



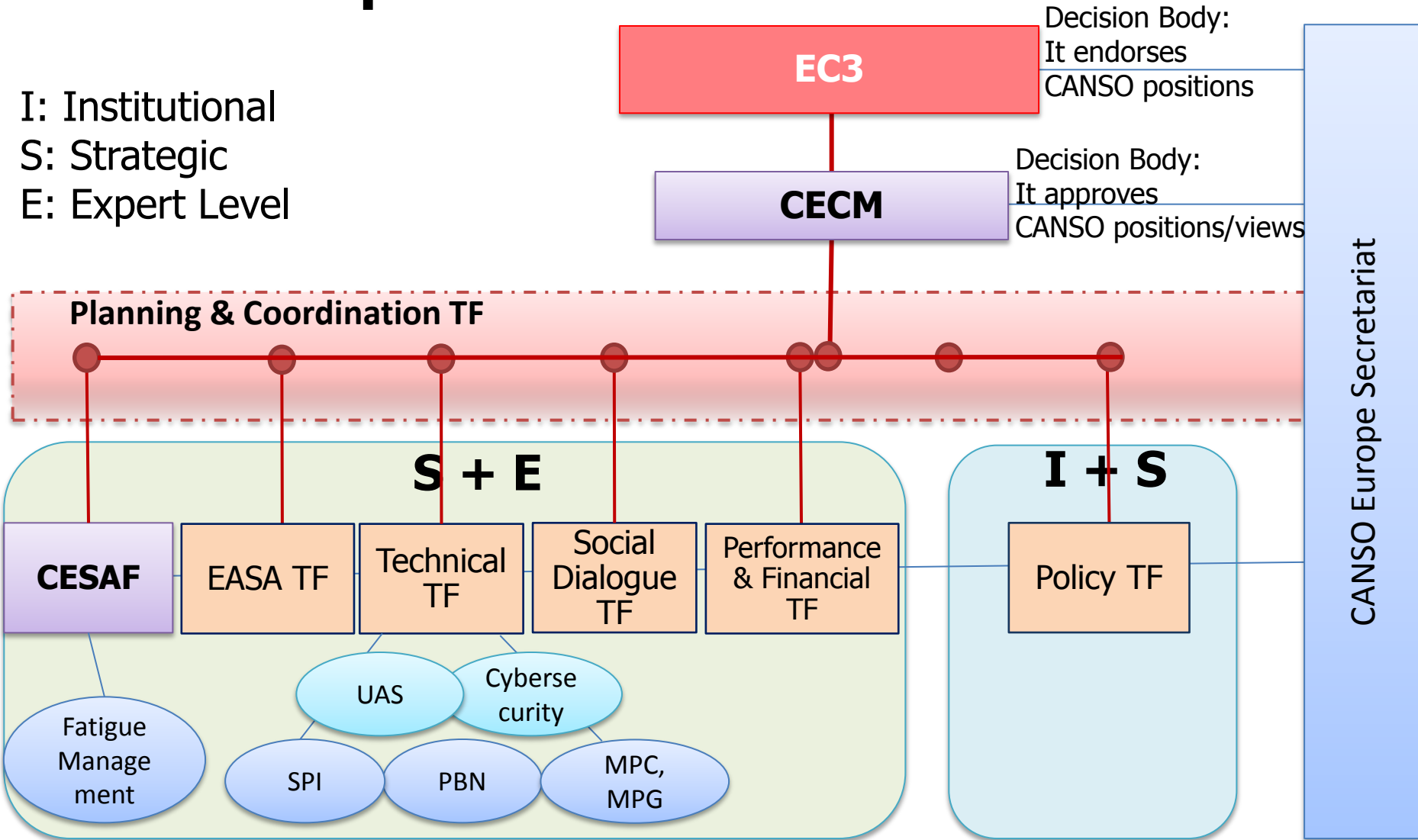
# **CANSO Fatigue Management Expert Group**

