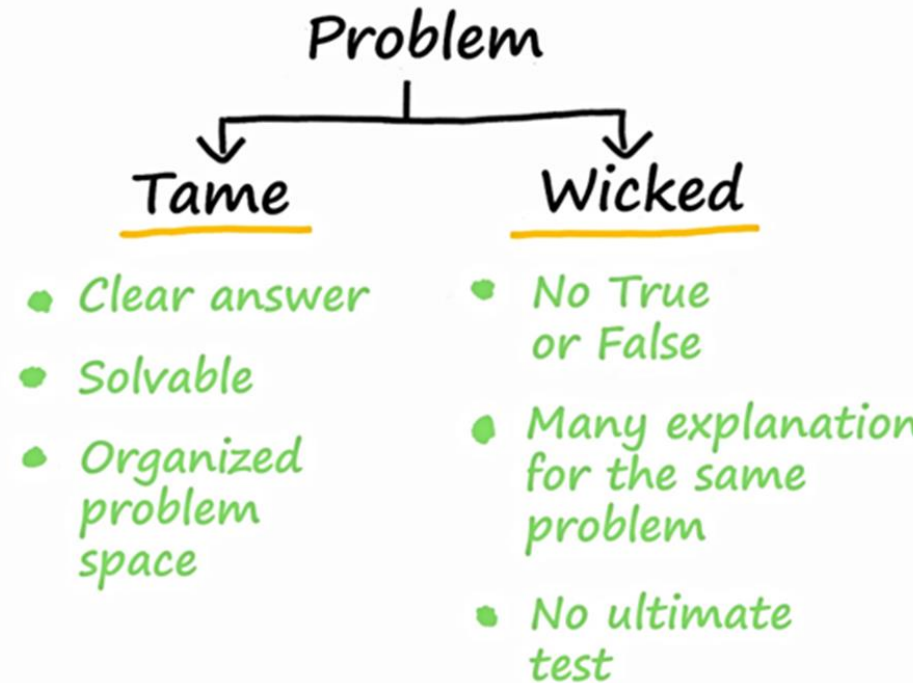
FATIGUE: A WICKED CHALLENGE

Leading
Safety™



TAME VS WICKED CHALLENGES

- Tame challenges: Well-defined issues with identifiable causes and clear solutions i.e., known problems with known solutions. Tame problems can be solved, and no require no further attention.
- Wicked challenges: Complex, multifaceted issues with conflicting perspectives and no clear solutions. There are no right solutions as the problems evolve and shift. Wicked problems can't be solved, only nudged and influenced.
- *It is wicked to “tame” a wicked problem prematurely.*





Air traffic controllers have one of the most stressful jobs in the world.

They are responsible for controlling the flow of all air traffic and ensuring that aircraft maintain proper distance from each other and take off and land safely.

They are often dealing with dozens of aircraft at once, all while making countless split-second decisions regarding variables such as equipment, configuration, weather, and traffic levels.

Any misstep or failure to follow proper air traffic control procedures can lead to a fatal plane crash.

SAFETY: THE OPERATING GUIDING PRINCIPLE

Air navigation service providers work to maintain and improve safety performance while facing many challenges, including increasing traffic demand, the implementation of new technologies, new entrants to controlled airspace, and increasing automation.

(CANSO Standard Of Excellence In Safety Management, 2023)

Air traffic controllers (ATCOs) play a vital role to keep air travel safe. Yet the demanding 24/7 nature of their role can lead to **fatigue** and affect human performance and safety.

(Eurocontrol, 2023)



WHAT IS FATIGUE?

