

CANSO AFRICA CONFERENCE 2022

Dakar, Senegal

5 – 9 September 2022

09:00 – 17:00

Host:



WORKSHOP: SAFETY – FATIGUE MANAGEMENT, JUST CULTURE & CISM

SESSION 1: THE STATUS OF FATIGUE RISK MANAGEMENT IN AFRICA

FACILITATOR



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Fatigue Risk Management

CANSO conference

Dakar, Senegal, September 2022



Aviation Consultants and Fatigue Experts

Who are we? (1)



- **World leading aviation consultancy firm** providing research and advisory services to the global aviation community
- Clients: **Airports, Air Navigation Service Providers, Institutions and Authorities, and Airspace users**
- Assist clients in improving operational performance across areas of **Safety, Environment, Efficiency and Capacity**
- **Data analysis combined with operational expertise**
- International experience & local presence
- Founded in 2000
- Over 200 satisfied clients and **more than 100 employees worldwide** plus part-time aviation professionals



- **World leading specialist in workforce planning & scheduling and Fatigue Risk Management**
- Clients in aviation: **Air navigation/Air traffic control service providers, Airlines, Airports**
- Assist organisations in striking the **perfect balance between people, resources and time**
- **Strategic, tactical and operational solutions**
- International experience in all areas of economy including aviation
- Founded in 1987
- Over 1500 satisfied clients and **more than 180 employees worldwide**

Who are we? (2)



ATM expert &
Coordinator

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*Experienced ATM expert that
combines analytical and
organisational skills*



*Leading expert in fatigue
research, combining scientific
background with practical
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Fatigue &
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ATM expert

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*Licensed air traffic controller
and supervisor with years of
experience in fatigue risk
management*



- **Introduction to FRM**

- Fatigue
- Risk
- Management

- **Towards FRM**

- Develop prescriptive limitations and regulations for variations
- Comply with SMS requirements
- Guarantee regulatory oversight
- Training

Introduction to FRM

Fatigue is defined by ICAO as a physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload that can impair an Air Traffic Controller's alertness and ability to adequately perform safety related operational duties.

Key factors fatigue:

- **Time of day**

effect of circadian rhythms

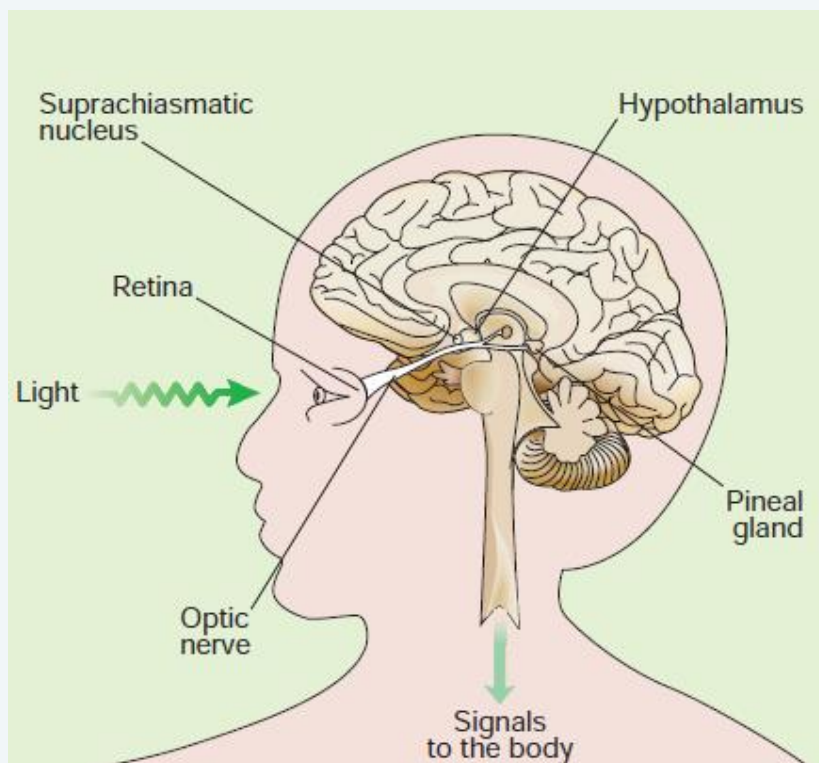
- **Period awake and amount of sleep**

quantity and quality of pre-duty sleep

- **Shift length and intensity**

time on position, workload, alternation in tasks and breaks

Key factor 1: Time of day - effect of circadian rhythms



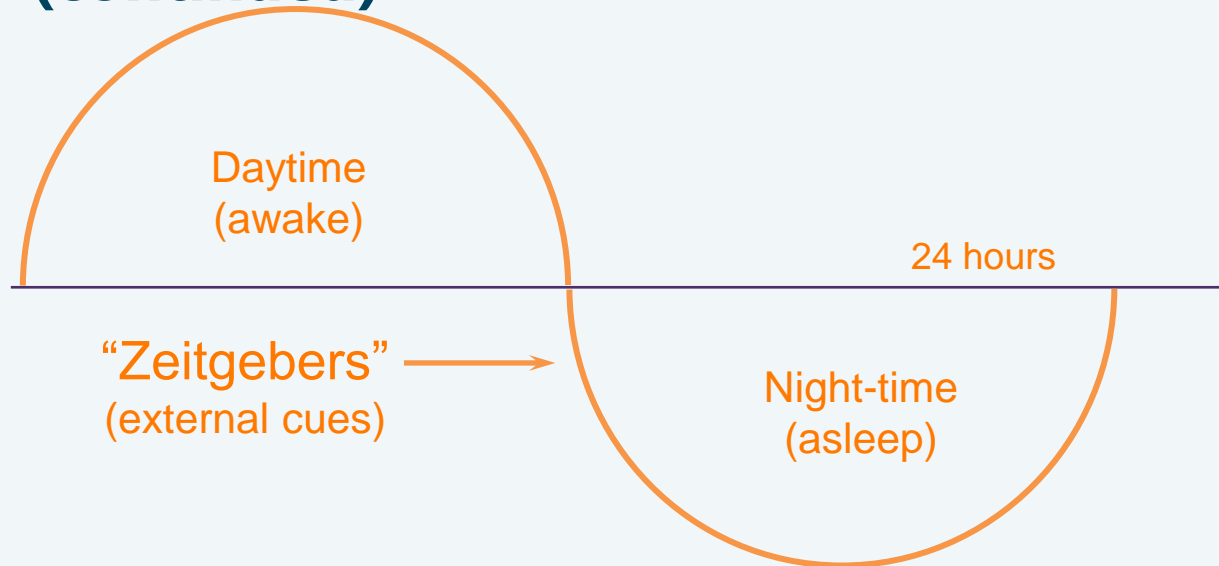
All human beings have a circadian master clock located in a small cluster of cells in the hypothalamus

The circadian body clock programs humans for daytime wakefulness and night-time sleepiness

Light, entering via the retina of the eye, helps the circadian body clock to stay in step with the day/night cycle

Key factor 1: Time of day - effect of circadian rhythms

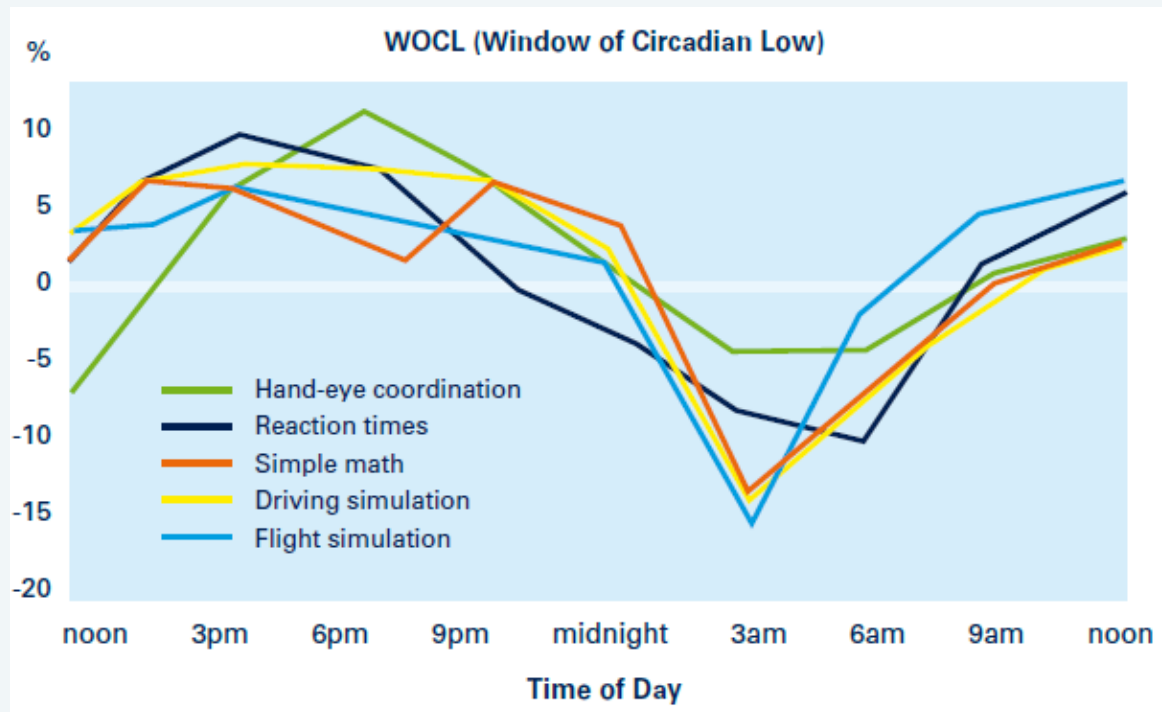
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The circadian body clock controls a daily rhythm that lasts approximately 24 hours