**TRANSFORMING**  
GLOBAL ATM PERFORMANCE

ES2-WS2-2018 - 28-29 of May 2018 ECTRL HQ –VEGA

# CANSO Europe structure 2018

I: Institutional  
S: Strategic  
E: Expert Level



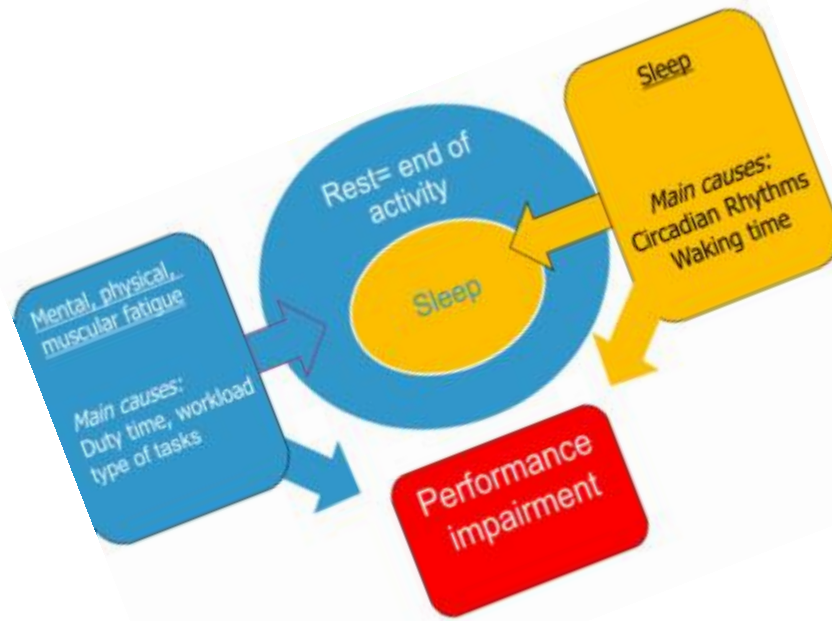


**canso**  
civil air navigation services organisation

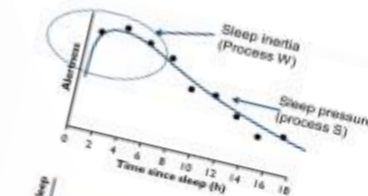
**Fatigue management in  
aviation : scientific approach,  
rostering and safety issues,  
regulatory situation and  
available material  
(ICAO, EASA)**

**TRANSFORMING**  
GLOBAL ATM PERFORMANCE

# A bit of science ... later !

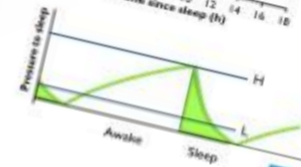


Adapted from Folkard, 2008



Alertness is decreasing along the hours as pressure to sleep is increasing

Process  
Clock,  
Waking  
and Sleep



Process C and S are synchronized

- Good nighttime sleep the night
- High daytime alertness

Alertness is decreasing along the hours as pressure to sleep is increasing

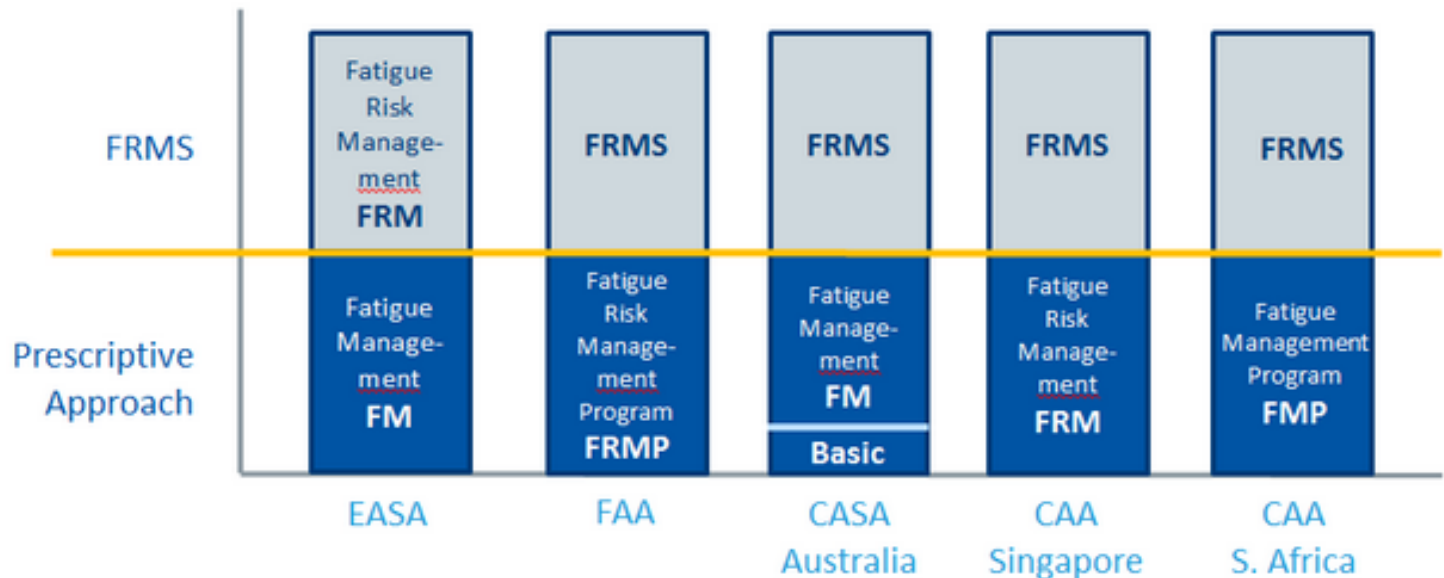


# As a starting point : ICAO

## Regulatory FM Terminology

### Fatigue Management Terminology

Where States have developed regulations for both fatigue management approaches, they have sometimes used different terms from “prescriptive” and “FRMS”. The following diagram identifies some of these different terms and clarifies to which of the two fatigue management approaches they relate.



# Well, it's not only a question of wording...

# The philosophy of the rule

## Annex 11, 2.28 Fatigue management

### Prescriptive regulations:

- Mandatory
- In accordance with **Appendix 6**

#### 2.28.1

FM regulations to be established by States

#### 2.28.2

ATS provider obligations for fatigue management

#### 2.28.3

Additional requirements associated with prescriptive regulations.

