Fatigue Risk Management

By: Capt. Hesham Hamy

AVIA SAFETY CONSULTANCY GROUP
We focus towards Safety

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هيئة دبي للطيران المدني
Dubai Civil Aviation Authority

Introduction

First Aviator Transatlantic

"The nose is down, the wing low, the plane is diving and turning. I've been asleep with open eyes...

I kick left rudder and pull the stick back... My eyes jump to the altimeter...

I'm at 1600 feet.

The turn-indicator leans over the left - the airspeed drops - the ball rolls quickly to the side...My plane is getting out of control!"

Charles Lindbergh

(First non- stop Transatlantic flight - May 1927 NYC-PAR)

Your Name

Title

Brief Background

What you aim to get from this session

Instructors

Capt Hesham Hamy

Masters Degree (Aviation Safety) – University of Newcastle, Australia

Current PhD Student (Psychological Safety and Leadership Styles in Aviation)

Type Rating Instructor / Examiner (Bell 206/212/412 Helicopters)

Aviation Safety Management Principal Consultant

Corporate Safety General Manager/SMS Postholder

Instructors

Eng Hamid Mohammed Almahdali

Bachelors Degree (Aircraft Engineering) – Kingston University, UK

Aircraft Maintenance Engineer License Holder – B1

Boeing 777 Type Course

Head of Aircraft Oversight at Dubai Civil Aviation Authority

Housekeeping

Punctuality

Phones

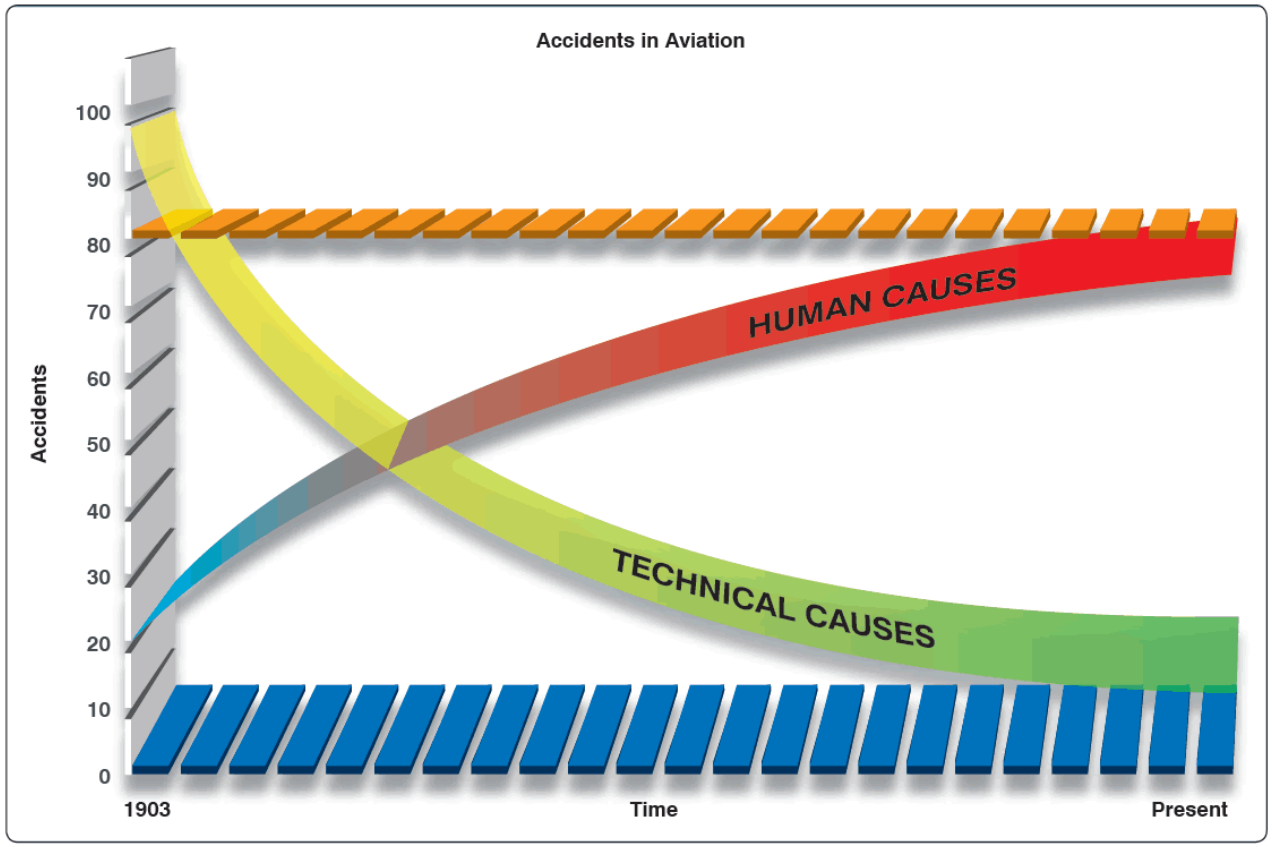
More Importantly NO SLEEPING

Participation

No Smoking

Intro to Human Factors

Accident/Incident Stats

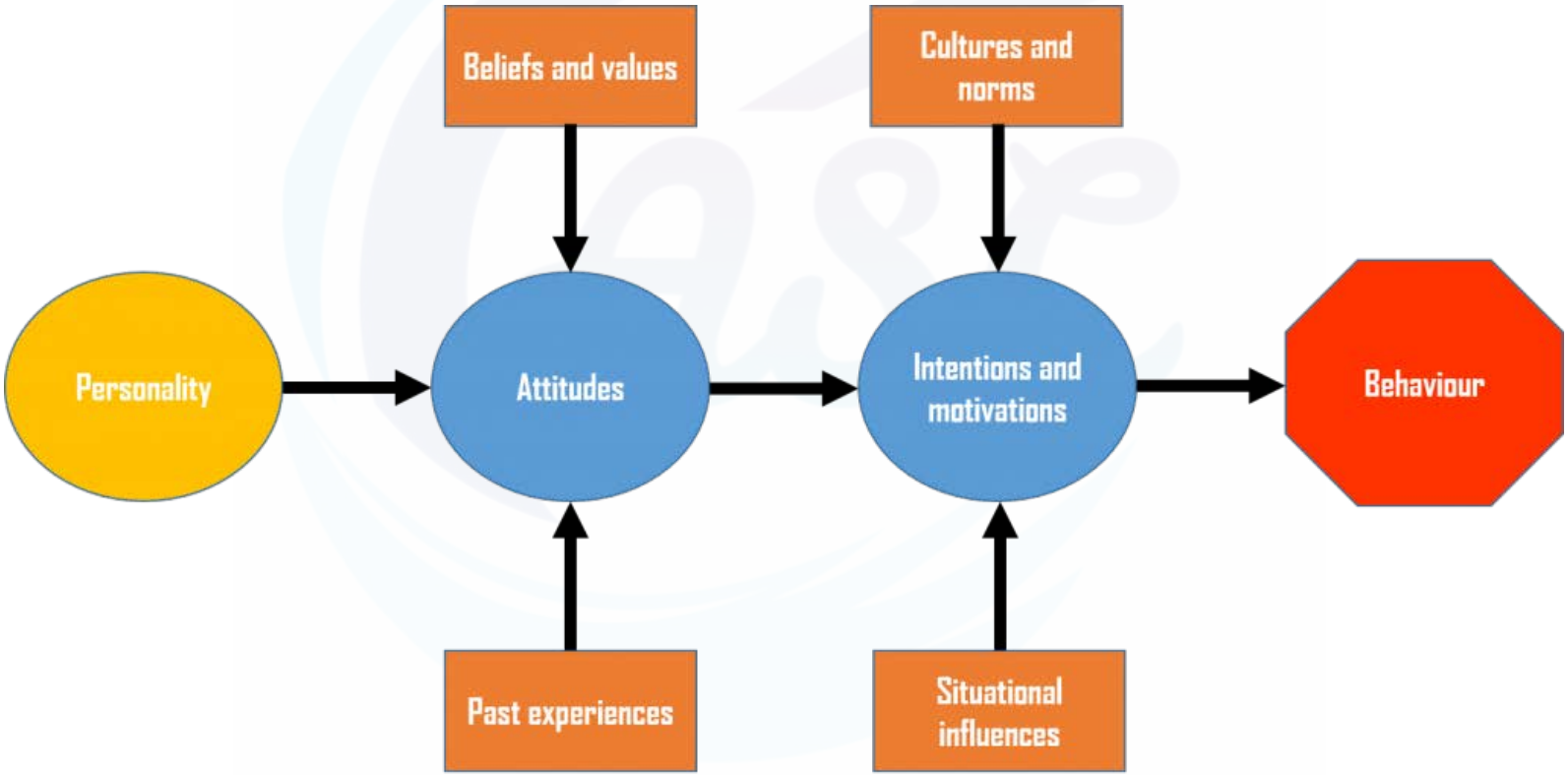


What is Human Factors

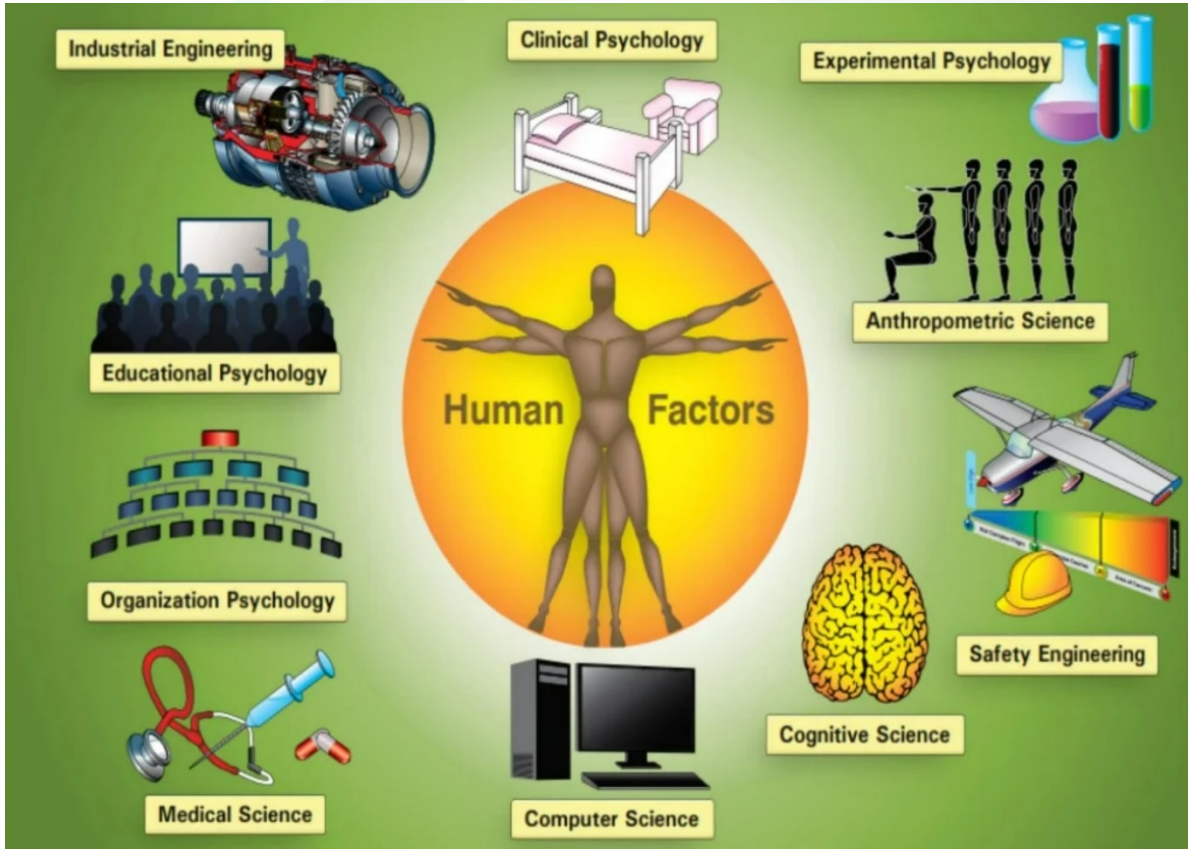
The Federal Aviation Administration (FAA) defines Human Factors as a

"multidisciplinary effort to generate and compile information about human capabilities and limitations and apply that information to equipment, systems, facilities, procedures, jobs, environments, training, staffing, and personnel management for safe, comfortable, and effective human performance"

