Fatigue Management

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FRM/FRMS Workshop - Tokyo 2021

Overview

- **Scientific Principles**
- **Secret of Success Implementing FRM/FRMS**
- **Importance of Data Driven Approach to FRM/FRMS**
- **Covid-19 Driven Fatigue Risks and Possible Mitigations**

Scientific Principles

Scientific Principles

- **Getting enough sleep (both quantity and quality) on a regular basis is essential for restoring the brain and body.**

- **Reducing the amount or the quality of sleep, even for a single night, decreases the ability to function and increases sleepiness the next day.**

- **The circadian body clock affects the timing and quality of sleep and produces daily highs and lows in performance on various tasks.**

- **Workload can contribute to an individual's level of fatigue. Low workload may unmask physiological sleepiness while high workload may exceed the capacity of a fatigued individual**

Sleep

Sleep is a critical and basic human biological requirement for survival

Even partial sleep deprivation can lead to serious consequences

- Most people need between 6 and 10 hours of sleep
- The average adult requires 8 hours
- Regularly sleeping less than 6 hours can reduce performance

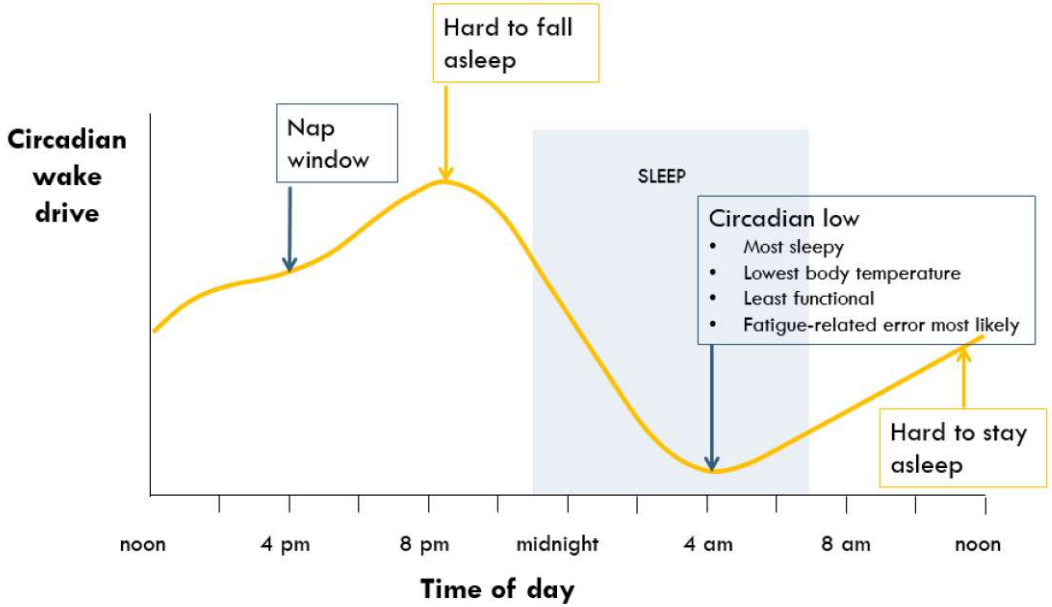
Continuous Wakefulness

- **Hours of Continuous Wakefulness is another factor related to fatigue**
- **The longer you go without sleep, the worse your alertness and performance become**
- **Sleep is the only way to restore alertness**

Circadian Factors

Humans are hard-wired to experience two periods of physiological sleepiness each day:

- 2-6 a.m. (Window of Circadian Low, or WOCL)
- 2-6 p.m. (Afternoon Nap Window)



Workload

- **The nature and amount of work to be done (including time on task, task difficulty and complexity, and work intensity).**

- **Time constraints (including whether timing is driven by task demands, external factors, or by the individual).**

- **Factors relating to the performance capacity of an individual (for example experience, skill level, effort, sleep history, and circadian phase).**