#### 2.28.4

Additional requirements associated with FRMS regulations

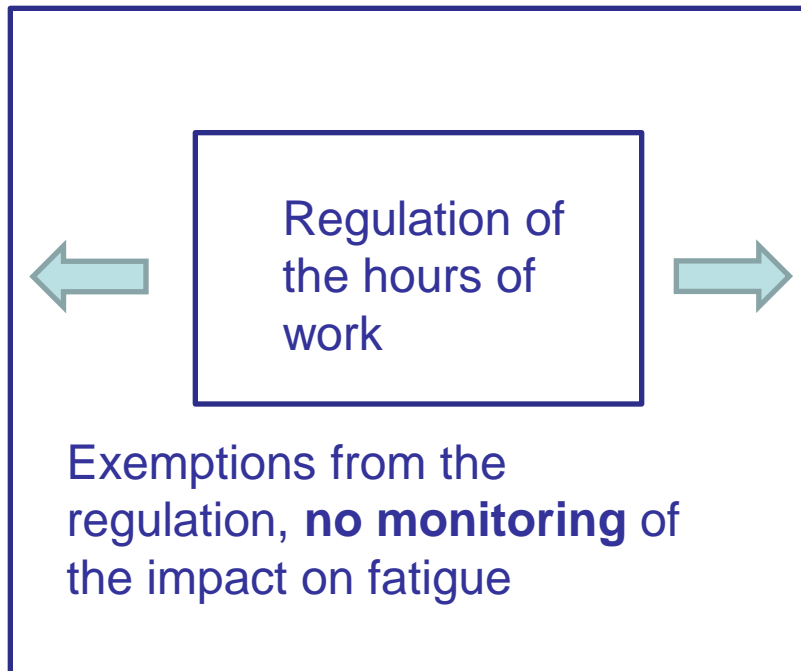
### FRMS regulations:

- Optional
- In accordance with **Appendix 7**

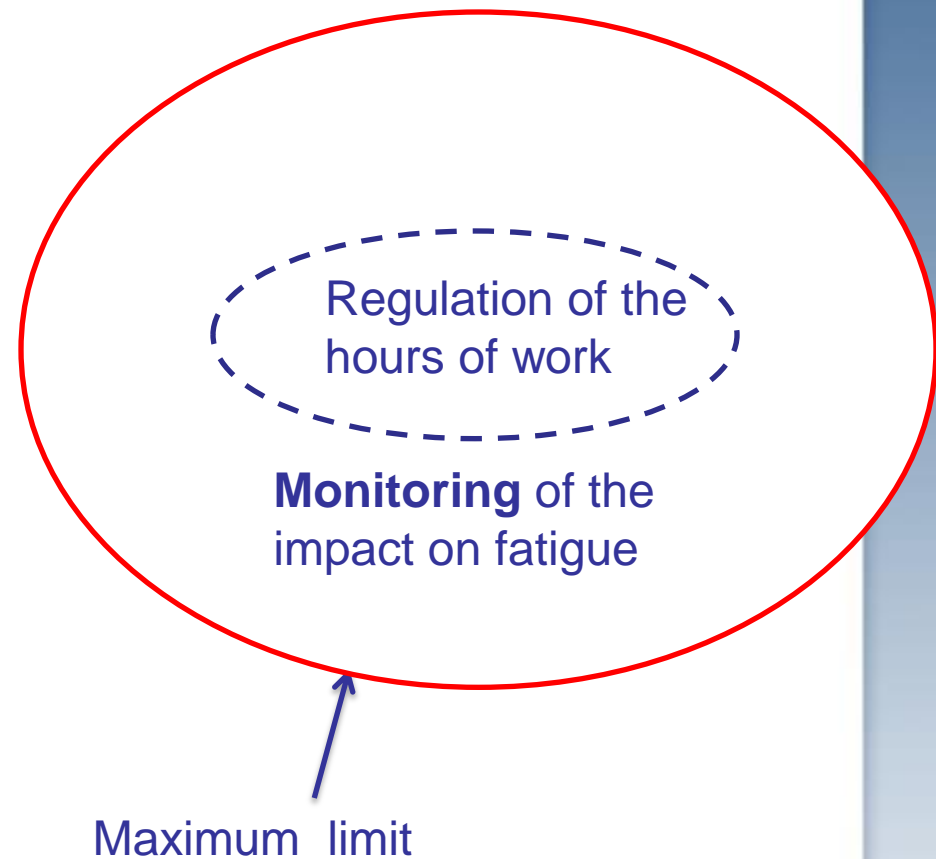


# Prescriptive versus FRMS approach

## Prescriptive approach

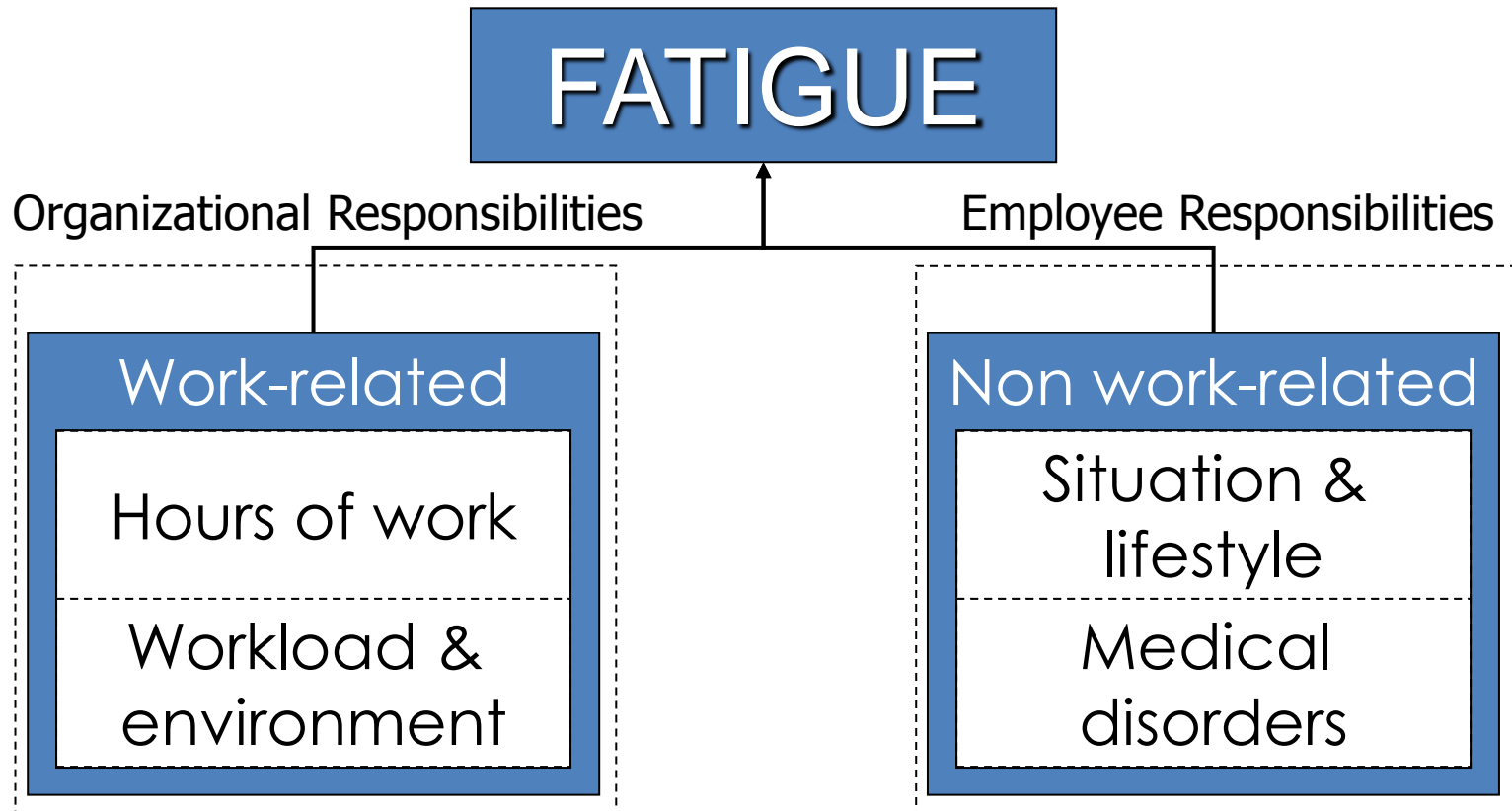


## FRMS approach





# Joint Responsibility for Fatigue



# Challenges ahead !

# 1. Prescriptive Regulation - How to construct rosters ?

## APPENDIX 6. PRESCRIPTIVE FATIGUE MANAGEMENT REGULATIONS

*Note.— Guidance on the development and implementation of prescriptive fatigue management regulations is contained in the Manual for the Oversight of Fatigue Management Approaches (Doc 9966).*

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.



### ATS.OR.320 Air traffic controllers' rostering system(s)

- (a) An air traffic control service provider shall develop, implement and monitor a rostering system in order to manage the risks of occupational fatigue of air traffic controllers through a safe alternation of duty and rest periods. Within the rostering system, the air traffic control service provider shall specify the following elements:
- (1) maximum consecutive working days with duty;
  - (2) maximum hours per duty period;
  - (3) maximum time providing air traffic control service without breaks;
  - (4) the ratio of duty periods to breaks when providing air traffic control service;
  - (5) minimum rest periods;
  - (6) maximum consecutive duty periods encroaching the night time, if applicable, depending upon the operating hours of the air traffic control unit concerned;
  - (7) minimum rest period after a duty period encroaching the night time; and
  - (8) minimum number of rest periods within a roster cycle.