Shift work (circadian disruption) is a mismatch with the human natural rhythms of sleeping, eating and (social) activity

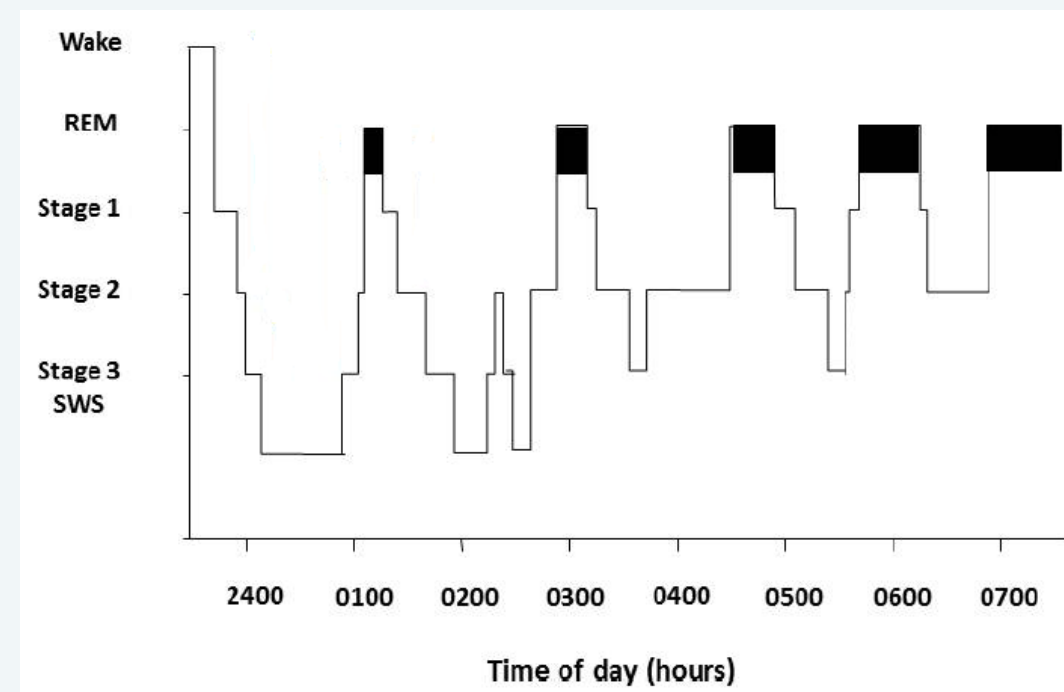
Key factor 1: Time of day - effect on performance



The circadian body clock produces daily highs and lows in performance (the window of circadian low is between 02:00 and 06:00 hours)

Key factor 2: Period awake and amount of sleep

- For sleep to be fully restorative, it must contain unbroken cycles of all the sleep stages
- The circadian body clock affects the timing and quality of sleep
- Reducing the amount or quality of sleep decreases the ability to function and increases sleepiness the next day
- Sleep quality declines as a normal part of aging