What is Human Factors



What is Human Factors



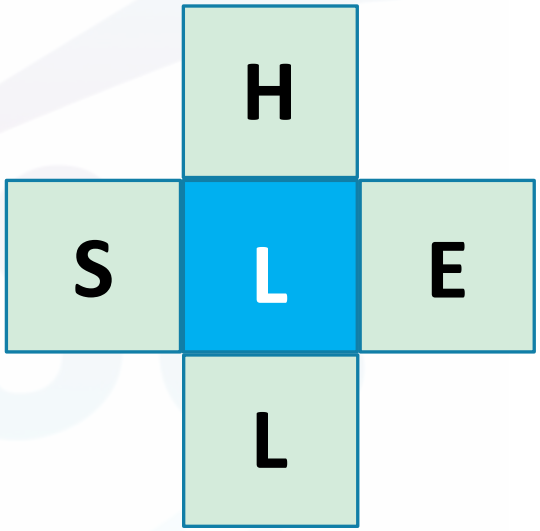
SHEL Model

S = Software (Procedures, Policies, Manuals, Checklists)

H = Hardware (Equipment, Technology, Aircraft Design, Tools)

E = Environment (Physical Surroundings, Organizational Culture, Economical Impact

L = Liveware (Team Work, Communication, Leadership, Relationships



Analyzes the interrelationship between Human Factors and the aviation environment

The Dirty Dozen

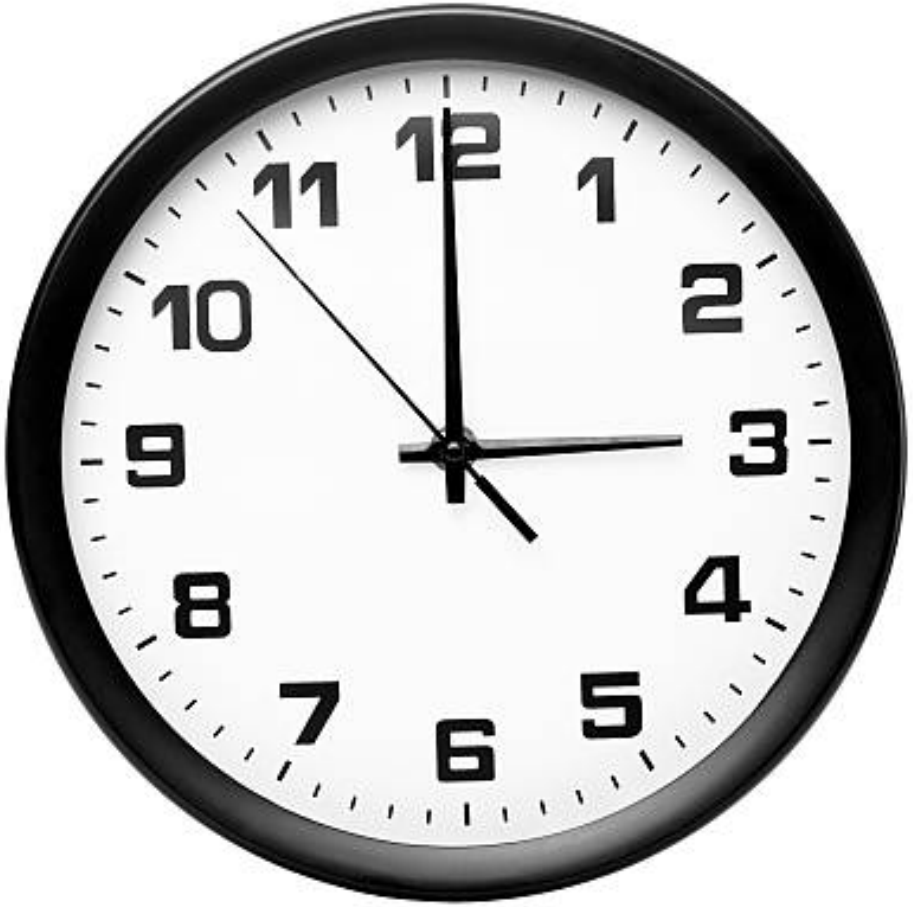
Schedule

09:30-11:00-Session activity

11:00 -11:15 -Coffee/Tea break

11:15 -13:30 -Session activity

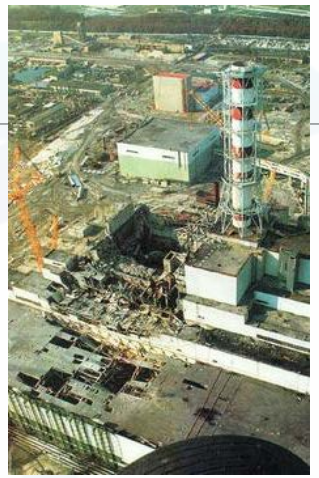
13:30 - Lunch Break



Introduction

Human Fatigue and Disasters

- BP Texas City Refinery (2007) – killed 15 people and injured over 180
  - Board Operator worked 12 hour shifts for 29 consecutive days
- Nuclear release of the Three Mile Island and Chernobyl Accidents
  - Human errors in recognition at early morning hours (0400-0600)
- Exxon Valdez Ship Accident
  - Grounded entailing fatigue, workload, reduced crew size
  - Insufficient rest



Significant risks for deaths and injuries:

- 360,000 worldwide workplace fatalities / year
- 960,000 workplace injuries / day
- 20 % related to fatigue (over 190,000 injuries per day)
- 50,000-100,000 patients died annually due to medical malpractice

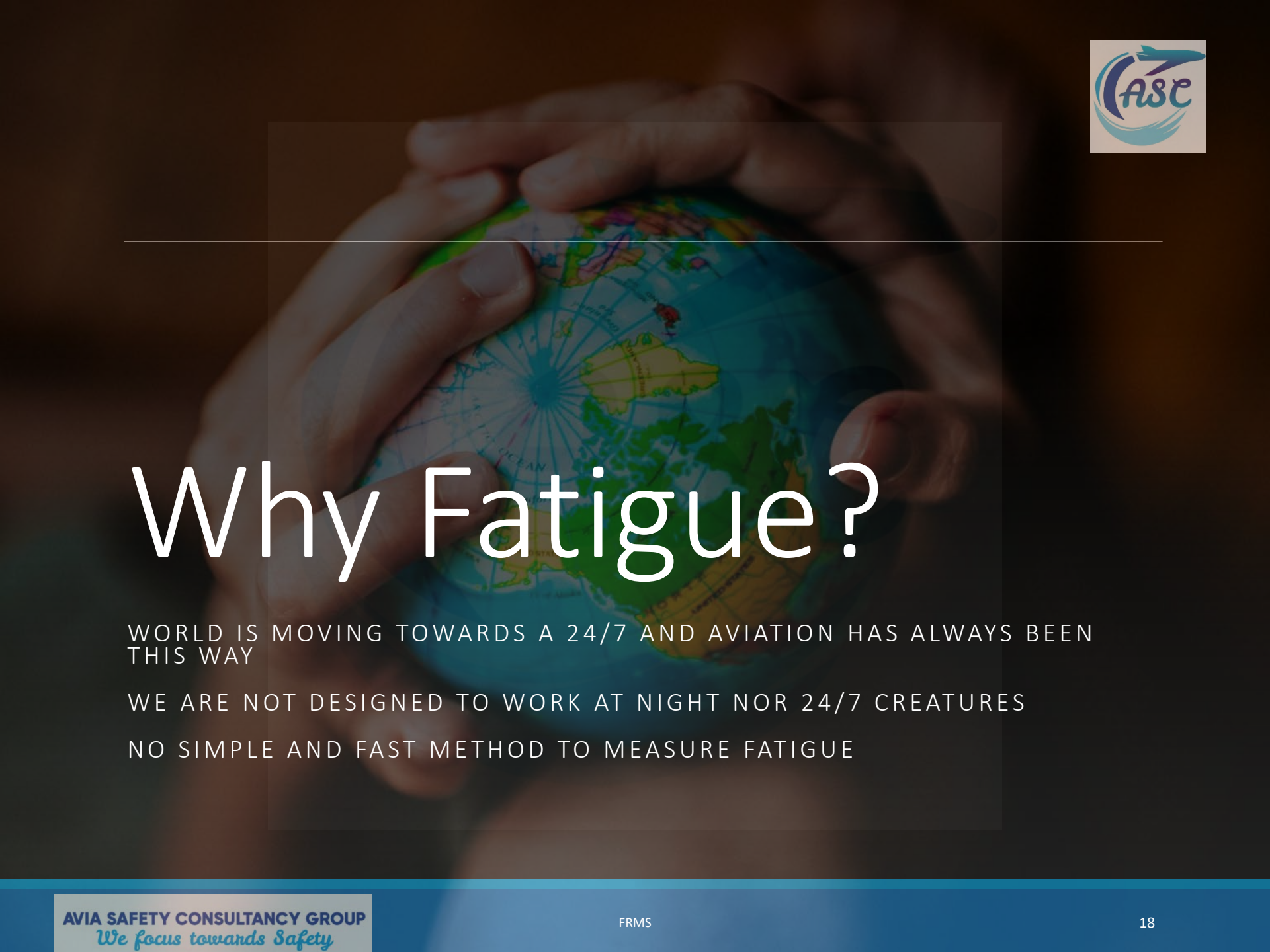
Nearly 23% of US population suffers significant sleep problems – highest rate in world, while Europe – 19% reported working 2 hours between (0100-0500)

Nighttime workers are 3X more likely to be injured compared to daytime workers

Jobs with overtime are over associated with 60% higher injury rate

Working 12 hour shifts 37% higher injuries

Working more than 60 hours 23% increase in injuries

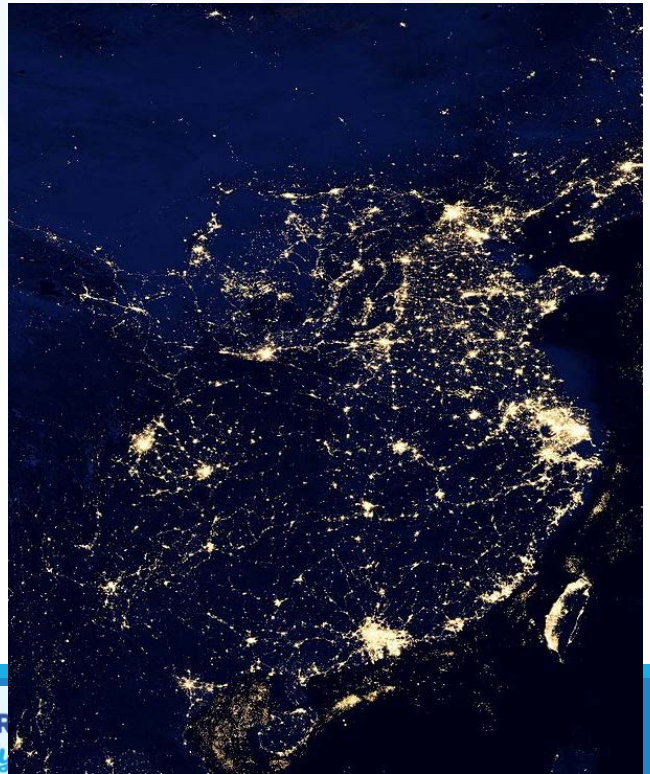


Why Fatigue?

WORLD IS MOVING TOWARDS A 24/7 AND AVIATION HAS ALWAYS BEEN THIS WAY

WE ARE NOT DESIGNED TO WORK AT NIGHT NOR 24/7 CREATURES

NO SIMPLE AND FAST METHOD TO MEASURE FATIGUE



The first successful test of a carbon filament light bulb was is 1879

NASA COMPOSITE NIGHT PHOTO SHOWING EXTENT OF NIGHT ACTIVITY

The Problem?

The problem is the impact of errors

Sales Required to Cover Losses

Yearly Incident Costs	Profit Margins				
	1%	2%	3%	4%	5%
$1,000	100,000	50,000	33,000	25,000	20,000
$5,000	500,000	250,000	167,000	125,000	100,000
$10,000	1,000,000	500,000	333,000	250,000	200,000
$25,000	2,500,000	1,250,000	833,000	625,000	500,000
$50,000	5,000,000	2,500,000	1,667,000	1,250,000	1,000,000
$100,000	10,000,000	5,000,000	3,333,000	2,500,000	2,000,000
$150,000	15,000,000	7,500,000	5,000,000	3,750,000	3,000,000
$200,000	20,000,000	10,000,000	6,666,000	5,000,000	4,000,000

Bird, Frank, George L. Germaine, Loss of Control Management: Practical Loss Control Leadership

Real world numbers

1 hard landing results in damaged nose gear and propeller

Repair required and the engine needs to be tested (possible overhaul)

Insured Costs = $55,000

Uninsured Costs = $75,000

Fatigue Related Mishaps

1993: American International Flight 808

"...probable cause of this accident was the impaired judgment, decision-making, and flying abilities of the captain and flight crew due to the effects of fatigue."

1997: Korean Air Flight 801

"...probable cause of this accident was the captain's failure to adequately brief and execute the non-precision approach and the first officer's and flight engineer's failure to effectively monitor and cross-check the approach. Contributing to these failures were the captain's fatigue."