Simple human physiology applied to practical situations

- **Fatigue risk is higher while flying during normal sleep times**
- **Early report times can limit sleep opportunity which adds to fatigue risk**
- **Longer periods of continuous wakefulness increase fatigue risk due to impaired performance**
- **High workload can create a situation that exceeds the performance capability of a fatigued crew member**

Secrets of Success Implementing FRM/FRMS

Collaboration, Cooperation, Consensus

Effectively, change is almost impossible without industry-wide collaboration, cooperation, and consensus

Fatigue SME - Responsible to Everyone

- **Commercial**
- **Flight Operations**
- **Operational Control**
- **Crew Resources**
- **Labor**
- **Flight/Corporate Safety**
- **Regulator (NAA/EASA)**

Why is fatigue management such an emotional issue?

All aspects of a carrier's operation are affected:

- **Headcount**
- **Crew Utilization**
- **Equipment Utilization**
- **Network Planning**
- **Scheduling**

Fatigue Management = Additional Constraints

Increased Operating Costs

Managing Fatigue

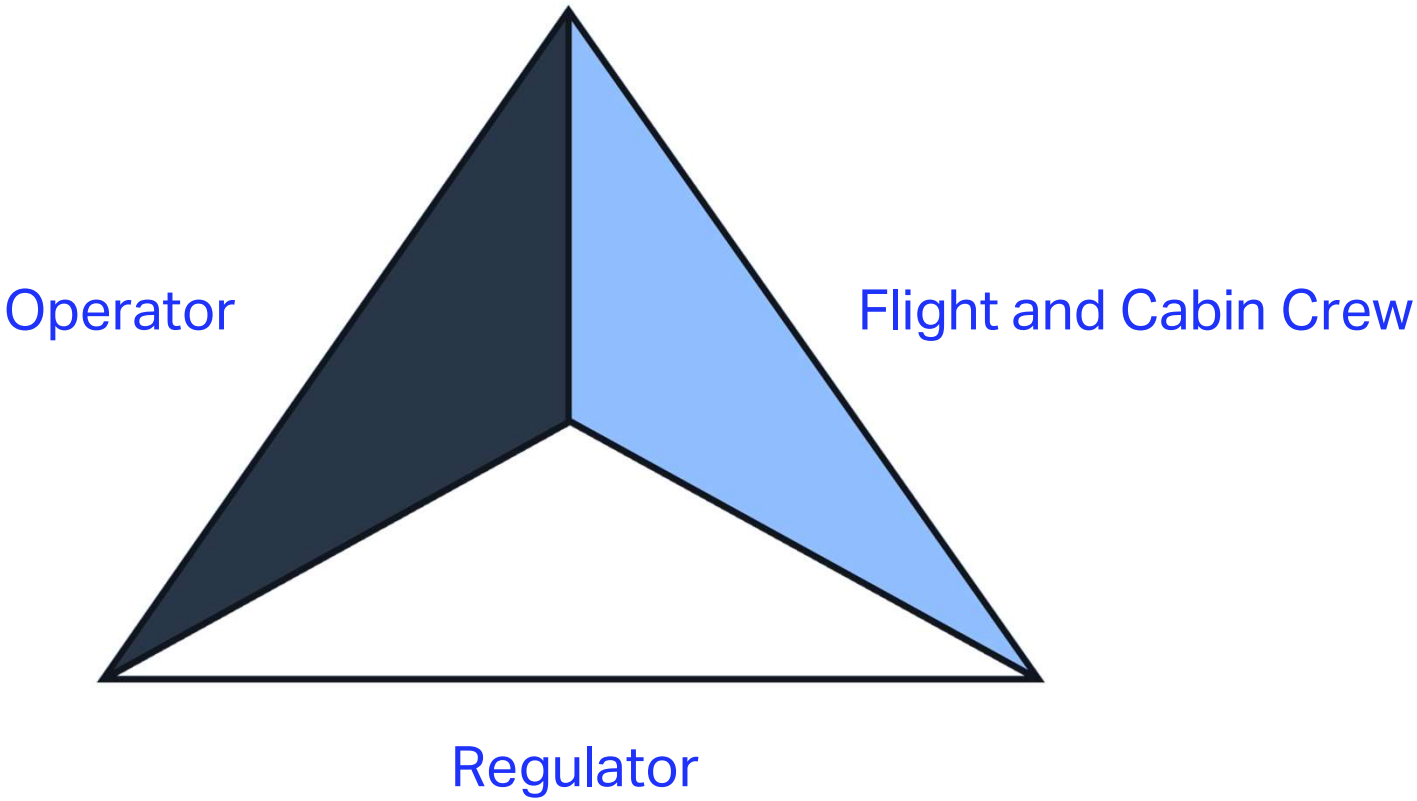
<u>*MITIGATIONS ARE REQUIRED FOR BOTH***</u>**