Source: Fatigue Management Guide for Air Traffic Service Providers

Key factor 3: Shift length and intensity - time on position, workload, alternation in tasks and breaks

- The ICAO definition of fatigue describes workload as “mental and/or physical activity” (slide 6) and recognizes that both high and low workload may potentially cause fatigue
- Breaks during a duty period are an important way of reducing the decline in performance with increasing time on task due to the effects of high workload
- Alternation in tasks may be an appropriate countermeasure in case of low workload
- Single Persons Operation may involve risks

Fatigue effects performance in numerous ways



**Situational
awareness**



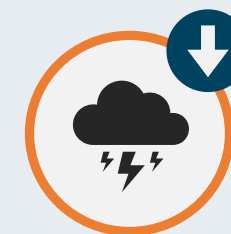
Decision-making



**Ability to communicate
and interact**



**Omissions
and errors**



**Ability to oversee
unexpected situations**



Fatigue

- is inevitable in a 24/7 industry
- cannot be eliminated



Must (therefore) be managed



Fatigue risk management deals with assessing and addressing the safety implications of fatigue.

It is a shared responsibility of:

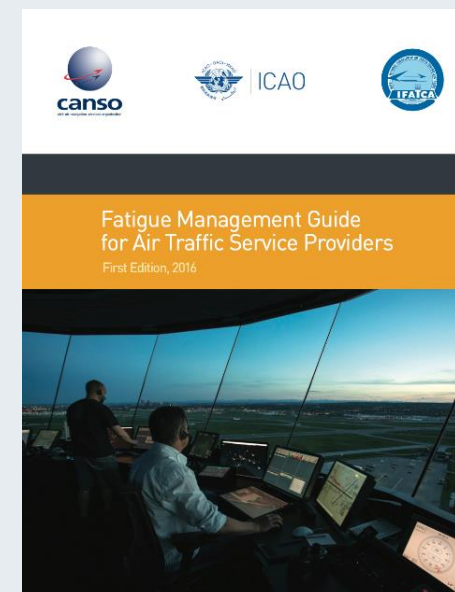
- State
- Service provider
- Operational personnel



Fatigue Risk Management

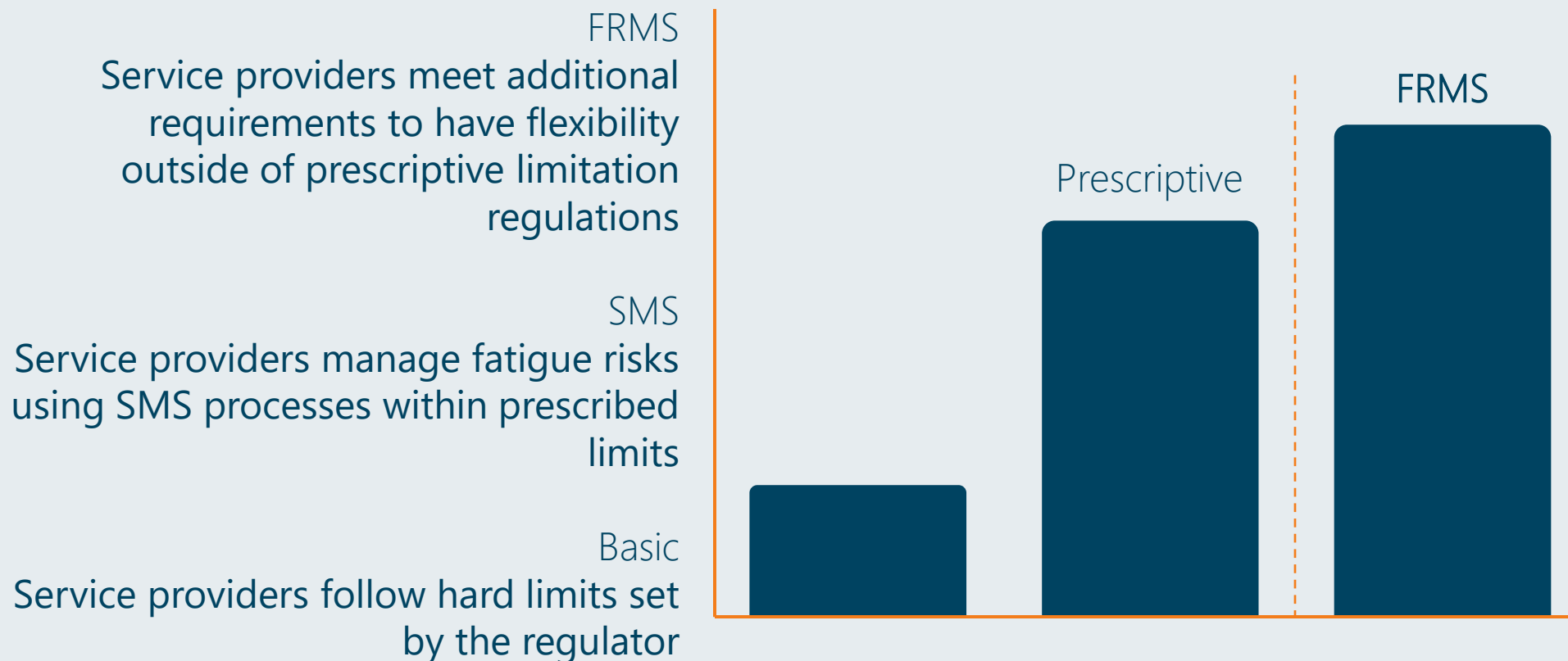
ICAO distinguishes between different approaches:

- Prescriptive approach
 - Service providers manage fatigue risks using SMS processes within prescribed limits
- Performance based approach (FRMS approach)
 - Service providers meet additional requirements to have flexibility outside of prescriptive limitation regulations *



** A Fatigue Risk Management System (FRMS) is defined by ICAO as a data-driven means of continuously monitoring and managing 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.*

Fatigue Risk Management

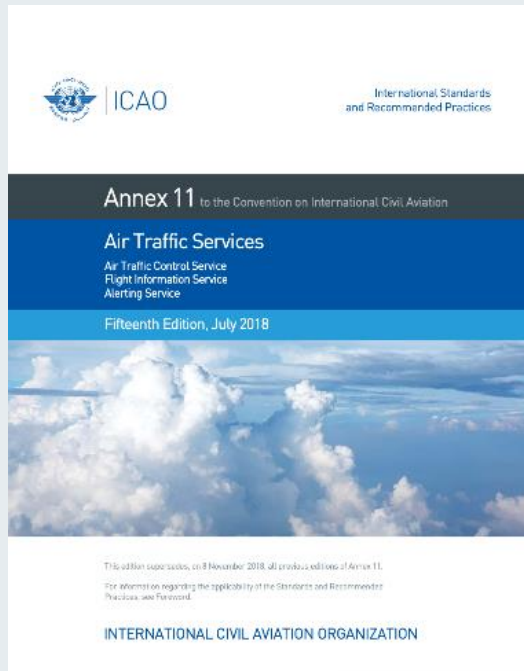


Source is based on material from ICAO Doc 9966
"Manual for the Oversight of Fatigue Management Approaches"