## 2. FRMS FOR ANSP: How to crunch a 12 years' experience story

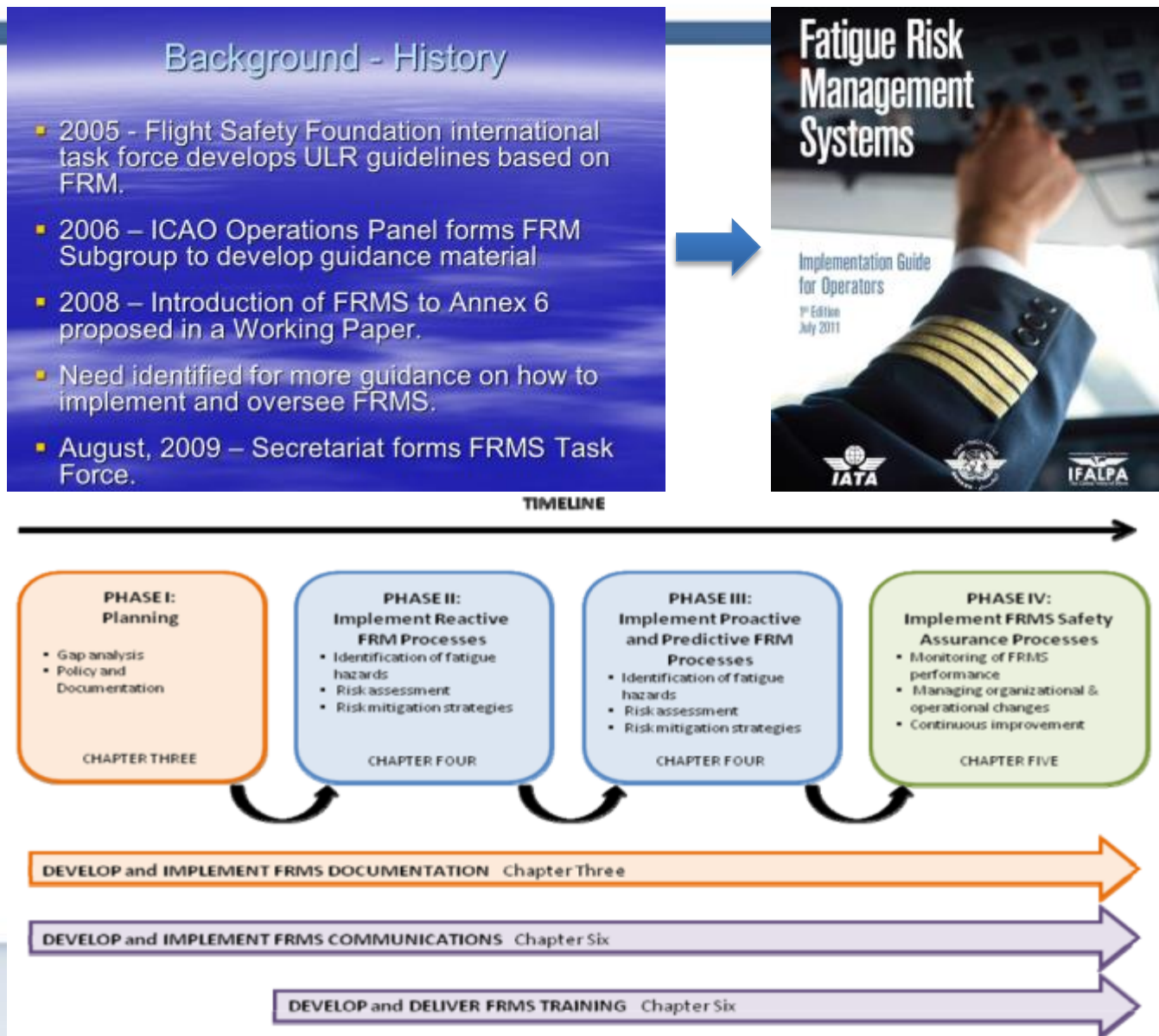


Figure 7.1: Stage approach to FRMS implementation

## 2. FRMS FOR ANSP: How to crunch a 12 years' experience story

Second Edition,  
2015



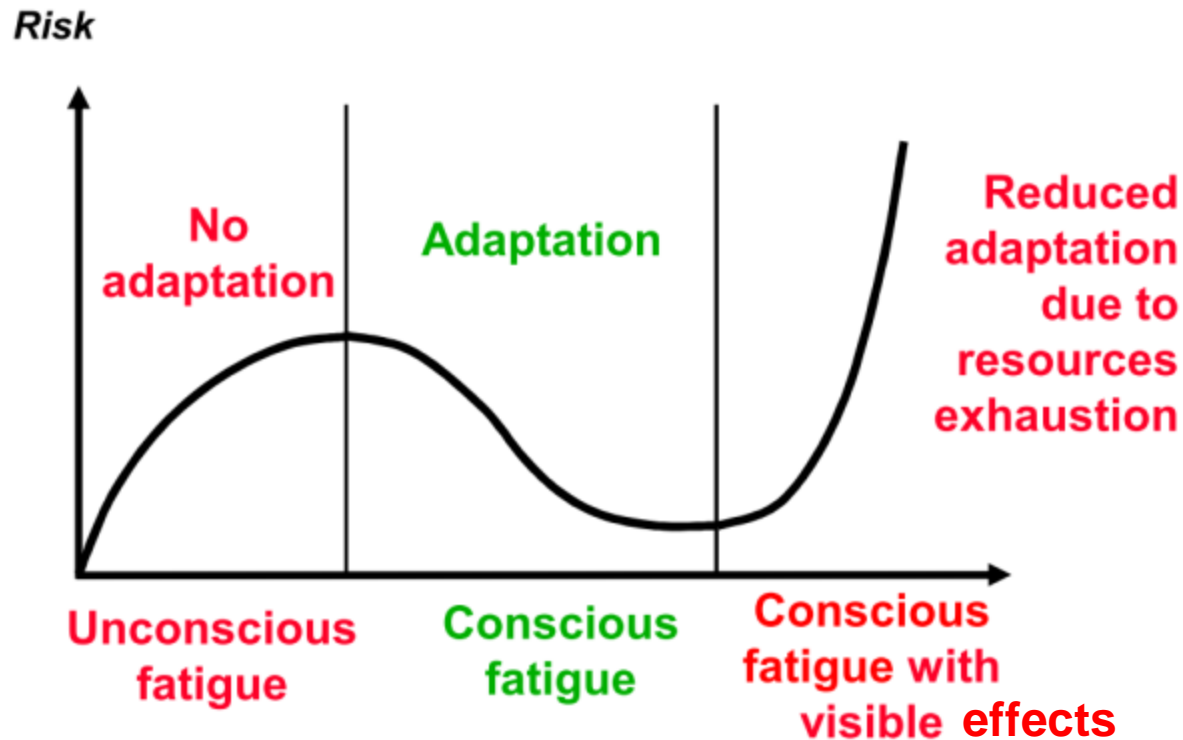
First Edition,  
2016



Figure 7-1. Four phases in FRMS implementation



# Fatigue and risk ? a non linear relationship



????

FRMS

????



# What is FRMS ?

- **FRMS is a risk approach to fatigue and should work inside an approved SMS**
- **A fatigue risk management system involves:**
  - **Policies/responsibilities**
  - **Risk assessment**
  - **Hazard controls/action plans**
  - **Training and education**
  - **Ongoing review and improvement**  
**(fatigue auditing and measurements)**

# Last but not least !

# Where is FRMS ?



## ATS.OR.315 Fatigue

In accordance with ATS.OR.200, an air traffic control service provider shall:

- (a) develop and maintain a policy for the management of air traffic controllers' fatigue;
- (b) provide air traffic controllers with information programmes on the prevention of fatigue, complementing human factors training provided in accordance with Sections 3 and 4 of Subpart D of Annex I to Regulation (EU) No 2015/340.

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  - (7) minimum rest period after a duty period encroaching the night time; and