Challenge:

- **Achieve a realistic balance between safety, productivity and costs**
- **Target limited resources to where they are needed**

Roles & Responsibilities

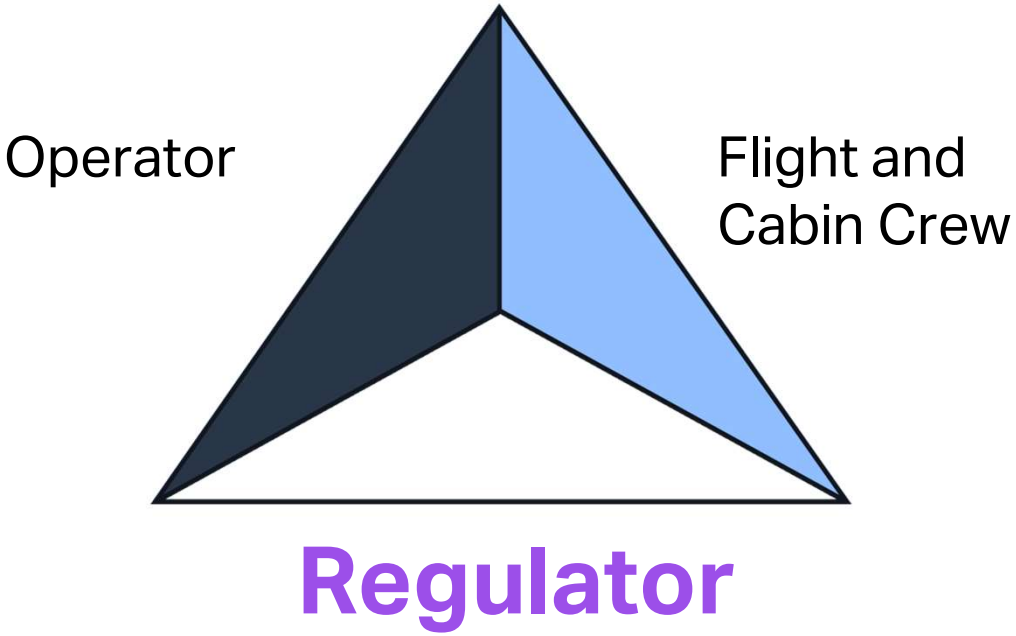
Shared responsibilities but different roles



Roles & Responsibilities

Shared responsibilities but different roles

- Establish the FM regulations
- Ensure compliance
- Provide effective oversight of SMS processes