- A physiological state of reduced mental or physical performance capability resulting from sleep loss, extended wakefulness, circadian phase, and/or workload (mental and/or physical activity) that can impair a person's alertness and ability to adequately perform safety-related operational duties. (ICOA)
- Fatigue describes physical and/or mental weariness which extends beyond normal tiredness. It is a state of physical and mental impairment.
- Although individuals vary in their experiences of fatigue, no one is immune from becoming impaired by fatigue. (Wicked challenge)



TYPES OF FATIGUE

- Transient fatigue: Acute fatigue brought on by extreme sleep restriction or extended hours awake within 1 or 2 days.
- Cumulative fatigue: Fatigue brought on by repeated mild sleep restriction or extended hours awake across a series of days.
- Circadian fatigue: Reduced performance during nighttime hours, particularly during an individual's "window of circadian low" (WOCL) (typically between 2:00 a.m. and 05:59 a.m.).



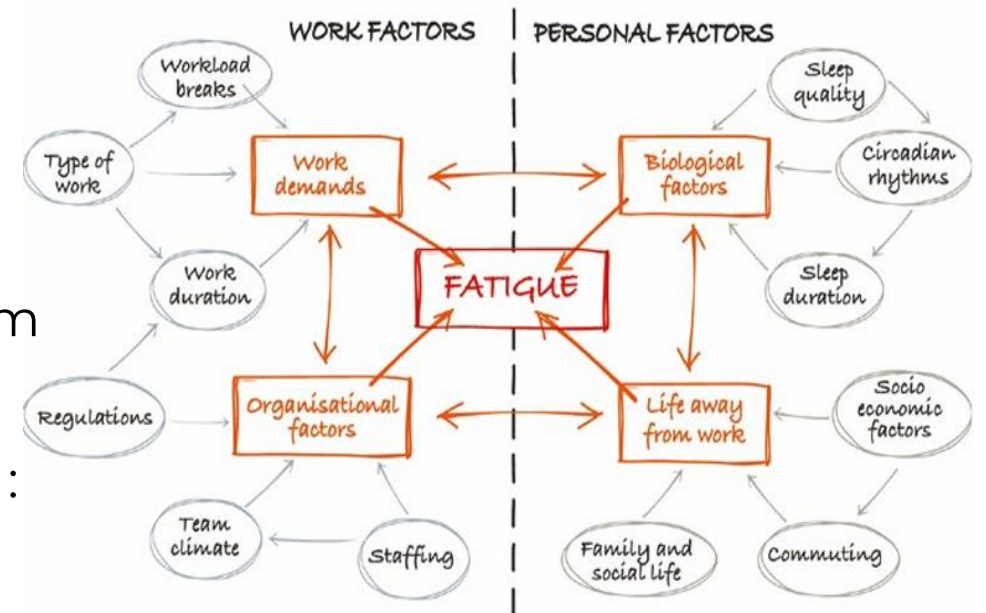
CONSEQUENCES OF FATIGUE

- The consequences of fatigue include, but are not limited to, reduced alertness, concentration and situational awareness, slower / delayed reaction time, lower energy levels, cognitive errors, memory impairment, poor judgement, reduced ability to assess risk or appreciate consequences of actions, withdrawn mood, strained relationships.
- Fatigue leads to a decrease in performance, well before an individual notices the degradation in their physical and mental health. (Wicked challenge)
- People are not the best evaluators of their own alertness state. They are often sleepier than they report. (Wicked challenge)
- Although controller fatigue does not appear to have contributed to as many accidents as pilot fatigue, controller fatigue can and has resulted in serious events.



CONTRIBUTING FACTORS

- Fatigue is a consequence of many personal factors, as well as work and environmental factors
- Work related factors include, but are not limited to:
 - Length of shift, shift sequence, shift rotation and changes, shift schedules, irregular shifts
 - Time of day
 - High or low workload
 - Stability and predictability of rosters
 - Resting time, number of breaks
 - Insufficient sleep due to disrupted circadian rhythm
 - Difficult weather conditions
- Personal related factors include, but are not limited to :
 - Family demands
 - Stress related to personal lives
 - Health and general wellbeing and fitness