1999: American Airlines Flight 1420

"...probable causes of this accident were the flight crew's failure to discontinue the approach…and failure to ensure that the spoilers had extended after touchdown. Contributing to the accident was the flight crew's impaired performance resulting from fatigue..."

FedEx Flight 1478

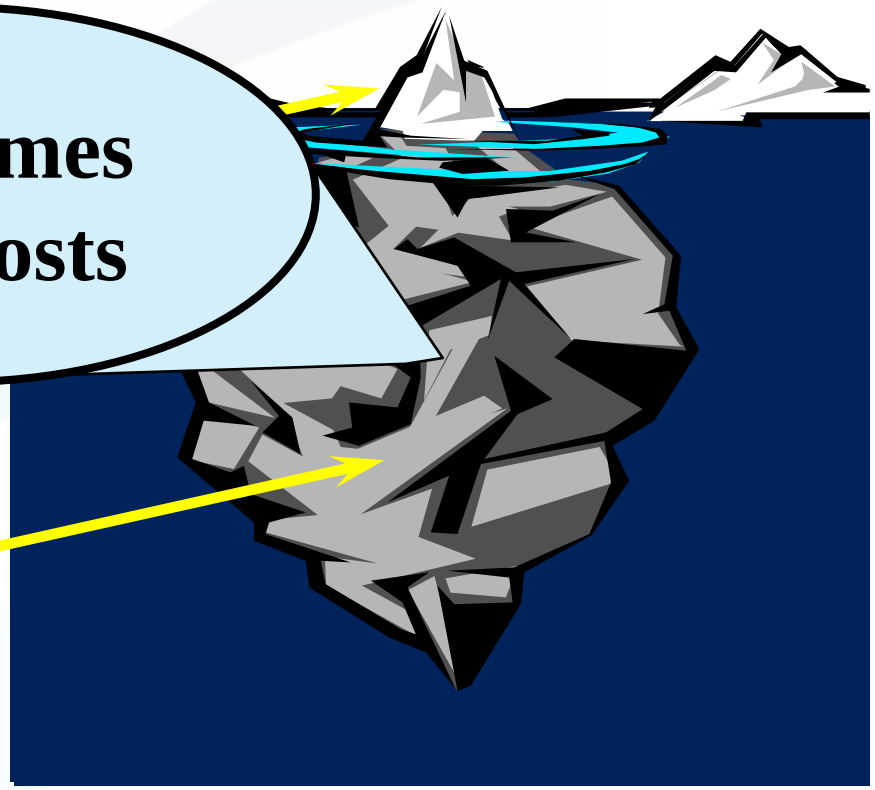
"...probable cause of the accident was the captain's and first officer's failure to establish and maintain a proper glide path during the night visual approach to landing. Contributing to the accident was a combination of the captain's and first officer's fatigue..."

Economics of Aviation Safety

True cost of an accident

Insu

1 to 7 times direct costs



Uninsured Costs

Did fatigue start in 1993?

Guantanamo Bay in 1993 was the first accident in history for which pilot fatigue was cited as the primary cause.

The pilot stalled a perfectly serviceable aircraft into the ground on approach.

His inability to monitor the aircraft's safe flight was accepted as being the direct result of fatigue.

• Why did it take so long for investigators to cite fatigue as a cause? (before 1993 it was rarely cited even as a contributory factor).

Guantanamo DC-8-60F

Situation: The aircraft was making a visual approach over the sea from the south to land on an easterly runway (10). The right turn had to be made late on approach because of the proximity of the Cuban border to the US Navy air base, and the captain banked the aircraft to 50 deg to intercept the extended centerline.

Guantanamo DC-8-60F

Probable causes: "The impaired judgment, decision-making, and flying abilities of the captain and flight crew due to the effects of fatigue; the captain's failure to properly assess the conditions for landing and maintaining vigilant situational awareness of the airplane while manoeuvring onto final approach; his failure to prevent the loss of airspeed and avoid a stall while in the steep bank turn; and his failure to execute immediate action to recover from the stall."

Guantanamo DC-8-60F

Real cause in simple words:

“the flight crew had been on duty 18 hours, flying for 9 hours, and were suffering from circadian rhythm disturbance and lack of sleep. But it was still legal!”

Dead tired: Kirksville J31 and San Bernadino Learjet 35

"On 24 October 2004 a Med Flight Air Ambulance Bombardier Learjet 35A crashed into high ground while following an air traffic control clearance after take-off from San Bernardino airport, California. All five people on board were killed.

The air traffic control officer was warned twice by his minimum safe altitude warning system that the aircraft was in danger, but ignored it.

Dead tired: Kirksville J31 and San Bernadino Learjet 35

Flightcrew fatigue was cited as a factor in that accident but, after the report came out, National Transportation Safety Board members criticized the absence of recommendations concerning controller fatigue, despite the fact **the duty ATCO had -**

"worked an 8h shift the day before the accident, and returned 7.5h later, without any sleep, to work through the midnight shift".

Dead tired: Kirksville J31 and San Bernadino Learjet 35

The fact that the ATCO had ignored two minimum safe altitude warning system alerts that could have enabled him to warn the crew in time to save their lives was detailed in the report, but the reason for this stupefying passivity was not probed nor deemed worthy of future study. It took the death of 46 people at Lexington Blue Grass airport last August to wake up the NTSB.

Dead tired: Kirksville J31 and San Bernadino Learjet 35

Now, having completed the factual review of the Lexington accident, the NTSB has made multiple recommendations for Federal Aviation Administration action to deal with the causes of ATCO fatigue. The NTSB didn't mention San Bernardino, but cited other results of controller fatigue including a near-collision between two United Airlines aircraft at Chicago O'Hare.

Shuttle America Flight 6448

February 18, 2007, Cleveland, Ohio

Contributing factors included captain's fatigue and company attendance policy

- Captain suffered from insomnia
- Awake 31 of 32 hours
- Did not "call in fatigued" due to fear of reprisal

Two recommendations to FAA

- Develop "best practice" attendance policy that considers fatigue
- Require operators to implement policy

Safety Board Aviation Fatigue Recommendations

- 32 aviation recommendations since 1972

- On Most Wanted List since 1990

- Most recommendations concern flight and duty time regulations and policies

Recent accidents highlight the need for comprehensive fatigue management efforts

Source NTSB

The Aviation Industry

- A challenging & dynamic industry with many risks ...
- Every take-off and landing is a risk ...

So how do we respond to these challenges….

Fatigue is a Risk State

"People have difficulty believing that humans can make a fatigue-related error while performing an over-learned task under highly-motivated (even life-threatening) conditions. But it happens because fatigue is a risk state that degrades behavioral efficiency."

-Dr. David Dinges, University of Pennsylvania School of Medicine

Over the years

- Many accidents
- Many injuries & fatalities
- Loss of equipment
- Increase in insurance cost
- Loss of reputation
- Loss of credibility
- Loss of revenue

We need to learn from accidents.

Chelsey "Sully" Sullenberger speaks about the importance of adequate rest

The events of 15th January, 2009.

Captain Chelsey "Sully" Sullenberger became an instant hero when he successfully ditched US Airways Flight 1549 into New York's Hudson River after both engines failed due to bird strikes. All 155 passengers and crew survived what has been called the Miracle on the Hudson.

Just a few days after the miracle, Sullenberger told ABC news that proper rest leading up to the incident was a key facilitator into the successful ditching:

"I'm convinced that had we [Sullenberger and First Officer Jeffrey Skiles] been tired, had we not gotten sufficient rest the night before, we could not have performed at the same level."

"The fact that we got so much right so quickly under that sudden stress is a testament [to] the fact that we had a chance to get sufficient rest."

Module Objectives

What is fatigue	Fatigue Hazards	Effects of Fatigue
Impact of fatigue in the workplace	Causes of fatigue	Factors that increase the impact of fatigue
Managing Fatigue risks	Dealing with fatigue	Fatigue risk management systems FRMS

Fatigue (ICAO Definition)

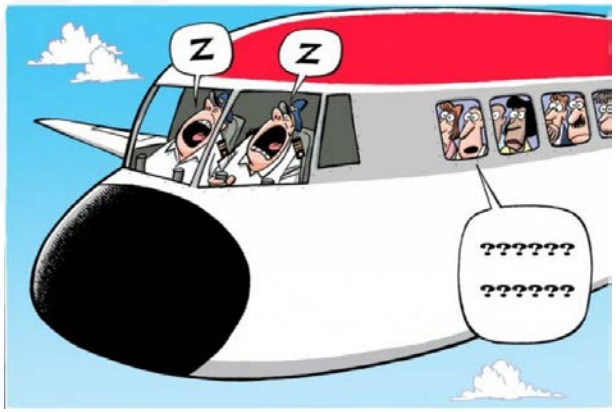
" ... A physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a crew member's alertness and ability to safely operate an aircraft or perform safety related duties."

"Fatigue" vs. "Tired"

There is a difference ! !

FRMS Definition (IATA/ICAO)

"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."



Why move to FRMS?

Prescribed limitations provide only “one slice of cheese”

FRMS provides more Defence barriers

Swiss Cheese model

Causes and Consequences of Fatigue

Module one

Why is Fatigue Getting so Much Attention?

All aspects of a carrier's operation are affected

- Headcount;
- Crew Utilization;
- Equipment Utilization;
- Network Planning;
- Scheduling.

- Fatigue Management= Additional Constraints

- Increasing operating costs with sick crews.

What is Fatigue?

- A state of physical or mental weariness that results in reduced alertness;
- The result of a lack of adequate sleep;
- A sleep debt that accumulates until paid off with adequate sleep.

What is Fatigue?

Fatigue is the general term used to describe physical and/or mental weariness which extends beyond normal tiredness.

What is Fatigue?

- Tiredness after hard physical work;
- Emotional fatigue;
- Short term effects of intense concentration on task;
- An overwhelming need to sleep:
  - Acute
  - Chronic

What is Fatigue?

1. Physical Fatigue.
2. Mental Fatigue.
3. Sleep patterns.

What is Fatigue?

Discussion

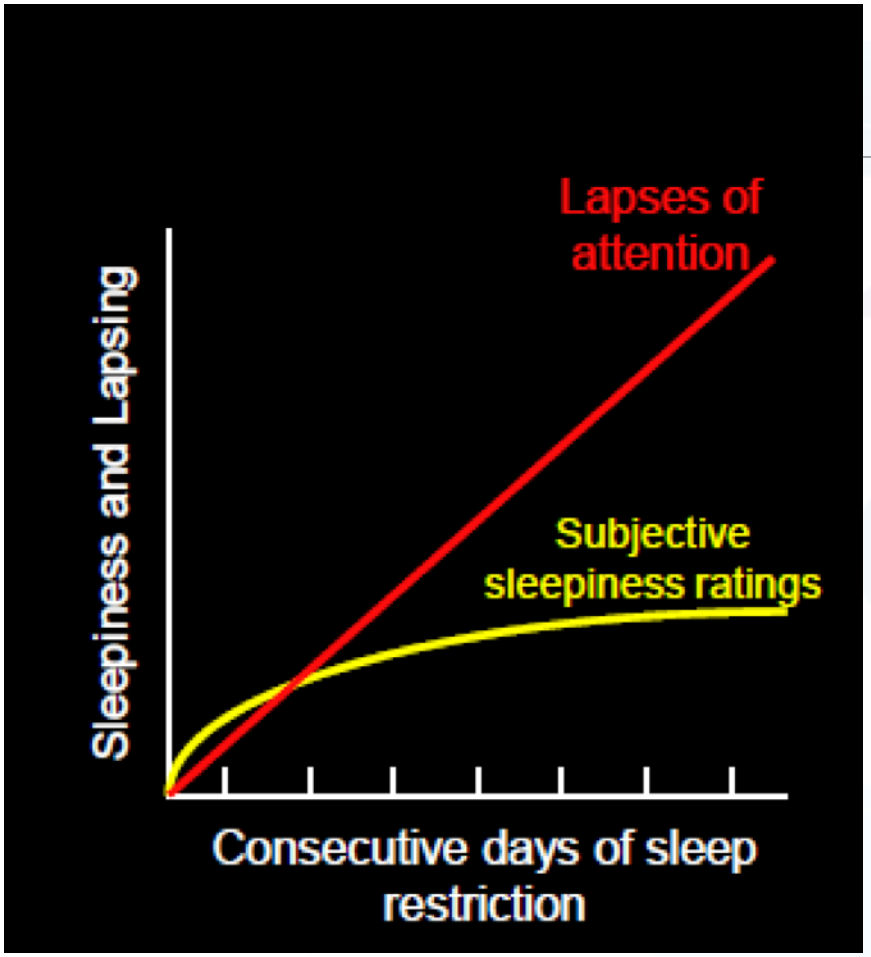
What are some conditions that make you feel particularly tired or fatigued at work?

Causes of Fatigue

Fatigue can be the result of a variety of factors:

- The body's natural rhythms;
- Work schedule;
- Type of task;
- Work environment;
- Non work-related issues.