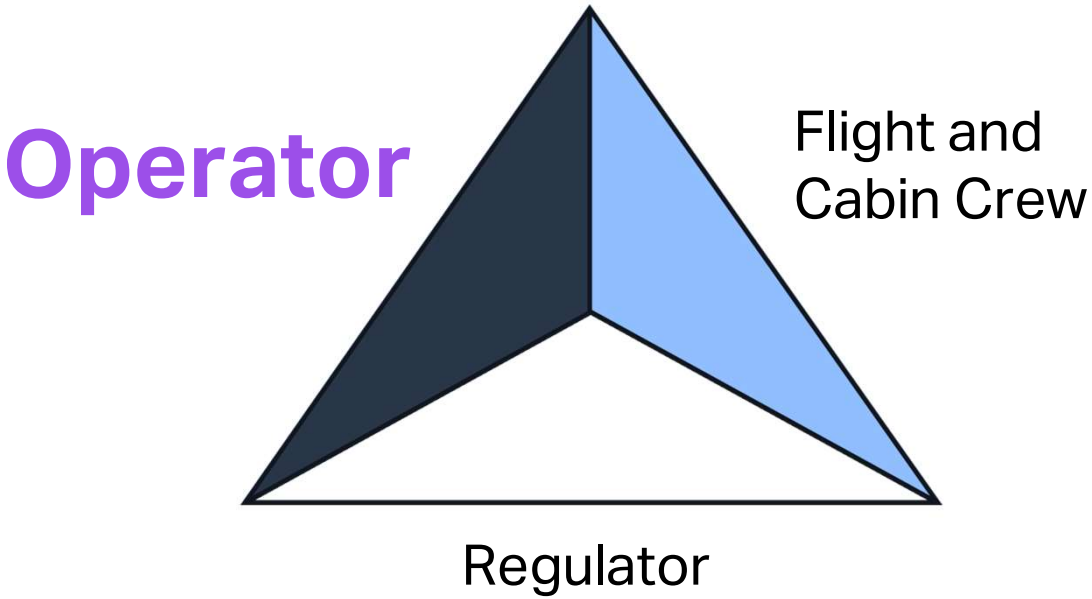
Challenges for the Regulator

- **Providing a regulatory environment that supports effective safety reporting**
- **Performance-based regulations require different regulatory skill sets**
- **Assessing the balance – flexibility with tolerable risk**
- **Provision of consistent and comprehensive guidance to operators**
- **Consistency in regulatory decisions**

Roles & Responsibilities

Shared responsibilities but different roles

- **Adequate resourcing**
- **Scheduling to the limits not a standard scheduling practice**
- **Scheduling practices consider scientific principles within the limits**
- **Effective reporting mechanisms and appropriate responses to fatigue-related reports**
- **FM training**



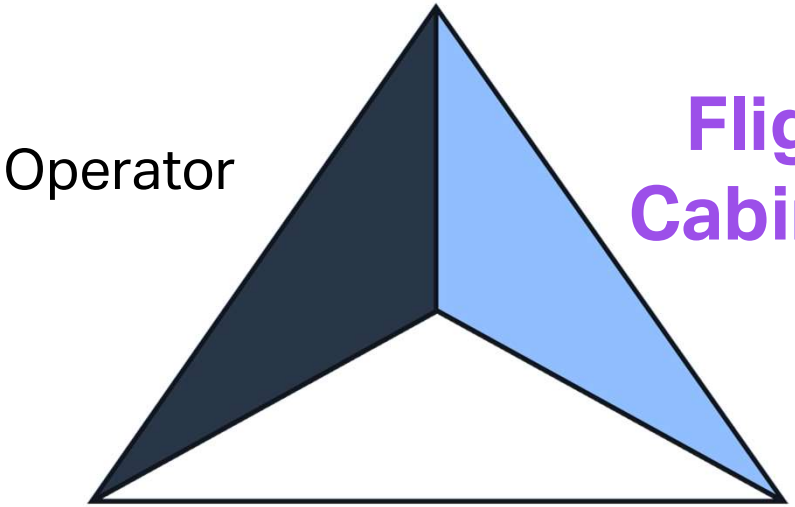
Operator Needs

- **Operate competitively within the global aviation environment**
- **A level playing field amongst global carriers**
- **Operational flexibility to react quickly to unforeseen circumstances**
- **Data-driven and/or results-oriented resource allocation**
- **Free-flow of information from pilots**

Roles & Responsibilities

Shared responsibilities but different roles

- **Use non-work periods to get adequate sleep and arrive fit for duty**
- **Use personal as well as operational mitigation strategies while on duty**
- **Report fatigue hazards**