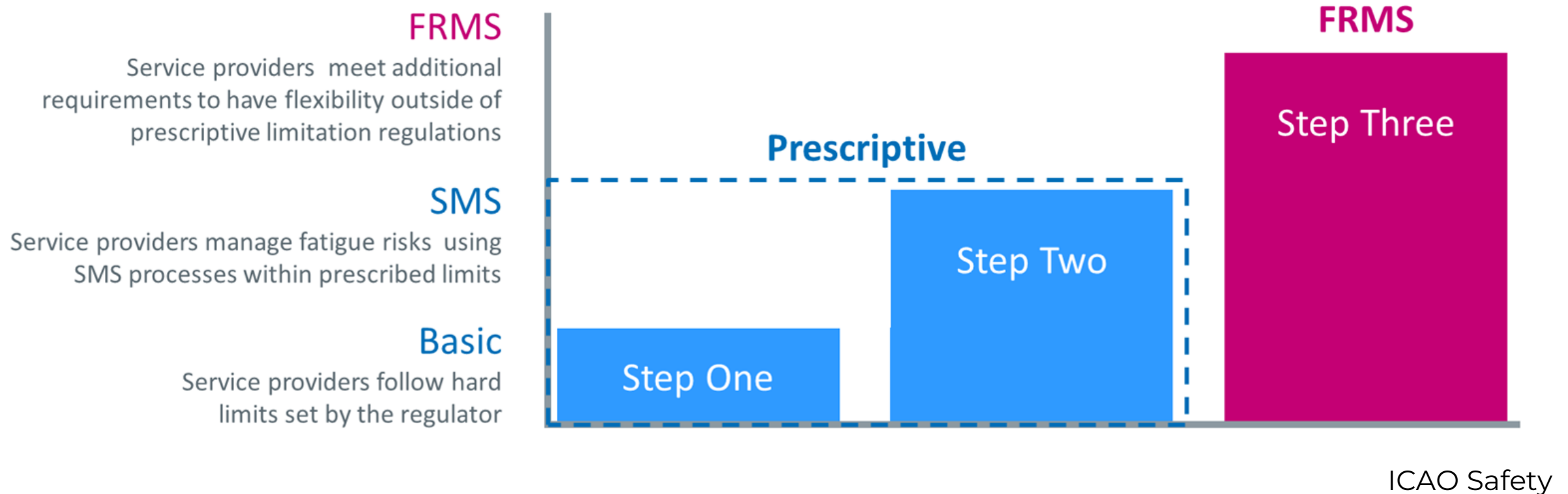


FATIGUE RISK MANAGEMENT: AN ENABLER OF SAFETY

- A Fatigue Risk Management System (FRMS) has been defined by ICAO as "a data-driven means of continuously monitoring and maintaining fatigue related safety risks, based upon *scientific principles and knowledge as well as operational experience* that aims to ensure relevant personnel are performing at adequate levels of alertness".
- FRMS can be established as a standalone system or as a part of the Safety Management System (SMS).



APPROACHES TO FATIGUE MANAGEMENT



Note: FRMS is also referred to as a performance-based approach.

APPROACHES TO FATIGUE MANAGEMENT

- Prescriptive Approach: The ANSP complies with requirements e.g., work period limits and non-work period minima defined by the regulator and manages fatigue hazards using the SMS processes that are in place for managing other types of hazards.
- Performance-based approach: The ANSP develops and implements a Fatigue Risk Management System (FRMS) and obtains approval from the regulator. The FRMS is a data-driven means of continuously monitoring and managing fatigue related safety risks, based upon scientific principles, knowledge and operational experience that aim to ensure relevant personnel are performing at adequate levels of alertness.
- A combination of both approaches.
- Fatigue awareness and management training to provide ATCs with the knowledge and skills to manage fatigue-related risk. This includes but is not limited to the causes and consequences of fatigue, fatigue risk management system, and personal fatigue management strategies.