  - (8) minimum number of rest periods within a roster cycle.
- (b) An air traffic control services provider shall consult those air traffic controllers who will be subject to the rostering system, or, as applicable, their representatives, during its development and its application, to identify and mitigate risks concerning fatigue which could be due to the rostering system itself.



# Annex IV to ED Decision 2017/001/R

- **GM1 ATS.OR.315 Fatigue**  
EFFECTS OF FATIGUE [...]
- **AMC1 ATS.OR.315(a) Fatigue**  
FATIGUE MANAGEMENT POLICY [...]
- **GM1 to AMC1 ATS.OR.315(a) Fatigue**  
FATIGUE TAXONOMY [...]
- **GM2 to AMC1 ATS.OR.315(a) Fatigue**  
FATIGUE IN OCCURRENCE  
INVESTIGATION AND ANALYSIS [...]
- **GM3 to AMC1 ATS.OR.315(a) Fatigue**  
IDENTIFICATION AND MANAGEMENT  
OF THE EFFECT OF FATIGUE ON THE  
SAFETY OF OPERATIONS [...]
- **GM1 ATS.OR.315(b) Fatigue**  
INFORMATION PROGRAMMES [...]
- **GM2 ATS.OR.315(b) Fatigue**  
INFORMATION PROGRAMMES [...]
- **AMC1 ATS.OR.320(a)(6);(7) Air traffic controllers' rostering system(s)**  
NIGHT TIME [...]
- **GM1 ATS.OR.320(a) Air traffic controllers' rostering system(s)**  
STRUCTURE AND VALUES OF THE  
ROSTERING SYSTEM [...]
- **GM1 ATS.OR.320(b) Air traffic controllers' rostering system(s)**  
AIR TRAFFIC CONTROLLERS'  
INVOLVEMENT