Flight and Cabin Crew

Pilots' Needs

- **Information, schedules and resources for allowance to responsibly prepare for, and execute duties**
- **Effective safety reporting culture**
- **High standards of professional behavior**

Challenges for Pilots

- **Focusing on safety needs vs. industrial desires**
- **Focusing on safety needs vs. personal preference**
- **Group acceptance of scientific principles and their application**
- **Confidence in the Operator's reporting system**

Safety / Commercial / Operations

Understanding Each Other's Language

- **Understanding each other's language to help one another improve safety and the operation**

- **Using the F (Fatigue) and S(Safety) words aren't always the driver of change we desire – we need to use data to make decisions as well**

Lessons Learned

- **Operational experience counts**
- **Education and availability of information are important**
- **Data collection is necessary**
- **Develop relevant KPIs/SPIs**
- **Science/scientists are needed, but don't over-rely on them**

Lessons Learned

- **Cultural issues from previous employers or fleet types vary greatly**
- **Change is difficult and needs to be managed with care**
- **It's better to keep the regulator involved**
- **Pilots contribute more when they see that their data/input affects operational decisions**

Lessons Learned

- **Time of day for departures is a factor**
- **Social factors should be considered**
- **Longer layover time isn't necessarily better**
- **Clear guidance needs to be given to operational managers for irregular operations**

Essential Elements - Roadmap to Success

- **Understanding basic scientific principles**
- **Operational experience**
- **Regulatory guidance and rulemaking that addresses safety and business needs**
- **Industry best practices and collaboration with other airlines and regulators**
- **Integrating with existing corporate SMS processes**
- **Gathering input from stakeholders**

Essential Elements - Roadmap to Success:

- **Use the available guidance**
- **Learn from previous regulatory efforts (i.e. Europe (EASA), US (FAA), Canada (TC), Singapore (CAAS)**
- **Share experiences with other stakeholders (Labor, Industry, Regulators)**
- **Develop a strong relationship with your regulator**
- **Collaborative approach is essential to success**
- **The objective should be common, so should the approach**

Importance of Data Driven Approach with FRM/FRMS

Why is Fatigue a Safety Concern?

Associated with declining performance:

- Less vigilant
- Increasingly variable but overall slower reaction times
- Forgetfulness
- Inattention
- Apathy
- Irritability
- Poor decision-making
- Diminished communication
- Slow processing, tunnel vision
- Less creative problem solving

Fatigue is a major human factors hazard because it affects most aspects of a crewmember's ability to do their job