THE CANSO STANDARD OF EXCELLENCE IN SMS

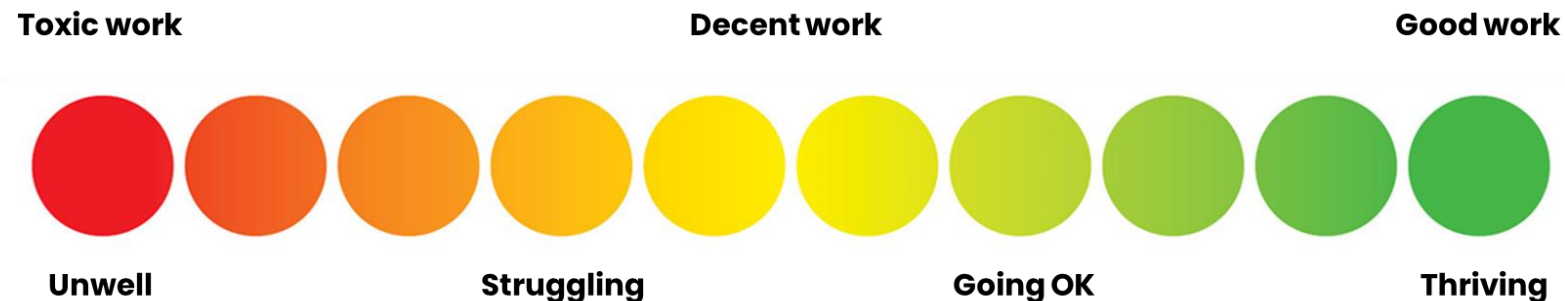
A measure of quality that represents the ANS industry’s view on the desired level of maturity and effectiveness which should be reached by all ANSPs in this area of air navigation services.

7. FATIGUE-RELATED RISK MANAGEMENT

OBJECTIVE	INFORMAL ARRANGEMENTS	DEFINED	MANAGED	RESILIENT	EXCELLENCE
7.1. A data-driven means of continuously monitoring and managing fatigue-related safety risk that aims to ensure relevant personnel are performing at adequate levels of alertness.	Fatigue-related risk is not recognised as a safety risk which needs to be managed.	The organisation has informal methods in place that address fatigue-related risk.	<p>The organisation has defined the responsibilities of management and staff for the control of fatigue-related risk.</p> <p>The organisation has formal processes and procedures by which fatigue is managed.</p> <p>The organisation provides training on the control of fatigue-related risk.</p> <p>The organisation assesses ongoing compliance with fatigue-related risk processes and procedures.</p> <p>The organisation communicates the importance of measuring and reporting fatigue-related risk to all staff.</p> <p>The organisation has processes to measure and improve the management of fatigue-related risk based on internally collected data. [SP]</p>	<p>The organisation uses occurrence data to better understand the fatigue profile of its workforce. [SP]</p> <p>The organisation uses comparative analysis or data and information from external sources to improve the management of fatigue-related risk. [CI]</p>	<p>The organisation measures and reviews its fatigue-risk baseline using sleep science principles. [SP]</p> <p>The organisation measures the effectiveness of its fatigue-risk management system (FRMS). [SP]</p> <p>The organisation has set best practices for safety management for this objective.</p>

THE SCIENTIFIC PRINCIPLES OF FATIGUE MANAGEMENT

- According to ICAO the four basic scientific principles underpinning fatigue management are:
 - The need for sleep
 - Sleep loss and recovery
 - Circadian effects on sleep and performance
 - The influence of workload.
- These principles highlight that adequate sleep quantity and quality are essential for optimal performance and minimising fatigue, while factors like disrupted sleep schedules, excessive workload, and circadian misalignment can significantly increase fatigue risk.
- These principles inform the design of work that supports the physical and mental wellbeing of air traffic controllers.