## FATIGUE MANAGEMENT POLICY

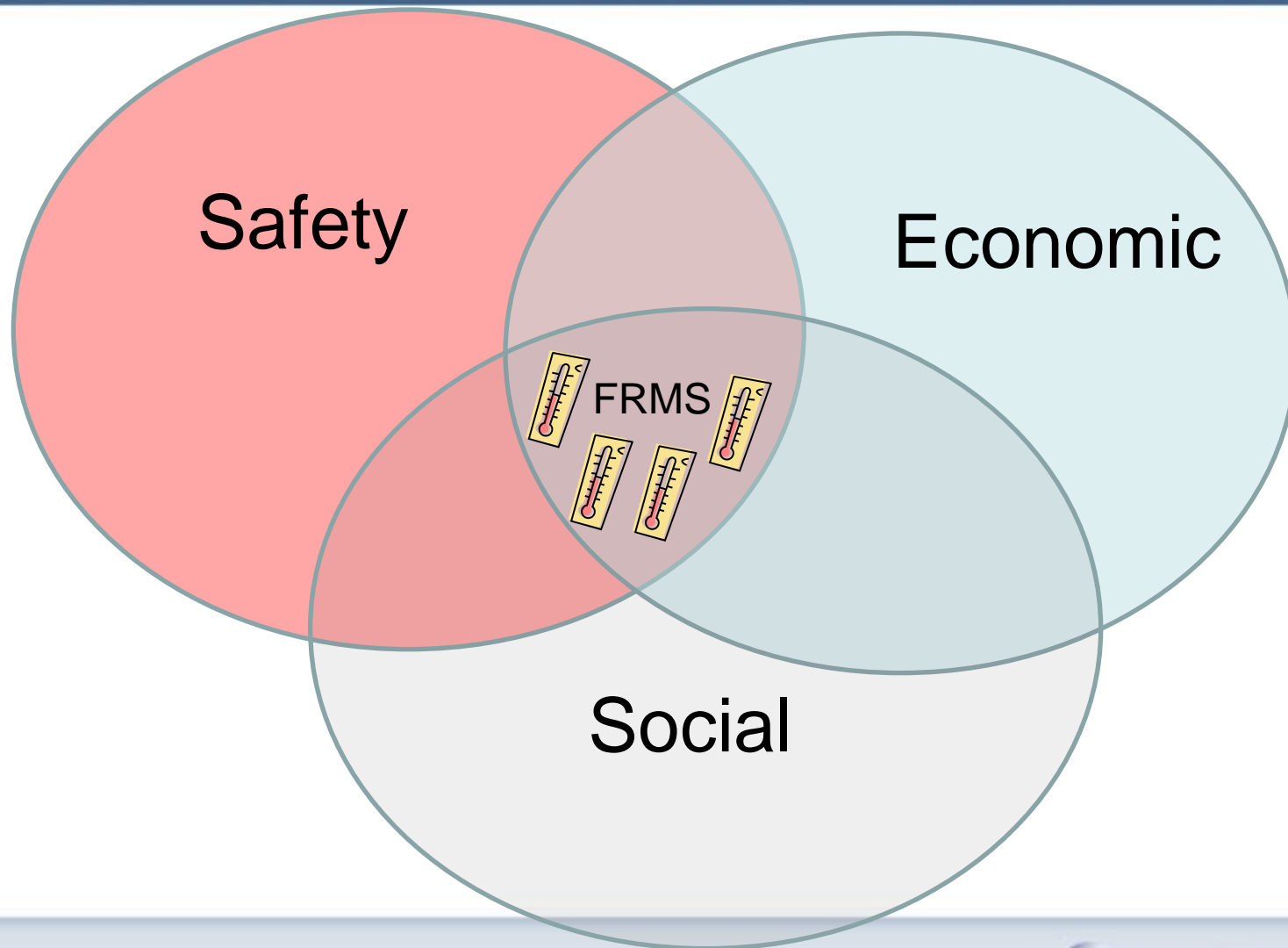
- (a) The air traffic controllers' fatigue management policy should:
- (1) declare the commitment to proactively and systematically monitor and manage fatigue and describe the expected benefits for the safety of operations;
  - (2) be signed by the accountable manager;
  - (3) address the mitigation of the operational impact of air traffic controllers' fatigue;
  - (4) be communicated, with visible endorsement, throughout the air traffic control service provider;
  - (5) include a commitment to:
    - (i) consider the best practices;
    - (ii) provide appropriate resources; and
    - (iii) enforce fatigue management as a responsibility of managers, staff involved in fatigue management procedures and air traffic controllers;
  - (6) be periodically reviewed to ensure it remains relevant and appropriate.
- (b) In accordance with the policy in point (a), the air traffic control service provider should establish and implement:
- (1) principles and procedures to enable fatigue reporting;
  - (2) principles and procedures for occurrence investigation and analysis to consider fatigue as contributing factor;
  - (3) procedures for the identification and management of the effect of fatigue on the safety of operations.



### IDENTIFICATION AND MANAGEMENT OF THE EFFECT OF FATIGUE ON THE SAFETY OF OPERATIONS

- (a) The following non exhaustive list contains some of the initiatives that the air traffic control service provider may undertake in order to identify air traffic controllers' fatigue:
  - (1) establishment of a procedure allowing air traffic controllers to report when fatigued, and promotion of its use. Templates for such reporting procedure could be established;
  - (2) utilisation of system support to manage rostering principles and thresholds established in accordance with [ATS.OR.320](#), also highlighting criticalities in advance;
  - (3) undertaking fatigue surveys;
  - (4) application of scientific principles on fatigue and fatigue management and their effect on the operational and organisational context.
- (b) The knowledge and understanding of the underlying scientific principles of fatigue, as well of its potential impact on the safety of operations, may represent a considerable added value for the effectiveness of fatigue management arrangements established within the organisation. For this purpose, the air traffic control service provider might consider making available education and information programmes for staff involved in fatigue management, such as operational and safety managers, staff in charge of managing the rostering system, staff in charge of occurrence investigation.
- (c) Activities air traffic control service providers could undertake to monitor the effectiveness of the established fatigue management arrangements may be but are not limited to the following:
  - (1) verification of the allocation and implementation of duty and rest periods in accordance with the rostering principles established in [ATS.OR.320](#);
  - (2) collection and analysis of data related to planned versus achieved rosters, and in particular:
    - (i) exceedances of planned working hours and reasons generating exceedances;
    - (ii) variation of the nature of the duty (office work, operational air traffic control service provision, training, etc.);
    - (iii) operational circumstances which required a modification of established duty and rest periods; and

# FRMS : Measuring dynamic trade-offs





# CANSO Survey

- **CANSO Secretariat collected the 8 elements of the rostering detailed in the paragraph ATS.OR.320 “Air traffic controllers' rostering system(s)” of regulation 2017/373.**
- **CANSO Secretariat launched a call for inputs on 15th January 2018 and 15 ANSPs submitted their information.**
- **Wide variety of profiles – to be analysed**