Fatigue –Poor Self-Assessors



Individuals are poor judges of their own fatigue impairment

Impaired judgment increases as sleep loss increases

Fatigue Hazards

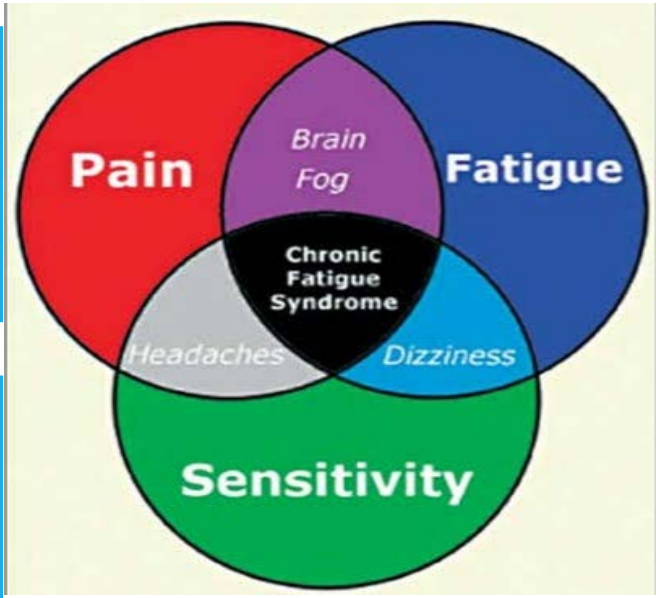
Fatigue usually results in impaired standards of operation with increased likeliness of error. e.g.:

- Increased reaction time;
- Reduced attentiveness;
- Impaired memory;
- Withdrawn mood.

Chronic Fatigue Syndrome

No single test to confirm a diagnosis of chronic fatigue syndrome;

Symptoms of chronic fatigue syndrome can mimic any other health problems;



Doctor must rule out a number of other illnesses before diagnosing chronic fatigue syndrome.

- Sleep disorders
- Medical problems
- Mental health issues

Unexplained, persistent fatigue for six months or more, along with at least four of the following signs and symptoms:

- Loss of memory or concentration.
- Sore throat.
- Enlarged lymph nodes in your neck or armpits.
- Unexplained muscle pain.
- Pain that moves from one joint to another without swelling or redness.
- Headache of a new type, pattern or severity.
- Unrefreshing sleep.
- Extreme exhaustion lasting more than 24 hours after physical or mental exercise.

The Body Clock

Known as circadian rhythms

Operates on a 24-hour cycle

Makes you sleepy when it's dark and awake when it's lig

Controls a variety of body functions:

- Sleepiness

- Digestion

- Hormone production

- Body temperature

The Body Clock

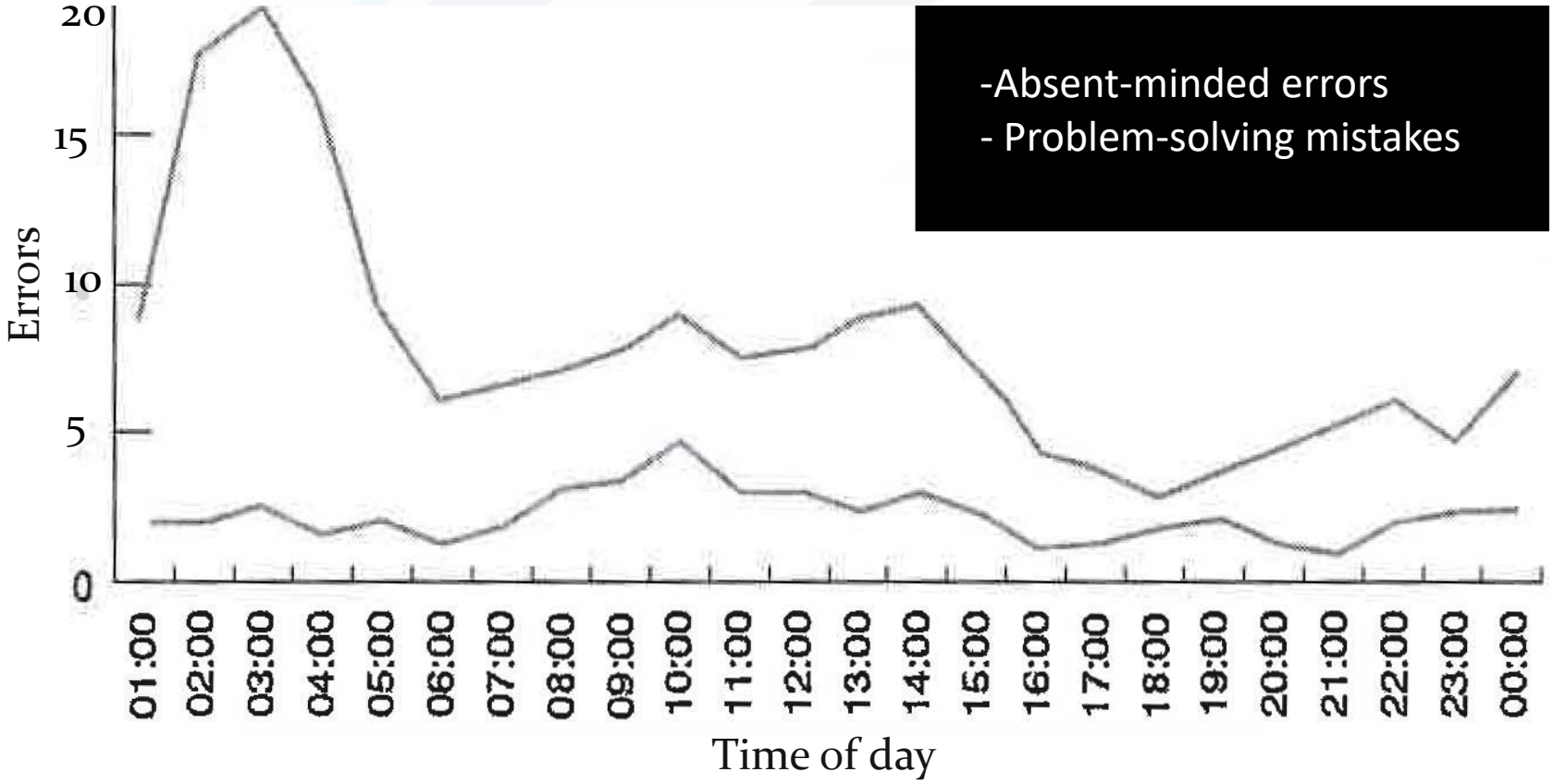
Causes of Fatigue:

- Sleep debt
- Circadian rhythms

Beware of WOCL!
(Window of Circadian Low)

Window of Circadian Low Example

Airline Personnel errors throughout the 24-hour day



Tips for dealing with the WOCL

- If possible, avoid the most critical tasks during the WOCL;
- If you can, keep the lights bright & temperature slightly cool;
- Try to avoid monotonous or tedious tasks;
- Stretch, walk around get some fresh air;
- If you can take a brief nap;
- Use caffeine carefully.

Factors that Increase the Impact of Fatigue

Lowlight

Passive activities

Boring or monotonous tasks

Warm temperature

How tired are you?
Epworth sleepiness scale

Epworth sleepiness scale

Developed by Dr. Murray Johns of Epworth Hospital in Melbourne

How likely are you to doze off or fall asleep in the following situations, in contrast to just feeling tired? This refers to your usual way of life over recent times. Even if you have not some of these things recently, try to work out how they would have affected you. Use the following scale to choose the most appropriate number for each situation:

No chance of dozing **0**	Slight chance of dozing **1**	Moderate chance of dozing **2**	High chance of dozing **3**

Situation	**Chance of dozing**
1. Sitting and reading	
2. Watching TV	
3. Sitting inactive in a public place (e.g. a theatre or a meeting)	
4. As a passenger In a car for an hour without a break	
5. Lying down to rest in the afternoon when circumstances permit Sitting and talking to someone	
6. Sitting quietly after a lunch without alcohol	
7. In a car, while stopped for a few minutes In traffic	

Results

1-6. Congratulations, you are getting enough sleep!

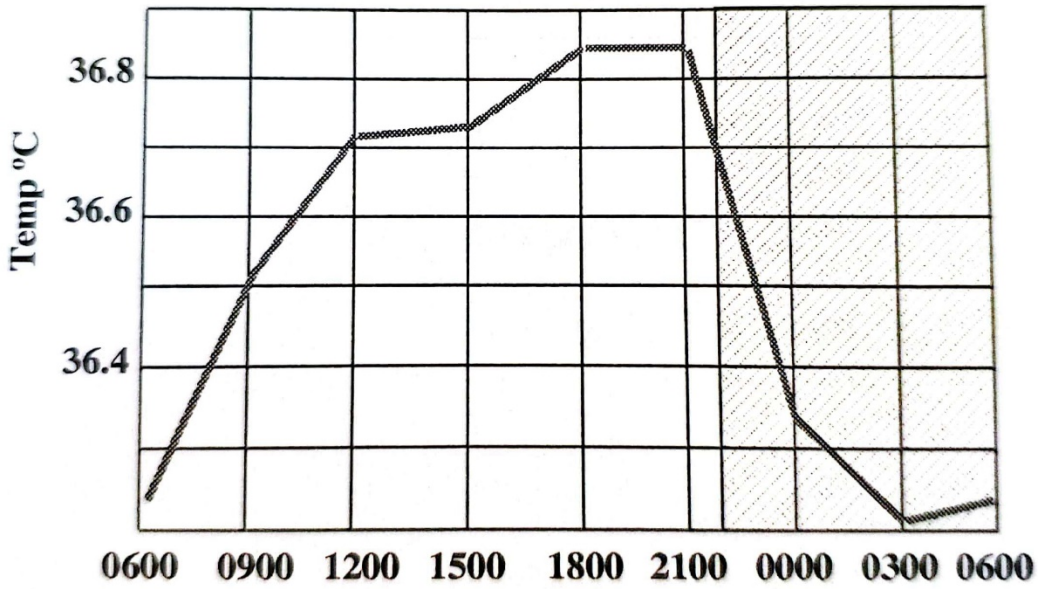
7 -8. your score is average

9 and up, seek the advice of a sleep specialist without delay.

Circadian Rhythms

Core body temperature across a 24 hour period

Alertness follows a similar curve-as body temperature rises, you become more alert.



Sleep

Most people need between 7 and 9 hours per day.

When you sleep it makes a difference in how much you get.

Sleep is best obtained in a single block.

Individual Differences

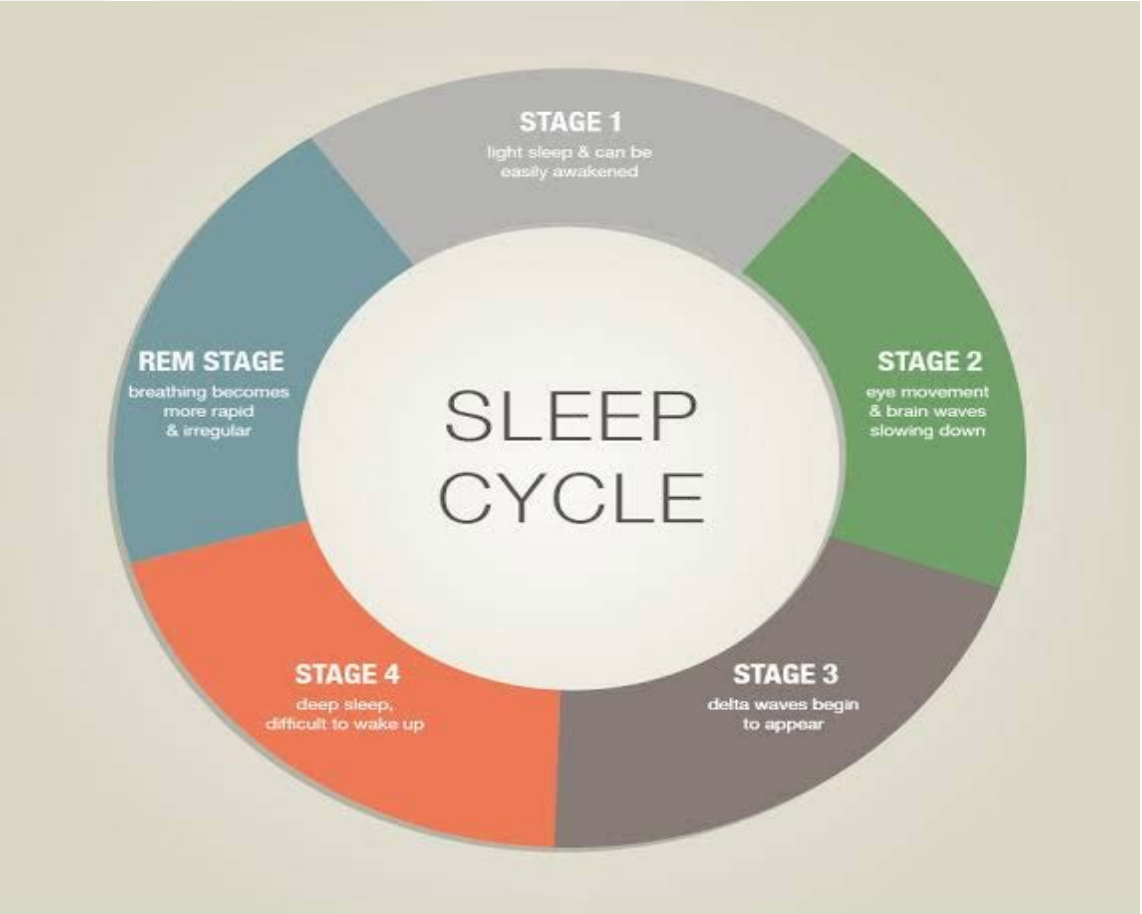
Quality Vs Quantity

The Impact of Fatigue in the Workplace

Myth	Reality
5 or 6 hours sleep a night is generally enough	Very few people can manage on this amount of sleep without being seriously affected.
Daytime sleep is just as good as nighttime sleep	Shift workers who have to sleep during the day generally get lower-quality sleep, & less of it.
We can judge how fatigued we are actually	Studies have shown that fatigued people often don't realize that their abilities are impaired by fatigue.
We need less sleep as we get older.	We still need the same amount of sleep, but our sleep becomes more fragmented, & we tend to wake up earlier.