PSYCHOSOCIAL HAZARDS IN ANSPS

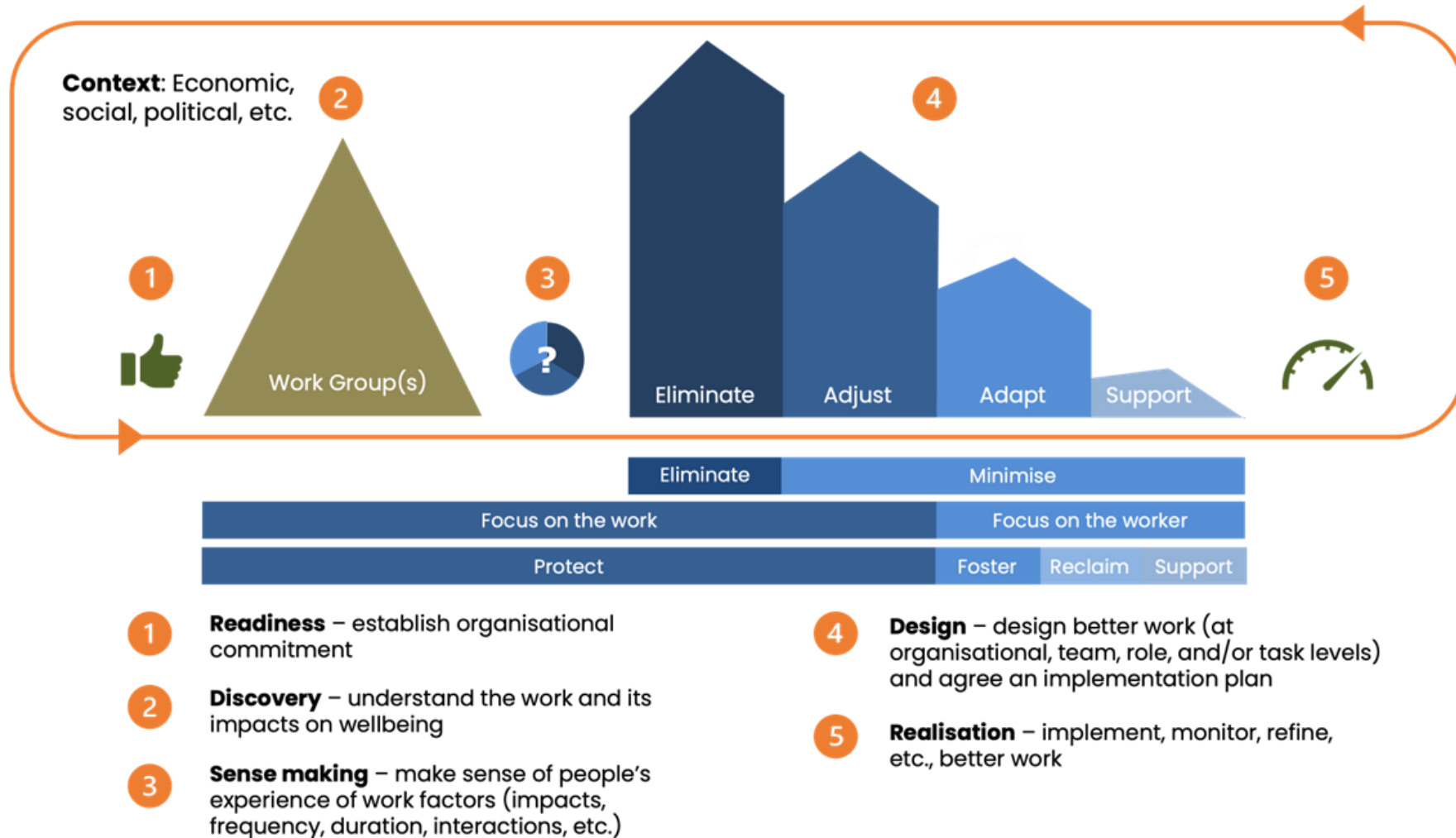
- Current regulations (e.g., EU Working Time Directive 2003 (2003/88/EC), Regulation 2015/340) and research (e.g., Guidelines on Fatigue Management in ATC Rostering Systems, EASA, 2024) have focused more strongly on understanding the work practices (e.g., rosters and schedules) required for adequate sleep and recovery than on understanding how to manage workload.
- The reality is that air traffic control is potentially stressful and exhausting work with several potential psychosocial hazards, in addition to workload.
- Psychosocial hazards are work-related factors with the potential to cause physical and/or mental harm. In ANSPs these include:
 - Shift work
 - Limited job control
 - High consequence errors
 - Lack of adequate breaks and recovery time:
 - Poor work-life balance
 - Social isolation
 - Potential for traumatic events