FRM - Compliance and benefits

Compliance

- Mandatory by ICAO since November 2020

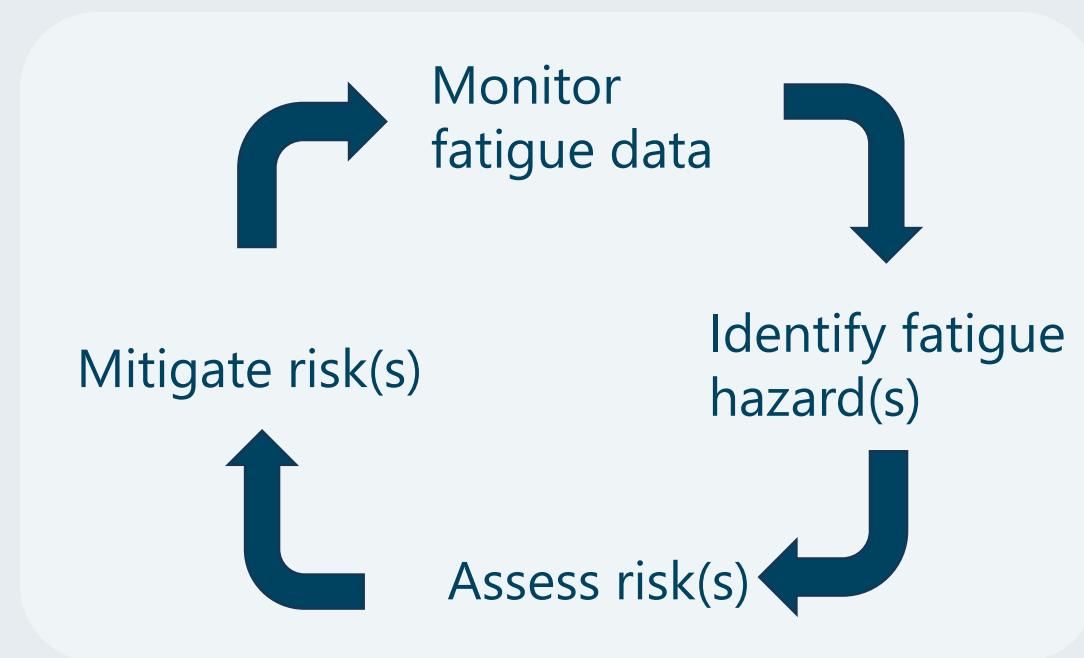


FRM benefits

- Improve operational task performance
- Improve safety
- Improve employee alertness
- Improve general well-being (thereby reducing staff turnover)
- Gain operational flexibility (FRMS)

Towards FRM

- 1 Develop prescriptive limitations and regulations for variations**
- 2 Comply with SMS requirements**
- 3 Guarantee regulatory oversight**
- 4 Training**



Develop prescriptive limitations and regulations for variations

1

1. States shall establish prescriptive limitation regulations that take into account acute and cumulative fatigue, circadian factors and the type of work being undertaken. These regulations shall identify:

a) the maximum:

- i) number of hours in any duty period;*
- ii) number of consecutive work days;*
- iii) number of hours worked in a defined period; and*
- iv) time-in-position;*

b) the minimum:

- i) duration of non-duty periods;*
- ii) number of non-duty days required in a defined period; and*
- iii) duration of breaks between periods of time-in-position in a duty period.*

Monitoring, Identifying and Assessing fatigue risks

ICAO SARPs identify different types of data and information to monitor in order to identify fatigue hazards in daily operations and/or schedules and to assess their risk(s):

2

- Fatigue assessment (questionnaire, **log study during duties**, interviews)
- **Sleep assessment** (sleep diary, actigraphy)
- **Roster analysis** (biomathematical tooling)
- Workload assessment (survey, site visits, performance data)



Objective:

To get a good understanding of the development of alertness, fatigue and workload during different types of shifts

To identify fatigue risks during the course of various types of shifts

Means:

A booklet with very short questionnaires to be filled in every hour during operational duties (paper-and-pencil log)

- Logs must be completed during active duty
- Paper-and-pencil logs are proven to bring minimal disruption to operational duties

Highlighted: Sleep Assessment

Objective:

To get a good understanding of sleep/wake patterns as well as quality and quantity of sleep post and prior to different duties

To assess if there are any 'sleep risks' (that is low levels of sleep duration and/or low levels of sleep quality) post or prior to specific duties or within specific schedules

Means:

Actigraphy in combination with sleep diaries for a set period of time

Actigraphy: a non-invasive method of monitoring human rest/activity cycles

- Actigraphy can be considered the most appropriate measure available to objectively record general sleep patterns in a non-laboratory setting

Sleep diaries: short online questionnaires upon awakening and at bedtime

- Sleep diary data are typically used to enhance the reliability of the actigraphy data



Highlighted: Roster Analysis

Objective:

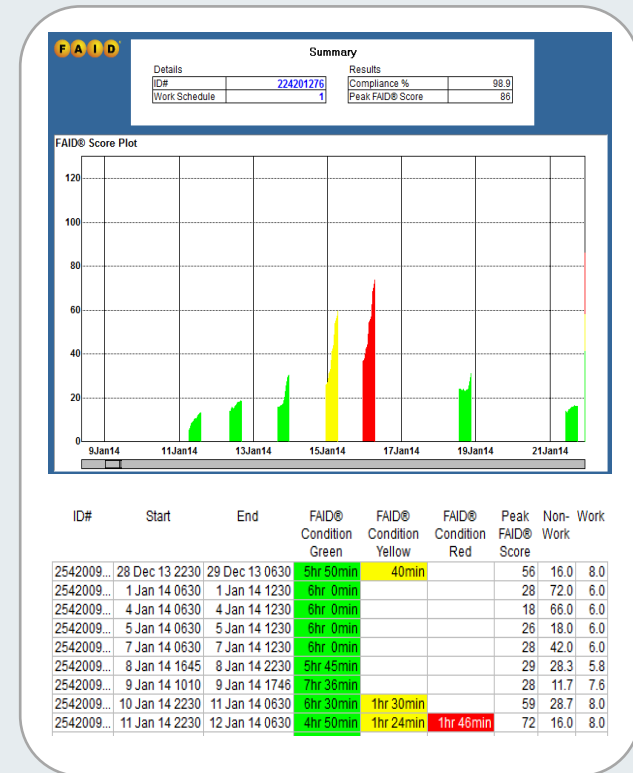
To examine general roster characteristics, assess robustness of the rosters and identify potential fatigue hazards (planned and actual roster)

Means:

General roster characteristics, and the robustness of the roster can be analyzed by using MS Excel

Fatigue hazards can be identified by using a bio-mathematical model

- FAID is an example of a bio-mathematical model :
 - It is an internationally accepted instrument for measuring current, work-related, fatigue and is often used in aviation
 - FAID calculates a Fatigue Risk Score, this score is based on four factors: (1) Time of day of work, (2) duration of work, (3) work history in the preceding seven days, and (4) biological limits on recovery sleep



2

Where a **fatigue risk** is identified while complying with prescribed limits, a safety action plan identifying appropriate mitigations and controls according to its current safety management practices has to be put in place

The **risk mitigations** need to be regularly reviewed and assessed to ensure their desired outcome continues

3

States must:

- Assess a service provider's compliance with prescribed limits and associated requirements
- Monitor compliance with approved processes for extending work periods in sudden unforeseen operational circumstances, to ensure that such extensions are used only as appropriate
- Check that SMS processes applied to fatigue-related risks are sufficiently robust to manage the fatigue risk in any situation

Service Providers have to incorporate basic fatigue management topics in their awareness and training programmes

ICAO provides recommended fatigue training topics for

- Individual operational personnel
- Personnel involved in schedule (roster) design and management
- Executive decision-makers and operational risk managers

4

Examples of topics:

- The basics of fatigue including sleep fundamentals and the effects of disturbing the circadian rhythms.
- The causes of fatigue, including medical conditions that may lead to fatigue.
- How to identify fatigue in oneself and in others.
- How scheduling affects sleep opportunities and can disrupt the circadian biological clock cycle, the fatigue risk that this creates, and how it can be mitigated through scheduling.
- Use and limitations of any scheduling tools and bio-mathematical models or other algorithms that may be used to predict an individual's fatigue across a schedule/roster
- The responsibilities and accountabilities of different stakeholders in fatigue management

How can To70/Déhora assist



Research

Data collection methods include: fatigue assessment (survey, log study), sleep assessment (sleep diary study, actigraphy), roster analysis (biomathematical models), as well as workload assessment (survey, site visits).



Recommendations

Based on the outcomes of research, To70/Déhora can provide recommendations from setting the appropriate parameters for prescriptive limitations on working hours to the implementation of a Fatigue Risk Management System.



Training

Training topics include: the working of the circadian body clock, sleep and sleep hygiene, alertness during the night, as well as strategies to deal with fatigue, including promoting a healthy lifestyle.

Combined Fatigue and ATM knowledge, with experience and resources

- Our team consists of a combination of scientific researchers and experienced operational experts, such as ATCOs, supervisors and airline pilots.
- Our team possesses the required knowledge, tools, experience and resources to successfully fulfil any FRM project in aviation.
- Our team has successfully completed FRM projects for other ANSP's and airlines.
- Our team can include a local partner in your country, making fast and easy communication possible.



Thank you for your attention

FACILITATOR



Loise Mwangi

CANSO Focal Point, Kenya Civil Aviation Authority, and
Chair, CANSO Safety Workgroup



QUESTIONS AND ANSWERS



THANK YOU

THANK YOU

TO OUR SPONSORS



THANK YOU

TO OUR EXHIBITORS