Sleep Cycles

When you sleep, you cycle through five different sleep stages.



REM sleep

Busy brain and paralized body.

Brainwave activity looks similar to waking activity.

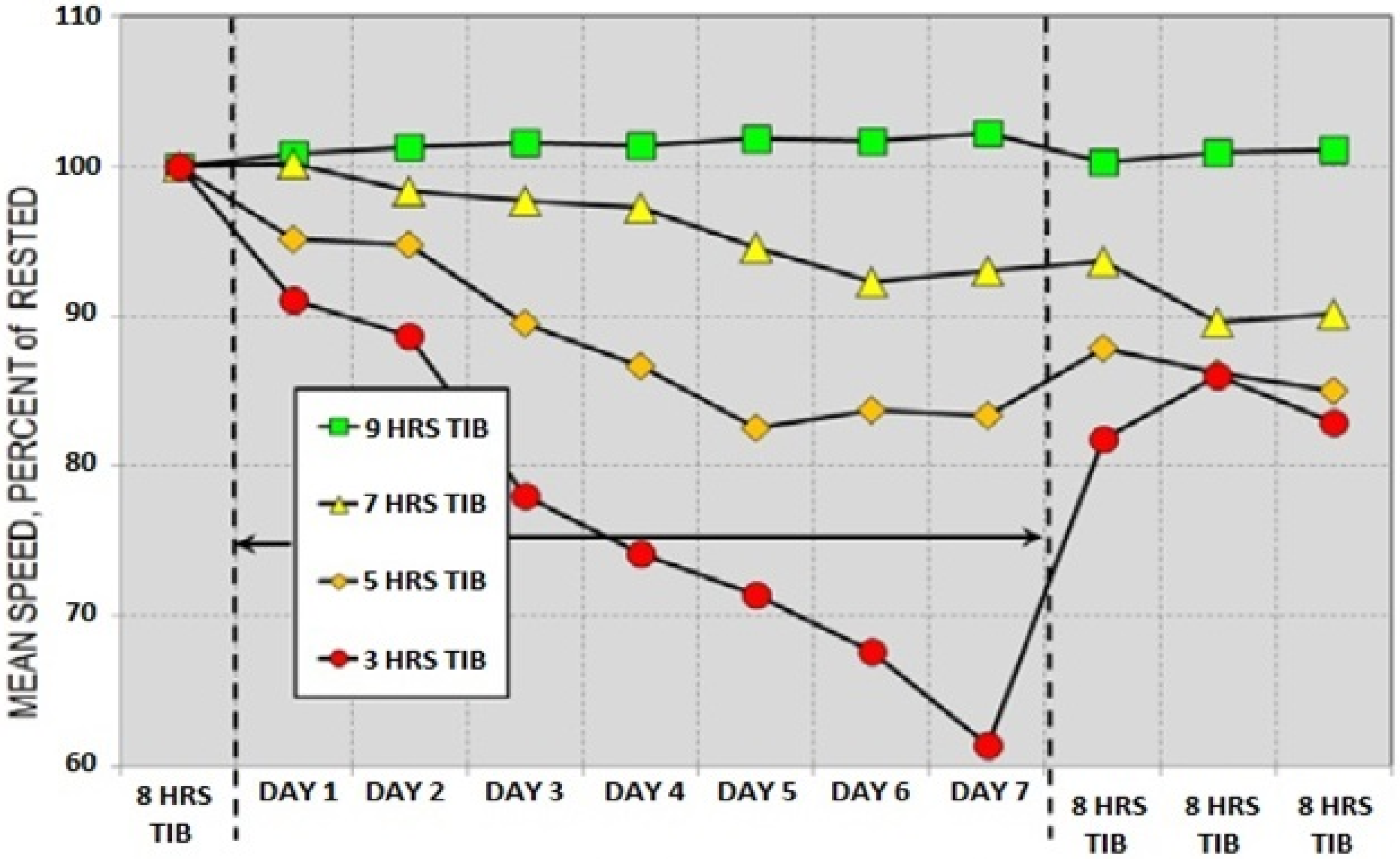
The body can’t move.

Electric signals from brain do not get through spinal cord.

People awaken from REM recall vivid dreaming.

Brief paralysis sometimes experienced after waking up.

Brain repairs itself during REM sleep.



Impact on performance of different times spent in bed at night (TIB)

Image taken by *Fatigue management guide for Air Navigation Service provider* - IFATCA, CANSO,ICAO 1st/E 2016

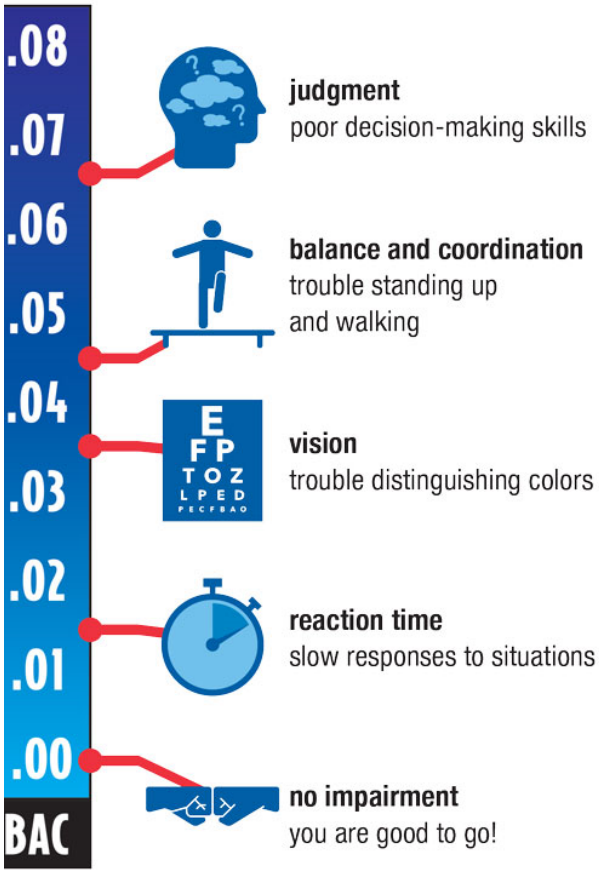
A Serious Safety Hazard

When you're fatigued:

- Your reaction time is slower;
- You have trouble concentrating or remembering things;
- You may have difficulty communicating clearly with co-workers;
- You may fall asleep on the job;
- There's a greater risk you'll make a safety-critical mistake.

Being fatigued can make you a risk to yourself, your co-workers, and the public!

How big a risk is fatigue?



Compared effects on performance of Alcohol and fatigue.

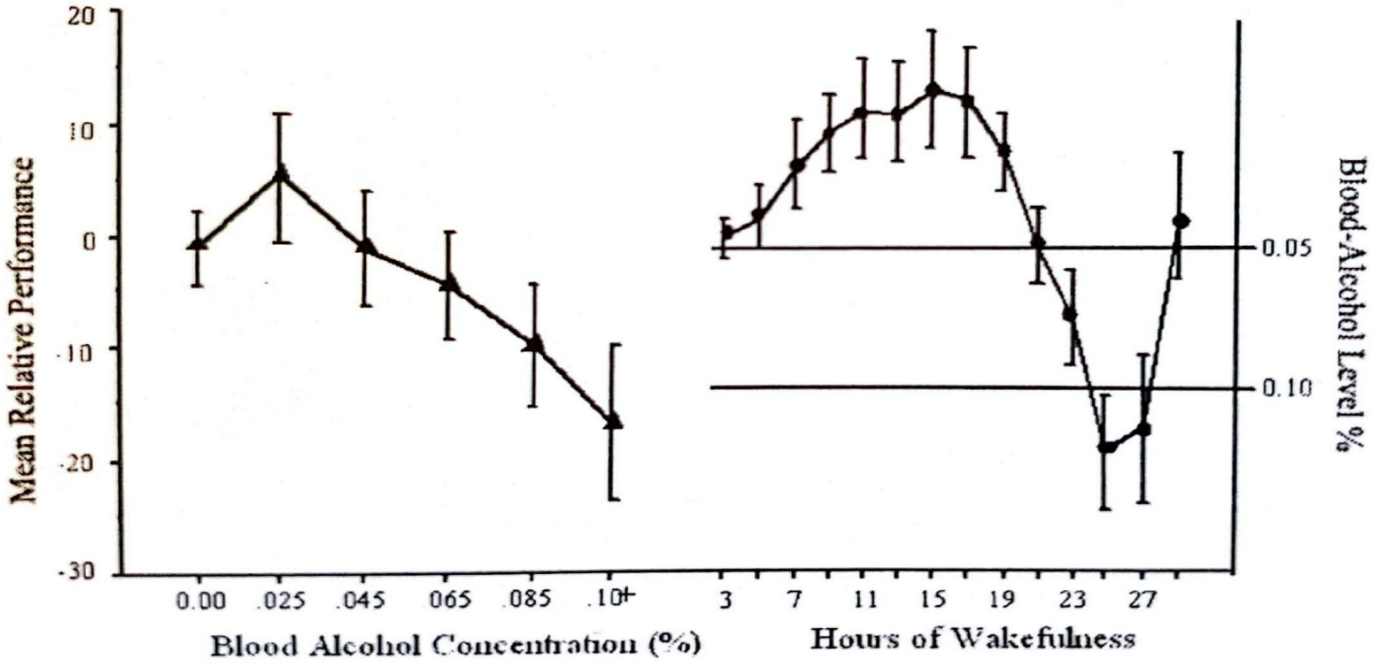
- Wakes at 7 a.m. and stays awake for

17 hours = BAC of 0.05% ……Legal

- Wakes at 7 a.m. and stays awake for

23 hours = BAC of 0.10%……. more than the legal limit of 0.08% in Canada.

As Dangerous as Alcohol?



After 24 hours awake, you will be as impaired as if you were legally too drunk to drive.

Effects of Fatigue

Effects of fatigue	
Performance category	**Effects**
Attention: reduced	Leave out steps in tasks
	Preoccupation with single tasks or steps
	Tunnel vision, less likely to notice the unexpected
	Less aware of poor performance
	Concentration requires more effort
Memory: diminished	Poor memory for tasks completed or underway
	Forget toperıorm task steps
	Revert to 'old lıabits'
	More likely to forget to return ıo interrupted-tasks
Mood: withdrawn	Reduced Communication
	More irritable, frustrated by minor difficulties
	Temptation to shortcut tasks
Reaction lime: increased	Slower to notice problem
	Less smooth control of equipment or vehicles

Types of Fatigue

Two common types of fatigue-related errors

- Memory failures;
- Failure to notice defects or problems.

Fatigue is one of the major causes of human error

Consequences for Health

Fatigue has an impact outside work.

Studies have found that shift workers are more likely to suffer from:

- Irritability, stress, anxiety, and depression
- Gastrointestinal problems
- Cardiovascular illnesses
- Reproductive problems

Family and Social Life

Working shifts can make you feel socially isolated -you work while others have fun.

It can take a heavy toll on family:

- Less involved in daily life;
- Harder to organize domestic chores;
- Difficulty arranging childcare;
- Higher risk of divorce.

You may be tempted to choose social or family activities over sleep.

Commuting

One of the most dangerous things you can do while fatigued is drive.

You may be driving during the very times that your body most wants to sleep.