PSYCHOSOCIAL RISKS

- Whether a psychosocial hazard constitutes a psychosocial risk is dependent on the individual and the context.
- A psychosocial risk is a combination of the likelihood of occurrence of exposure to work-related hazard(s) of a psychosocial nature and the severity of injury and ill-health that can be caused by these hazards. (ISO 45003)
- Psychosocial risk is **not** a single risk.
- Psychosocial risks are seldom observable and are difficult to measure.
- If not effectively managed, psychosocial risks can cause significant psychological or physical harm.
- Psychosocial risk management lags the management of physical risk.

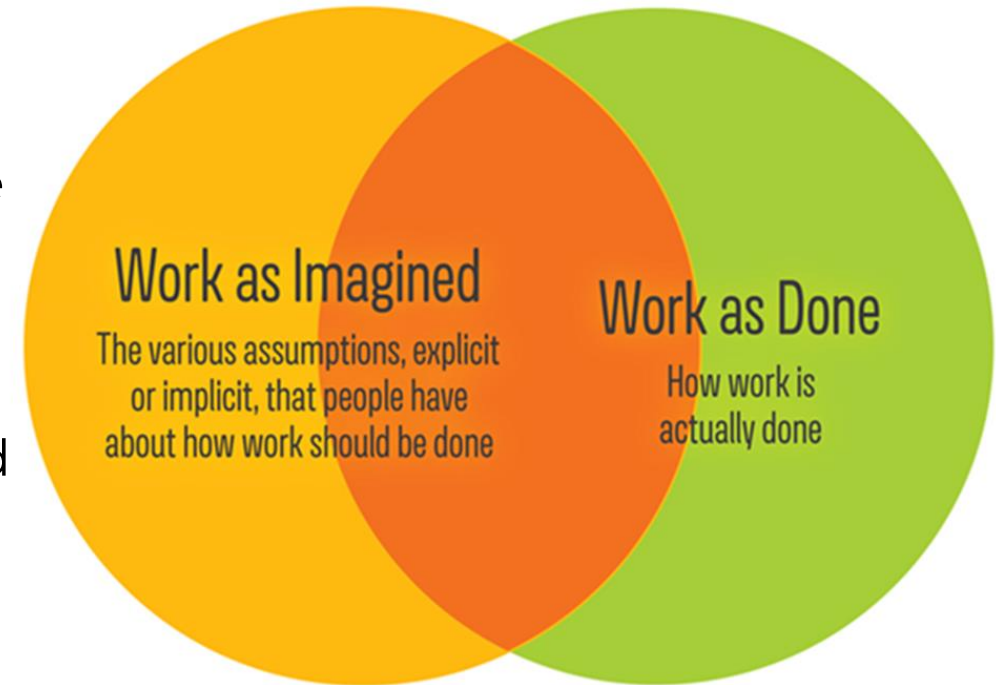


BETTER WORK BY DESIGN

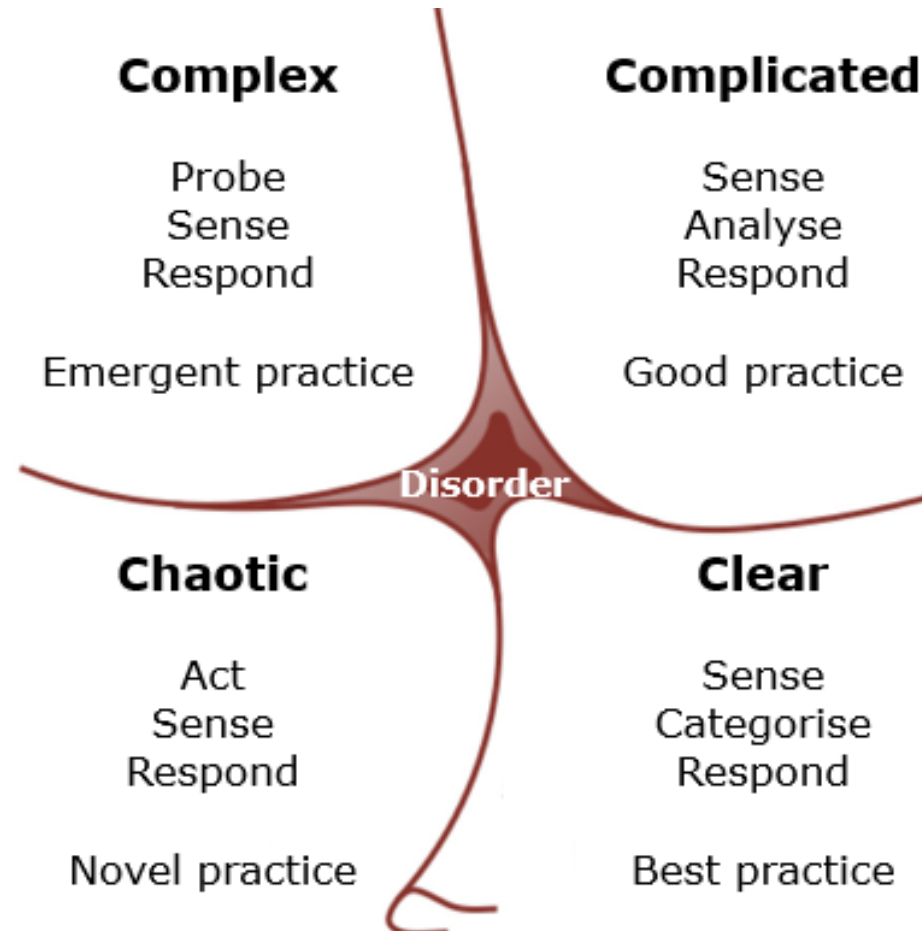


WICKED CHALLENGES

- Work-As-Imagined \neq Work As Done - there is no such thing as a perfect schedule.
- Shortage of staff.
- Swapping shifts
- Work and personal lives interact. Setting prescriptive hours rule does not take account of home-life issues, and the fact that ATCOs will and do swap shifts for personal reasons.
- Fatigued individuals have a relatively poor understanding of the effects of fatigue and the speed with which its effects can emerge.
- Assessment of fatigue is subjective and often underreported underplaying the contribution of fatigue.
- Self medicating to stay awake.
- Fatigue is an integrity issue.



ARE WE MAKING SENSE OF FATIGUE?



Adapted from Snowden & Boone (2007)



FATIGUE: A WICKED CHALLENGE

- In close, fatigue is a well-known impairment risk - although not necessarily well understood.
- There are many psychosocial risks that contribute to the impairment.
- Work should not harm people, both physically and mentally, so ANSPs have a responsibility to protect employees' physical and mental wellbeing by managing fatigue both as an impairment and a psychosocial risk.
- Fatigue management is a wicked challenge. It requires more than a technical solution.
- The true complexity of fatigue management lies in fully understanding the context in which the work is done not how the work is imagined.
- The devil is both in the detail and the context.



THANK YOU