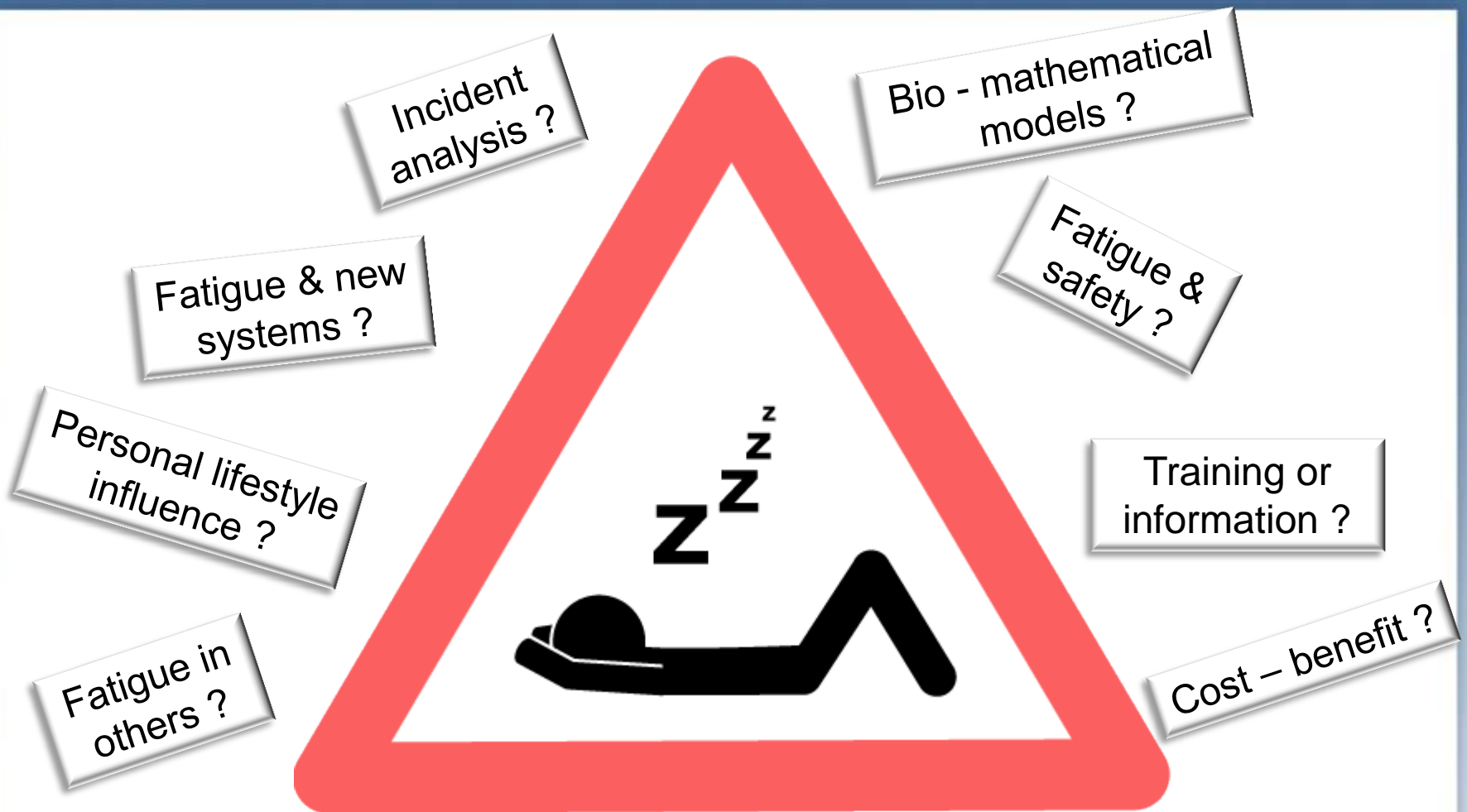
# CANSO questions

- **No standardization / benchmarking of the 8 items can be envisaged across ANSP**
- **8 items are inter-related**
  - How to analyse operations close to maximum limit for one or several of these ?
  - What is the influence of other factors ?
- **How can you justify items a posteriori from a scientific perspective ?**
  - Safety performance
- **What is an effective monitoring system ?**
  - WAI vs WAD

# CANSO strategy for fatigue management

- **Ensure that prescriptive regulation are appropriate from the business and safety perspective**
- **Build and communicate an ATM industry perspective on rostering and fatigue management**
  - Share issues and experience with fatigue management tools among members
  - Collaborate to validate fatigue management approach best suited for ATM
  - Share procedures for managing fatigue : declaring self-fatigue, occurrence investigation and analysis to consider fatigue, effect of fatigue on the safety of operations ...
- **Engage with stakeholders**
  - Social Partners
  - EASA, Competent Authorities
  - Cooperate with Eurocontrol

# Questions ?



# Many thanks to all of you!



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# **FRMS : a tool to engineer resilience ?**

- **FRMS is a process that anticipates and monitors risk associated with fatigue**
- **FRMS is a way to increase the flexibility of the system while increasing the focus on safety**
- **FRMS aims at increasing adaptive safety in addition to normative safety (Amalberti)**
- **In ultra-safe system, the impact of fatigue on risk is not linear**

**=> Need of non linear model**

- **Fatigue can be considered as a source of « normal variability » for the system functions (FRAM)**
- **Necessary to understand the conditions under which fatigue may increase risk**