Nightshift workers are 4 to 7 times as likely to have an accident driving home.

Fatigue Risk Management

Module Two

Recap

What is Fatigue

Is fatigue a workplace issue?

What are the signs of fatigue?

What are the effects of fatigue and their relationship to work?

What are some factors that are related to fatigue?

What are Circadian Rhythms (Body Clock)?

How much sleep do people need?

How can I get a "better" sleep?

slido

How do you feel the importance of implementing FRM in your organisation?

ⓘ Start presenting to display the poll results on this slide.

Shift and fatigue

How is sleep-wake cycle defined?

Circadian body clock

(or circadian rhythm)

Light-stimulated electric signals from eyes to brain, to keep body sincronized with day/night cycle.

Sleep homeostatic (Stability) process

Need for sleep increases as time spent awake passes.
Adenosine is created during the day, leading to sleepines.

WOCL

Workload and fatigue

Three main aspects of workload:

1. Nature and amount of work to be done (including time on task, task difficulty and complexity, and work intensity).
2. Time constraints.
3. Factors relating to the performance capacity of an individual (for example experience, skill level, effort, sleep history, and circadian phase).

High and low workload can contribute to fatigue.

Also, think about continuous changes in tasks, technology & rules

Fatigue management methods

The prescriptive approach

DUTY TIME LIMITS

Regulator Requirements

The proactive approach

FRMS

Fatigue risk management system

The Prescriptive Approach

- ICAO requires States to develop regulatory limits for work and non-work periods.
- Last minute duty extensions flexibility to manage operational disruptions.
- Fatigue risks can be managed using existing SMS processes.

The Prescriptive Approach How to?

- Comply with prescribed limits (social regulations can unintentionally help the fatigue management process)
- Use scientific principles in rostering (Be aware of Circadian rhytms, WOCL)
- Use caution while assigning unscheduled shifts

For example: ATCOs should be careful when swapping shifts

The Prescriptive Approach

Staying within prescribed limits may not be enough to manage fatigue.

Why a FRMS?

With a prescriptive approach, fatigue is one of the possible hazards that the SMS should consider

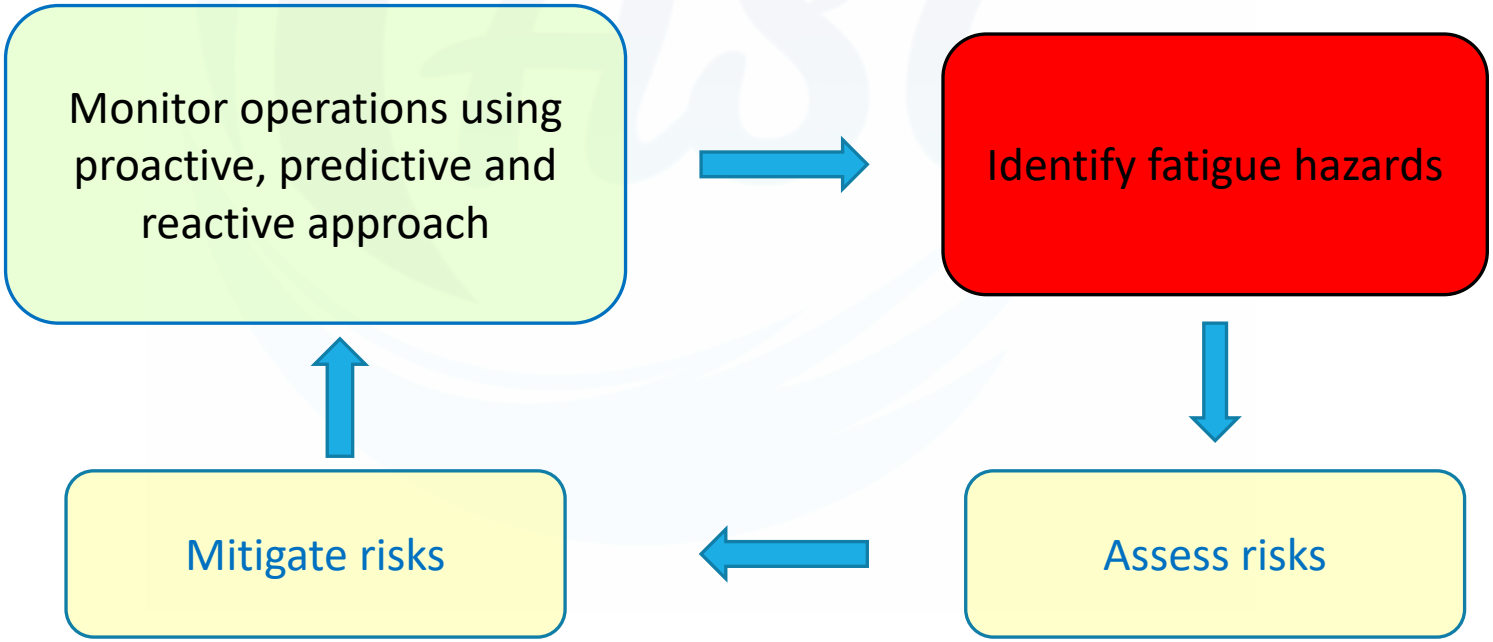
but

data-driven evidence related to fatigue is not specifically and actively collected unless a fatigue issue has been identified by the SMS.

The Operator then reacts only when a fatigue hazard is identified.

FRM Process

Using a FRMS, the Operator must additionally identify and assess potential fatigue risks prior to conducting operations, as well as identifying and assessing actual fatigue risks proactively during operations.



FRMS - Monitoring phase

Three ways of hazard identification:

Proactive: Measuring fatigue levels in normal day-to-day operations

Predictive: Examining scheduled rosters - the fatigue management way

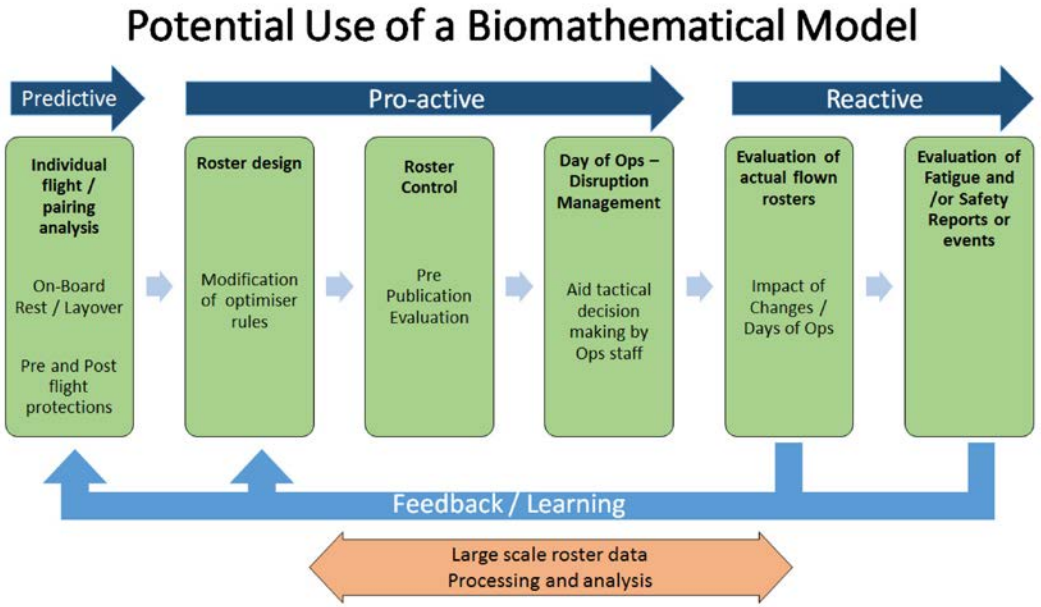
Reactive: Assessing the contributions of fatigue to safety reports/events

FRMS - Monitoring phase

PROACTIVE	PREDICTIVE	REACTIVE
Self reported fatigue risks	Previous experience	Safety reports
Fatigue surveys	Evidence based rostering	Event investigations
Safety databases	Bio-mathematical models	
Scientific studies		
Sleep monitoring		

Bio Mathematical Fatigue Models

Optional Tool for Fatigue Risk Hazard Management



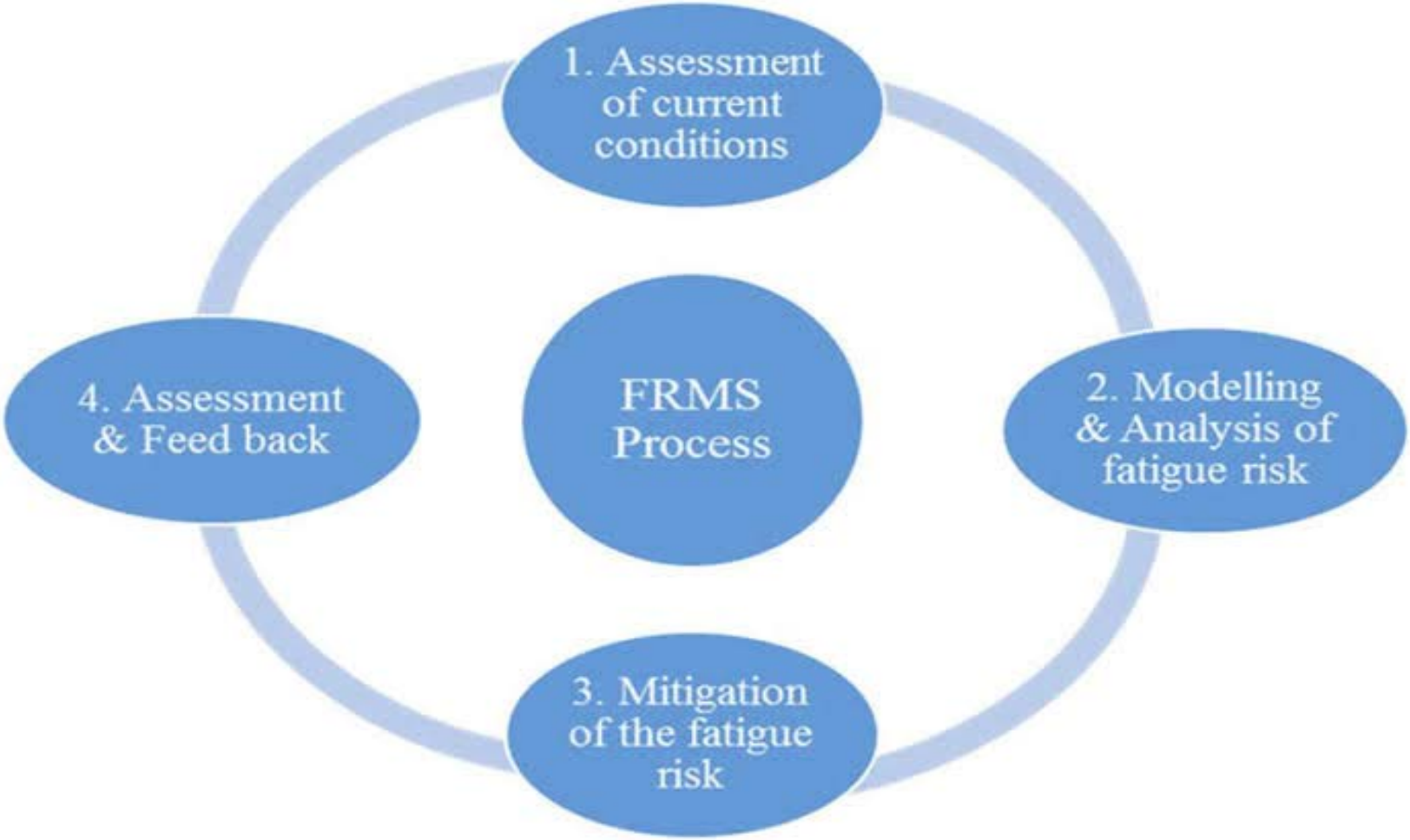
- A model is not an FRMS.
- An optimizer used in conjunction with a model does not constitute an FRMS.
- A model should not be used by individuals, operators or regulators as a go/no-go decision making tool.
- The output of a model does not necessarily correlate to a safety risk.
- Model outputs represent the population average and may not be accurate for specific individuals.
- Model sleep predictions may not reflect actual sleep which is fundamental to the validity of its output.

Fatigue Risk Management

A Fatigue Risk Management system involves:

- Policies/responsibilities;
- Risk assessment;
- Hazard controls/action plans;
- Training and education;
- Ongoing review and improvement.