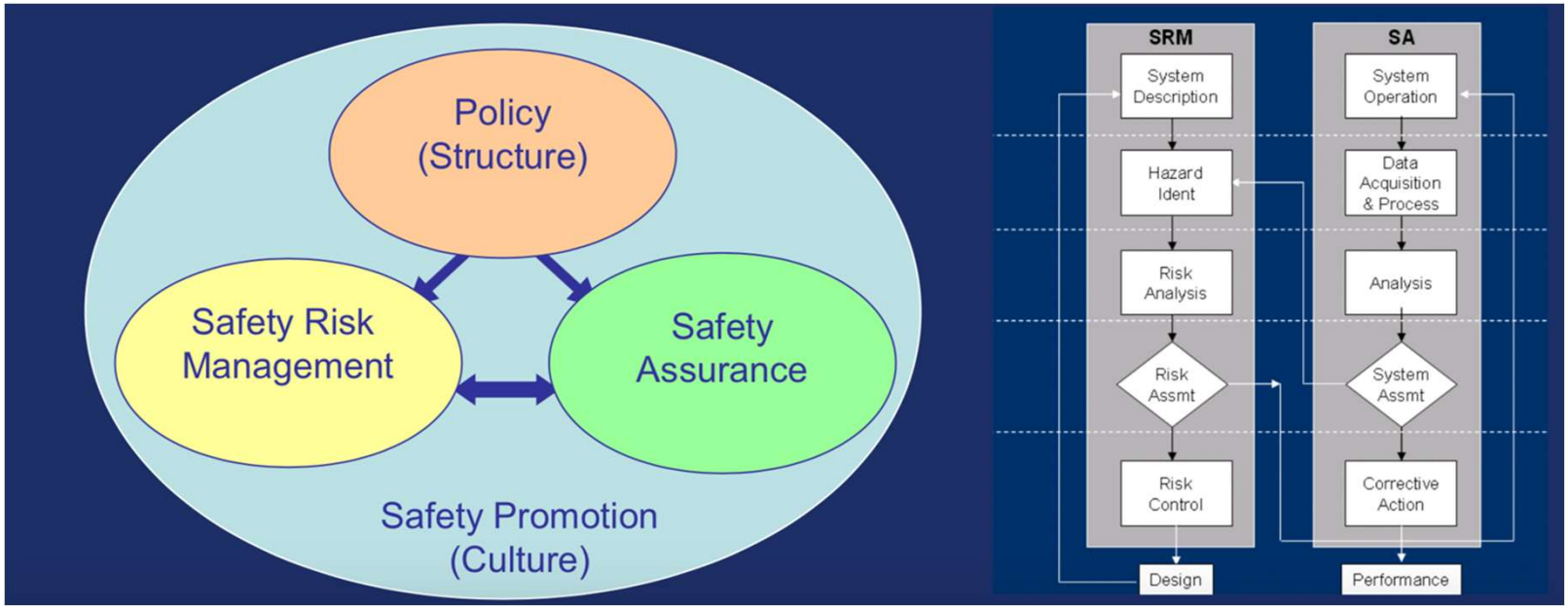
The World We Operate In

- **Risk/Performance based world**
- **Data driven to fix larger problem vs punitive to fix smaller, more localized problems**
- **Get to the core problem, not a symptom**
- **This applies to fatigue risks as well**
- **Moving from a reactive manner into proactive and predictive methods in dealing with fatigue risks**

Safety Management System

Provides a systematic way to:

1. Identify hazards and control risk
2. Provide assurance that risk controls are effective



ICAO DOC 9859

Fatigue Hazard and Risks

- **Fatigue, if not properly managed, can lead to serious problems, so it is a hazard**
- **Basic fatigue management starts with acknowledging the fatigue hazard and assessing the resulting risks for the operation**
- **Next, we need to look for ways of mitigating the risks**
- **This is standard SMS running**

The key to a sustainable fatigue management program is to design the program to operate in parallel with your organization's existing SMS

ICAO Hazard Identification

5.2.2. HAZARD IDENTIFICATION

The ICAO SARPs (Annex 6 Part 1, Appendix 7) require three types of hazard identification:

1. Predictive

- fatigue hazards identified by examining planned work schedules (rosters), taking into account factors known to affect sleep and fatigue.

2. Proactive (monitored during operations)

- fatigue hazards identified by measuring fatigue levels in current operations.

3. Reactive (gathered after an event or incident)

- fatigue hazards identified by assessing the contribution of fatigue to safety reports and events that have occurred.

Fatigue Risk

Reactive - e.g., 'fix' a pairing after publishing

Proactive - e.g., 'fix' a pairing during day-of operations

Predictive - e.g., set a process where potential risk mitigations are built into pre-month solution

Fatigue Risk examples:

- **Long hotel drive time to short layover**
- **Limited sleep opportunity before and after a disruptive or international flight**
- **Multi-segment FDP scheduled before and after a redeye flight, including more than one redeye flight in a pairing**

Challenges of Identifying and Measuring Fatigue in Aviation Operations

- **No gold standard for measuring fatigue**
- **Fatigue related performance affects many skills and has many causes**
- **Fatigue is associated with increased performance variability**
- **Individual differences exist**
- **Each operation is unique**