Fatigue Risk Management Process

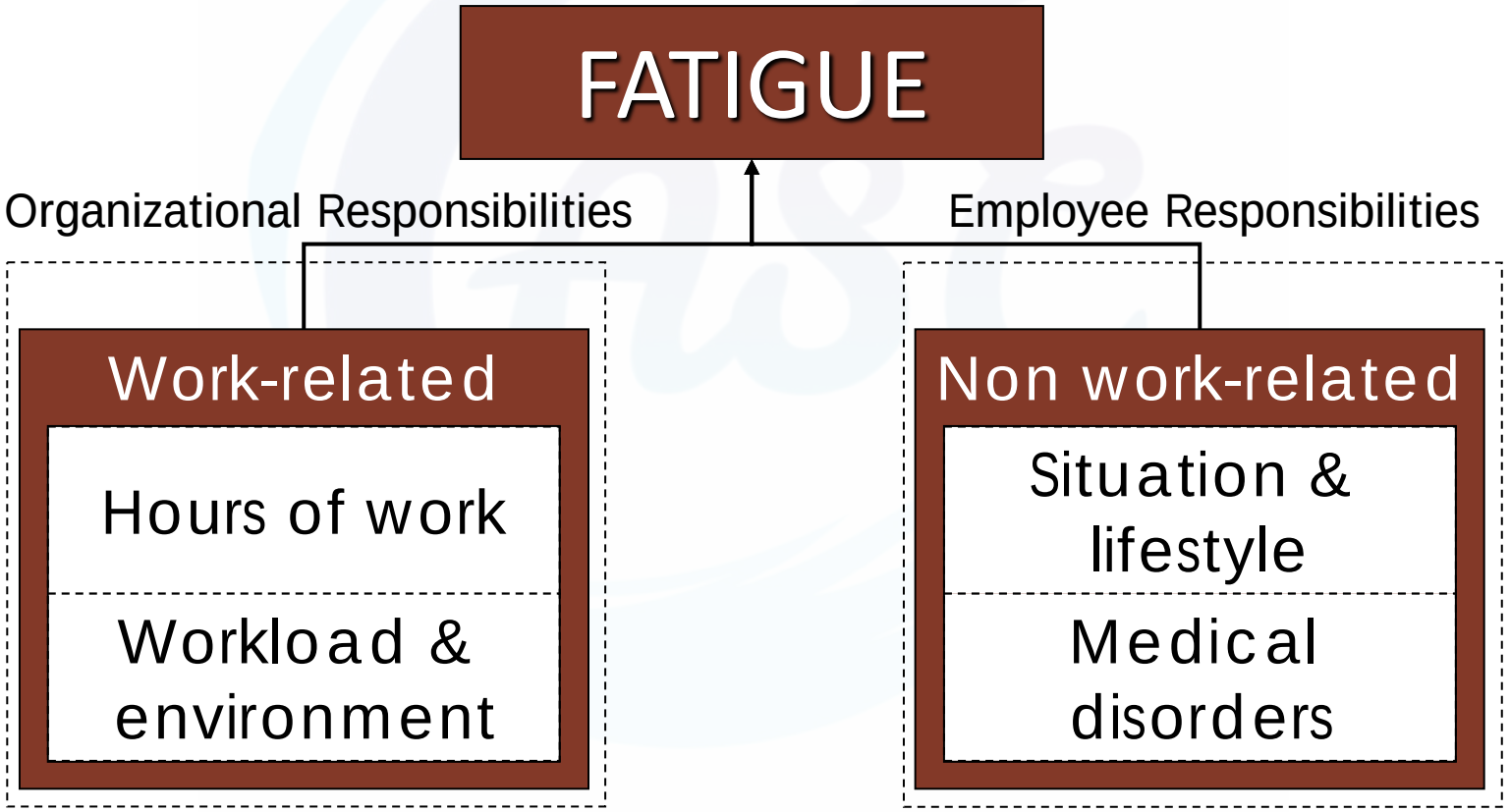


slido

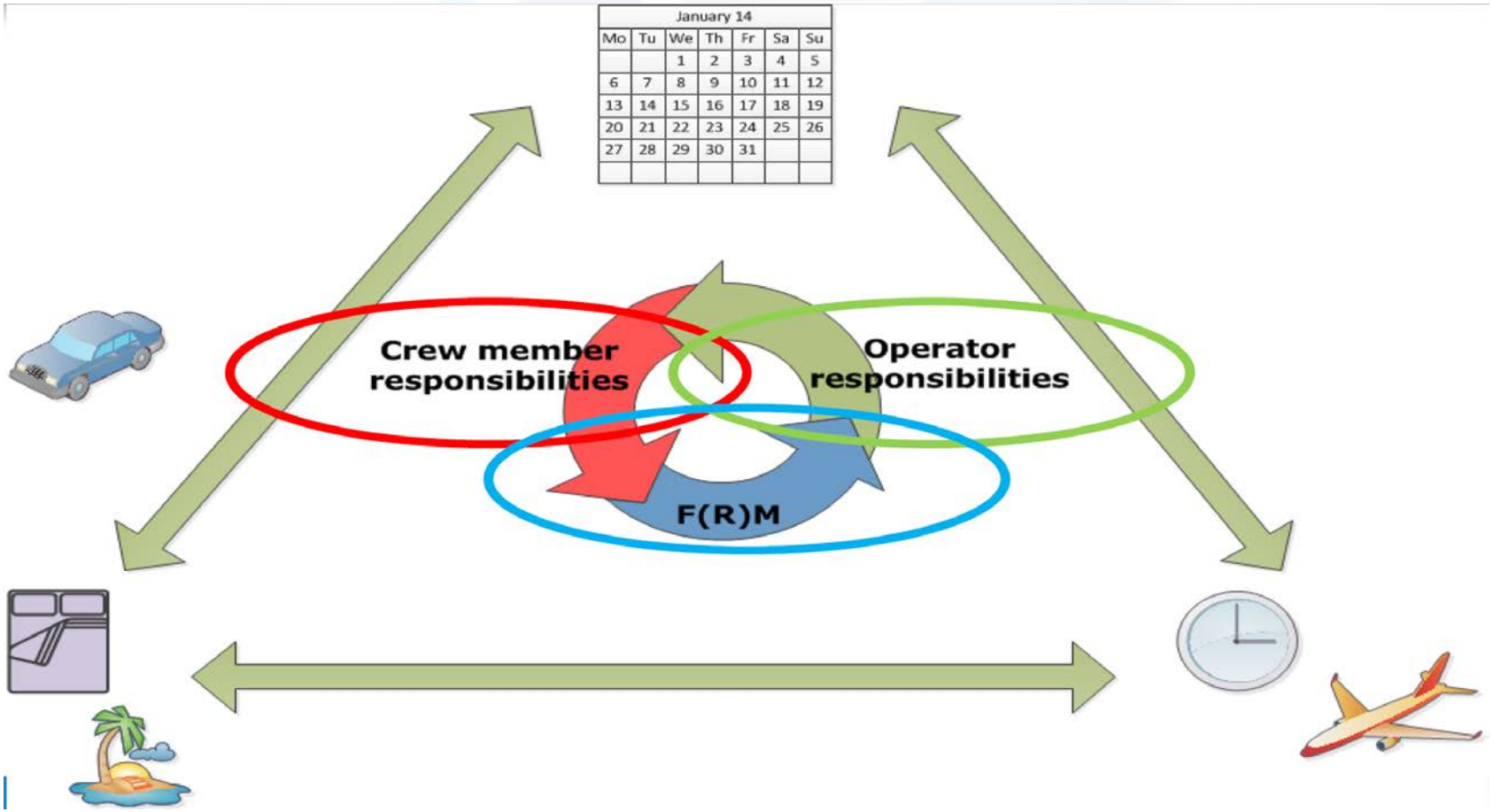
Who do you think we should base the responsibility of managing FRM on?

ⓘ Start presenting to display the poll results on this slide.

Joint Responsibilities for Fatigue



Shared Responsibilities



Joint Responsibilities for Fatigue

Are we the best judges of our level of fatigue?

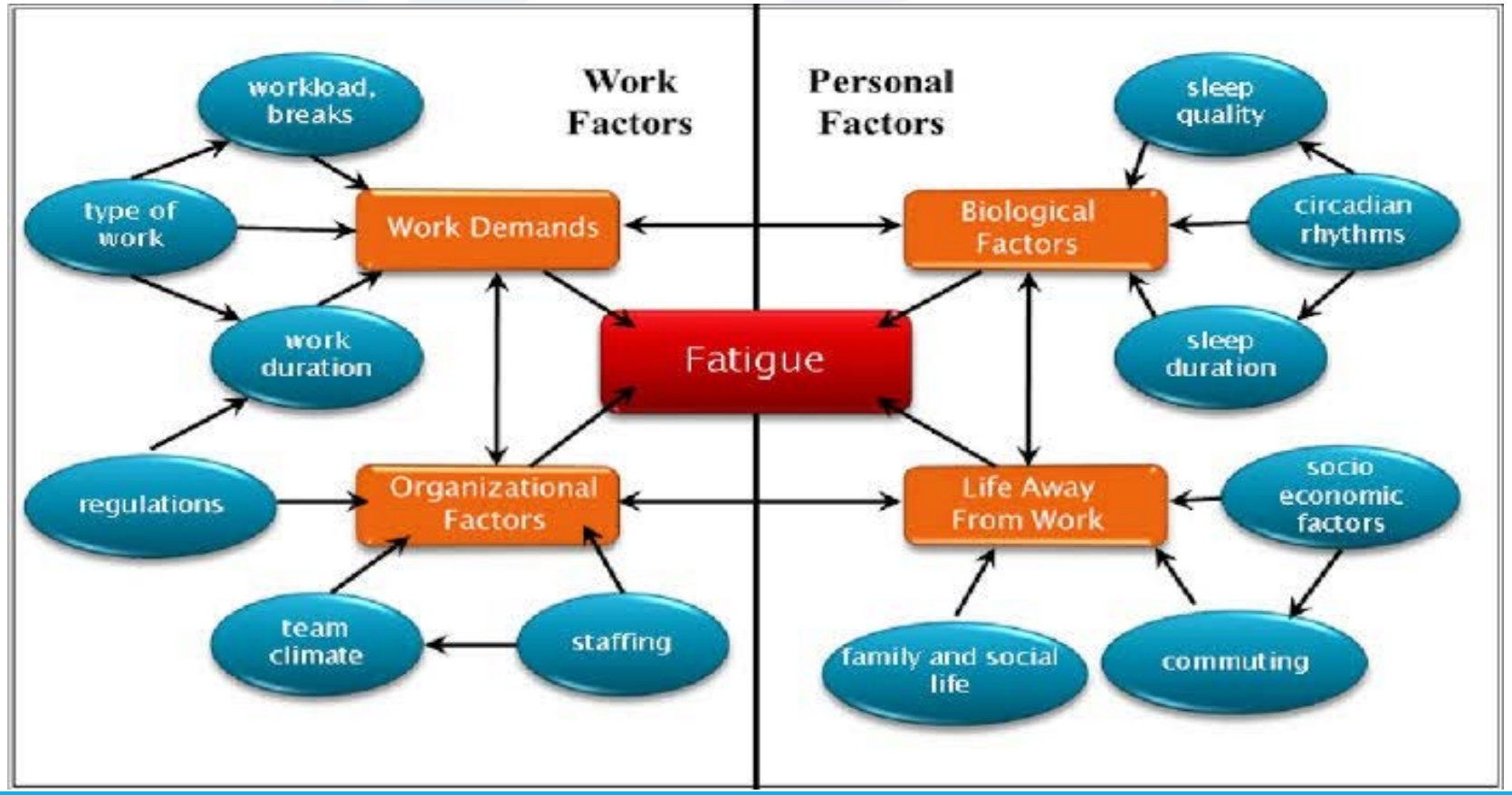
Ask yourself these questions before starting work:

- How much sleep have I been getting over the last few nights?
- How long have I been awake?
- Will I be working at a time when I would rather be sleeping?
- Have I had good-quality sleep?