Need a variety of measures and data sources

Fatigue versus safety risk

Fatigue causes impairment

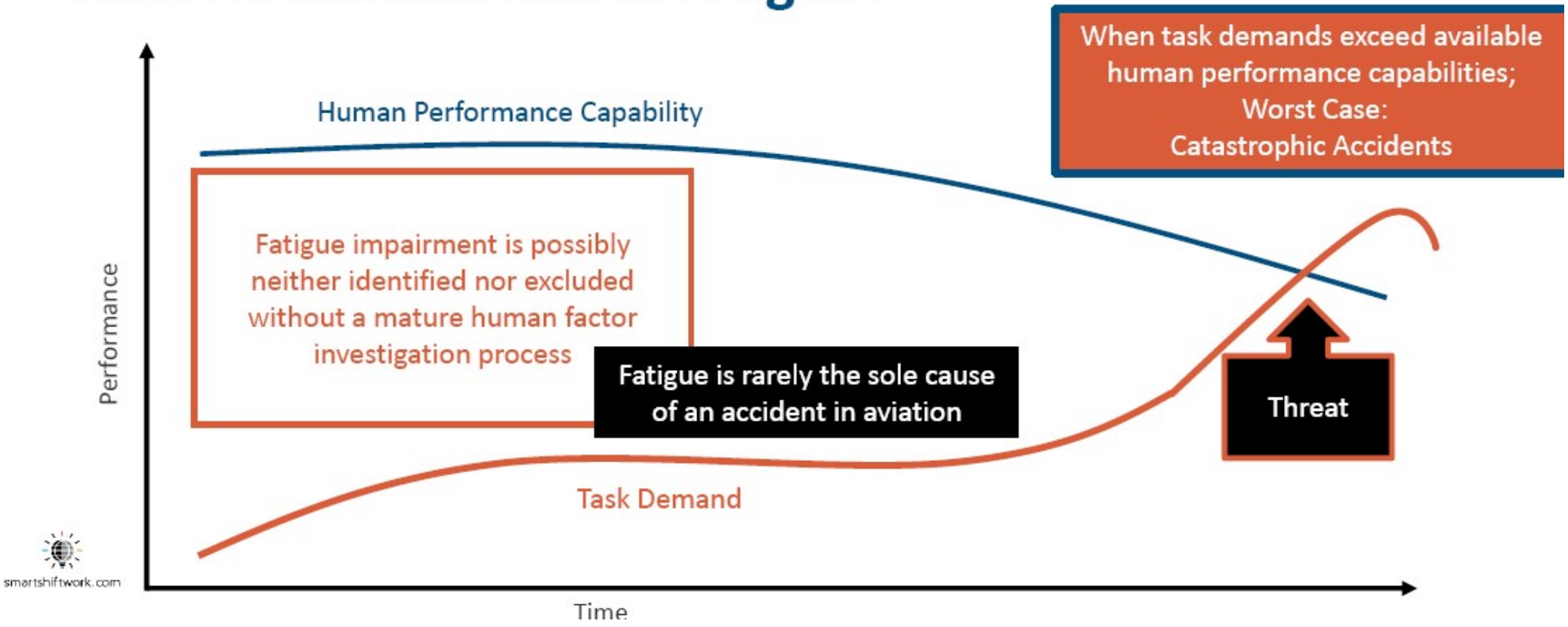
Safety risk depends on:

- What a fatigued person is doing
- Other hazards present
- Safety defences present

Solo helicopter pilot trying to avoid power lines around midnight, 15th load since a 1-hour nap 14 hours ago

4-pilot crew, in-flight sleep in crew bunk mid-cruise versus landing

What is the real risk of fatigue?



Operational SPIs

- **Create your own Safety Performance Indicators**
- **Derived from data that you already routinely collect**
- **Reflective of the specific causes of fatigue risk in different operations**
- **Supported by scientific knowledge and fundamentals**

Science Behind SPIs

Pairing Risk Name	Scientific Intent
Special Airports	Additional workload associated with these airports may increase fatigue. Pilots need to be fully rested for best performance through additional challenges
Multiple Time Zone Crossings	Sleep may be disrupted if the circadian master clock is not fully synchronized to local time. Pilots often split sleep - some during local night and some during biological night.
Late Release Time	Duty overlaps biological night and therefore restricts sleep opportunity. Later landings can occur during the WOCL.
Early Start Time	Duty overlaps biological night and therefore restricts sleep opportunity. Earlier take-offs may occur during the WOCL.
Domestic Rotation Limits	This limits the risk of greater sleep debt accruing over longer rotations.
Multiple Ocean Crossings	Long sequences of back-to-back trans meridian flights can cause circadian drift (circadian master clock cannot synchronise to any time zone and adopts a period longer than 24 h). This contributes to sleep disruption and cumulative sleep debt.
Scheduling to Maximum Limits	Scheduling to within 1 h of the FDP limits gives limited room for unforeseen delays that can lead to schedule changes and/or reduced rest breaks.
Scheduling to Limits on Consecutive Days	This creates the likelihood of sequential schedule disruptions and break reductions.
Degrees Crossing Direction	Eastward flights across at least 4 time zones can result in major circadian desynchrony as some rhythms adapt by shifting eastward and others by doing the inverse adaptation westward (e.g., 4 h west versus 16 h east). In general, adaptation is slower after eastward than westward flights crossing the same number of time zones.

Creation of Mitigations

- **Adjust optimizer rules or create new rules**
- **Pairing construction that avoids fatigue risk**
- **Hotel location/facility adjustments**
- **Creation of new policies and procedures**
- **Improvement of crew rest facilities on aircraft or in crew base**
- **Augmentation when not required under regulation**
- **Review and adjust regulatory and labor requirements**

COVID-19 Driven Fatigue Risks and Possible Mitigations

Potential Fatigue Risks

New areas of potential fatigue risks may include:

- **Reduction in staffing levels having the potential for remaining staff to be working longer, more intense or condensed hours**
- **COVID-19 health and safety measures may cause a more fatiguing working day**
- **COVID-19 influencing many aspects of personal life, affecting crews general physical and mental fitness**
- **Extended duty-times and use of heavy crew to avoid lay-overs due to testing / quarantine requirements**
- **Use of First class and Business class seats as rest facilities**
- **Unfamiliar operations, such as new airports for repatriation flights, or new gate locations for cargo vs. passenger facilities**

Safety Behaviors

Changing safety behaviors to be aware of may include:

- **Reduced safety and fatigue reporting by crews**
- **Increased likelihood of crews not identifying when impaired by fatigue**
- **A higher acceptance of reduced safety margins within operations**
- **Rushing or reduced time allocated for safety checks and procedures**

Limited science and experience is available

Resources

Quick Reference Guidance
(QRG)

Alleviation Title	**Variations to existing flight and duty time limitations**
Version	**1.0**
Publication Date	**17 April 2020**
Relevant Standard(s)	**Annex 6 Part I – 4.10 Fatigue Management** **Annex 6 Part III, Section II – 2.8 Fatigue Management** This guidance applies to the entire sections as listed above, with particular reference to: **Annex 6 Part I – International Commercial Air Transport — Aeroplanes** ...

The Global Voice of Pilots
IFALPA

POSITION PAPER

20POS02
4 April 2020

Fatigue Mitigation for Flights Affected by COVID-19 Restrictions

EASA
together4safety

The Fatigue of Aviation Personnel in the Context of COVID-19

IATA

Guidance for managing crew fatigue during a crisis
Edition 1 – 16 October 2020

U.S. Department of Transportation
Federal Aviation Administration

SAFO
Safety Alert for Operators

SAFO 20009
DATE: 4/17/20

Flight Standards Service
Washington, DC

http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo

A SAFO contains important safety information and may include recommended action. SAFO content should be especially valuable to air carriers in meeting their statutory duty to provide service with the highest possible degree of safety in the public interest. Besides the specific action recommended in a SAFO, an alternative action may be as effective in addressing the safety issue named in the SAFO.

Subject: COVID-19: Updated Interim Occupational Health and Safety Guidance for Air Carriers and Crews.

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Thank you for your attention