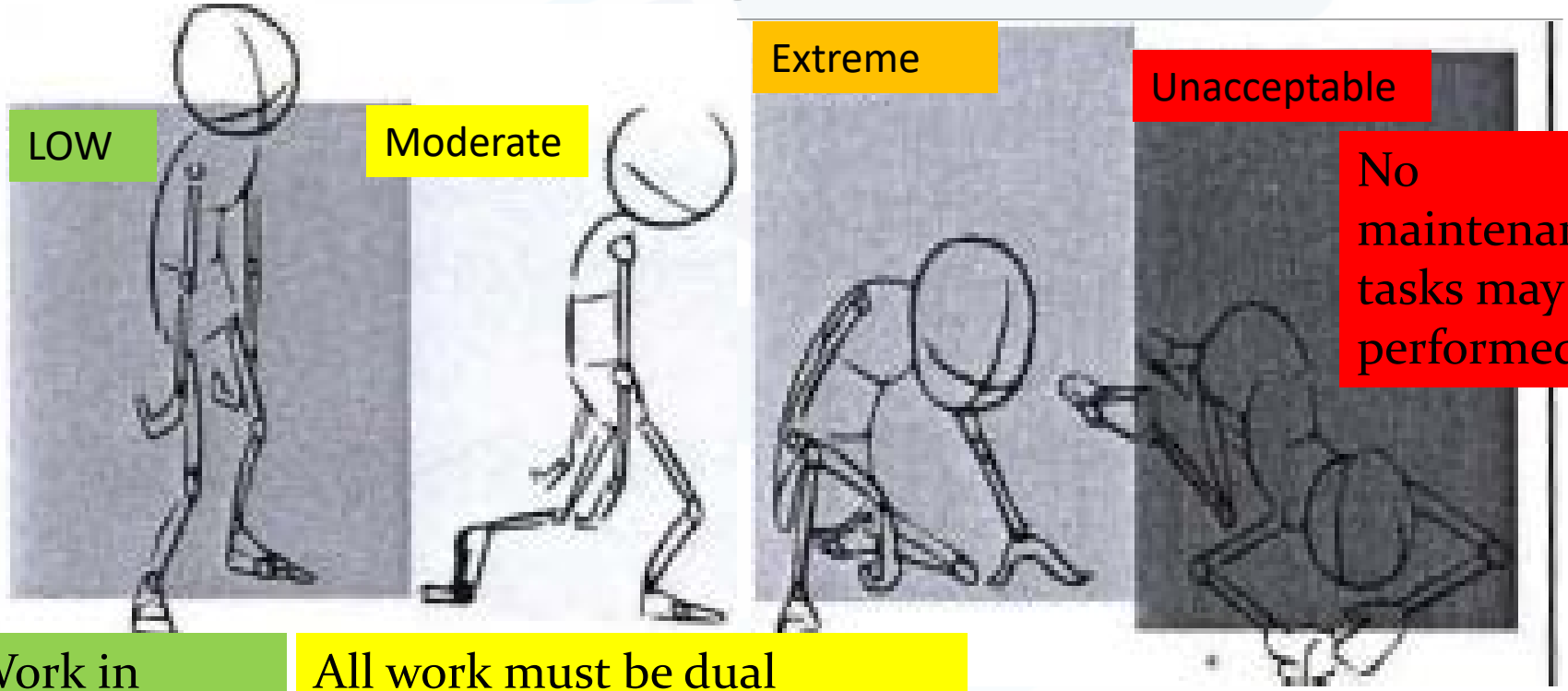
Operator Responsibilities

Managing Fatigue Risk

Employer & employee responsibilities for managing fatigue



Levels of Fatigue



No maintenance tasks may be performed.

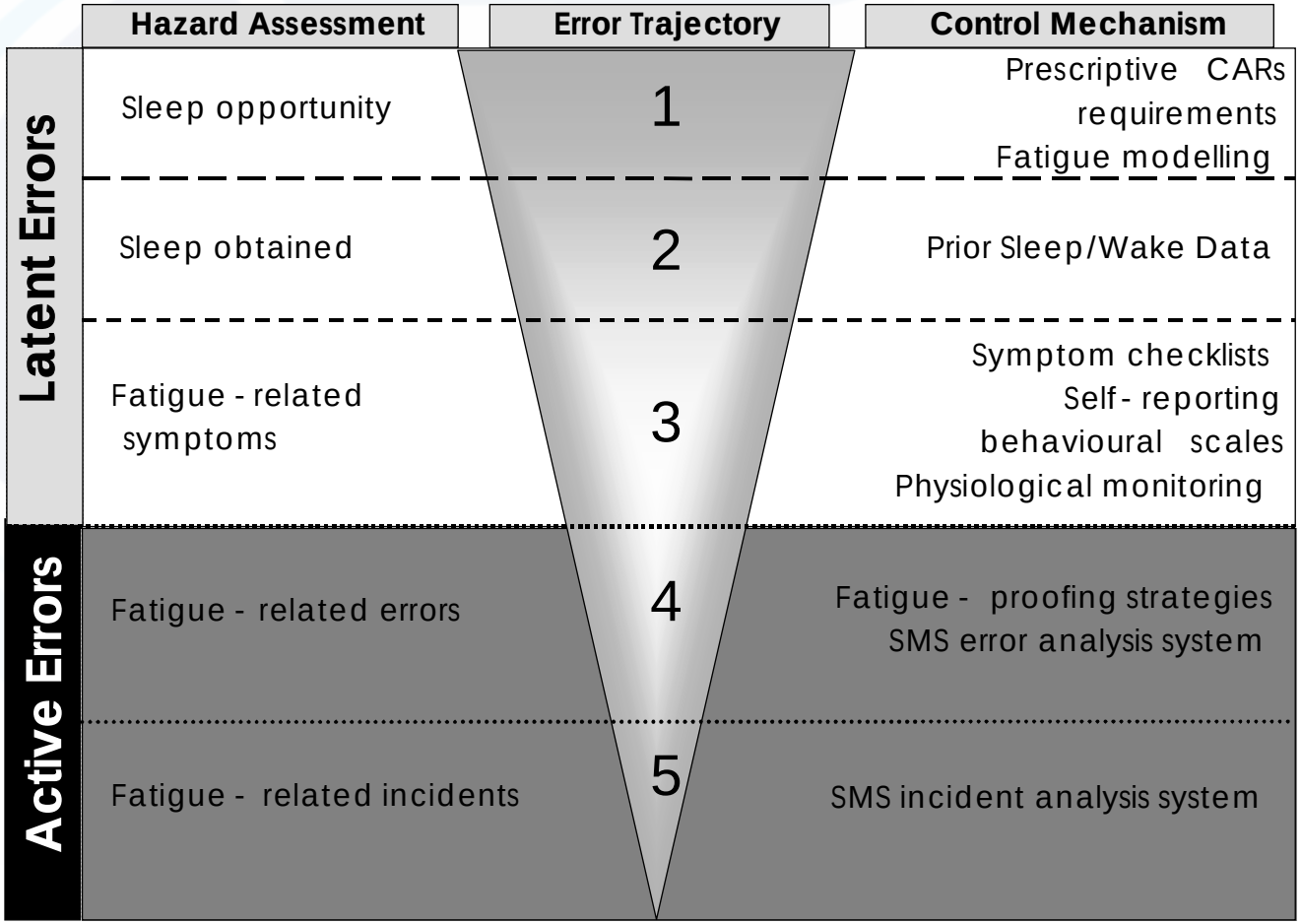
Work in accord with normal privileges and limitations.

All work must be dual inspected.
Operational/Functional checks must be accrued out whenever a critical system has been disturbed.

Previous restrictions and No sig-off authority.
May not interact with critical systems such as flight controls.

Hazard Control Model

Five levels of defense reduce the possibility of a fatigue .. related error or incident.



Level 1 Controls- Sleep Opportunity

Level 1 controls are intended to make sure you get enough time off between shifts to get enough sleep.

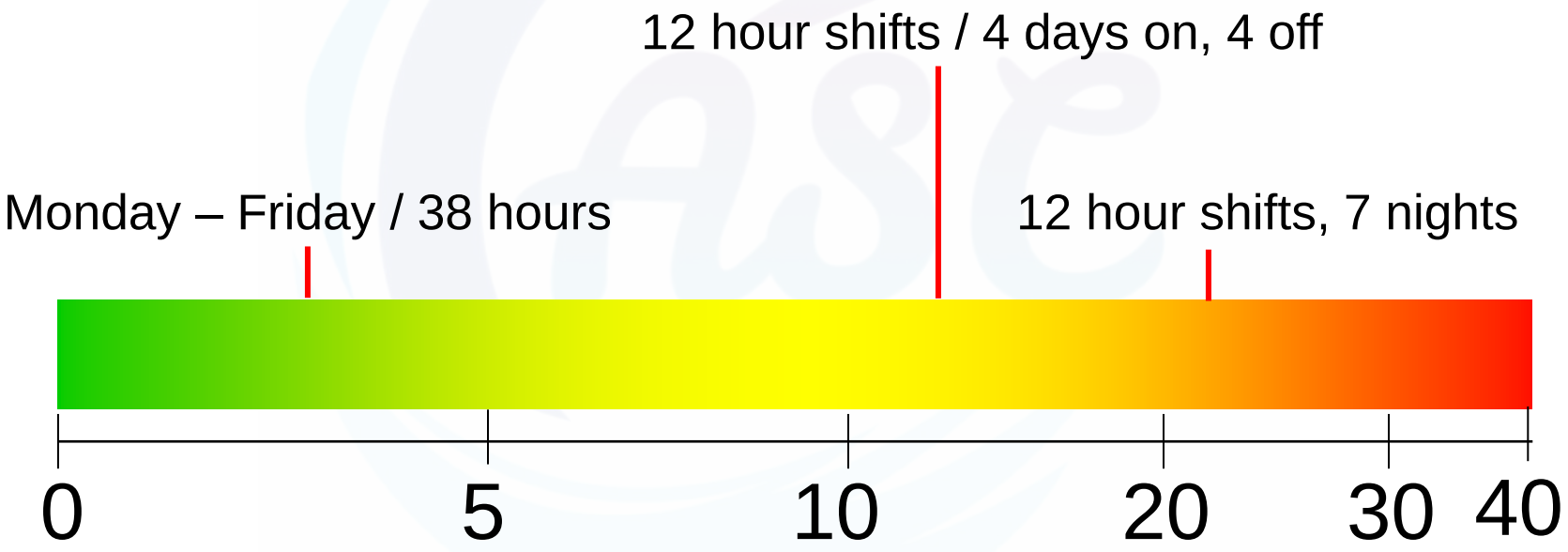
Schedules are evaluated according to:

- length and timing of shifts;
- length and timing of breaks;
- number of shifts worked in a row;
- number of days off between shifts.

Level 1 Controls- Sleep Opportunity

Fatigue Likelihood Scoring Matrix for Work Schedules					
	0 points	**1 point**	**2 points**	**4 points**	**8 points**
a) Total hours per 7 days	≤ 36 hours	36.1 – 43.9	44 – 47.9	48 – 54.9	55+
b) Maximum shift duration	≤ 8 hours	8.1 – 9.9	10 – 11.9	12 – 13.9	≥ 14
c) Minimum short break duration	≥ 16 hours	15.9 – 13	12.9 – 10	9.9 – 8	≤ 8
d) Maximum night work per 7 days	0 hours	0.1 – 8	8.1 – 16	16.1 – 24	≥ 24
e) Long break frequency	≥ 1 in 7 days	≤ 1 in 7 days	≤ 1 in 14 days	≤ 1 in 21 days	≤ 1 in 28 days

Level 1 Controls- Sleep Opportunity



Level 2 Controls - Sleep Obtained

Level 2 controls are intended to determine whether employees actually got the sleep they needed:

- Identifies employees who fail to get sufficient sleep;
- Provides a procedure to report fatigue to a supervisor or manager;
- Outlines clear steps to take when an employee makes a fatigue report.

Level 2 Controls – Fatigue likelihood score

Prior sleep factor	Threshold value	Score
X (sleep in prior 24 hours)	5 hours	Add 4 points for each hour below threshold
Y (sleep in prior 48 hours)	12 hours	Add 2 points for each hour below threshold
Z (time awake since last sleep)	Y	Add 1 point for each hour of wakefulness greater than Y

A simple calculation can give you a fatigue likelihood score.

Level 2 Controls - Sample Decision Tree

Score	Action
0	No action.
1-4	Talk to supervisor and undertake approved individual countermeasures (I.e., self monitoring for symptoms, team monitoring by colleagues, task rotation.
5-10	File fatigue report with supervisor. Organize supervisory checks. Complete symptom checklist, task re-assignment
10+	File fatigue report with manager. Do not engage In risky behavior. Do not start shift until fit for work.

Level 2· Controls - ILS Card

FRONT

Individual Fatigue Likelihood Assessment

Step 1. Sleep in prior 24 hours

Sleep	≤ 2h	3h	4h	5+h
Points	12	8	4	0

Step 2. Sleep in prior 48 hours

Sleep	≤8h	9h	10h	11h	12+h
Points	8	6	4	2	0

Step 3. Hours of wake since last sleep

Add one point per hour awake greater than sleep in step 2.

BACK

Individual Fatigue Likelihood Assessment

Step 4.

Add all points together to determine your score

Score	Control Level
1-4	Self-monitoring
5-8	Supervisor monitoring
9+	Don't commence shift until fit for work

Refer to FRMS policy for detailed explanation of controls

Level 3 Controls - Fatigue Symptoms

Level 3 controls are intended to identify employees who show signs of fatigue:

- symptoms of fatigue indicate an increased risk of fatigue-related error;
- employees should watch for symptoms in themselves and others;
- a system of reporting allows the company to take measures when the risk is considered high.

Level 4 Controls - Fatigue Proofing Strategies

- Increased supervisor/co-worker monitoring;
- Working in pairs;
- Double-check systems;
- Checklists;
- Task rotation;
- Additional breaks;
- Napping;
- Moving critical/monotonous tasks to daytime

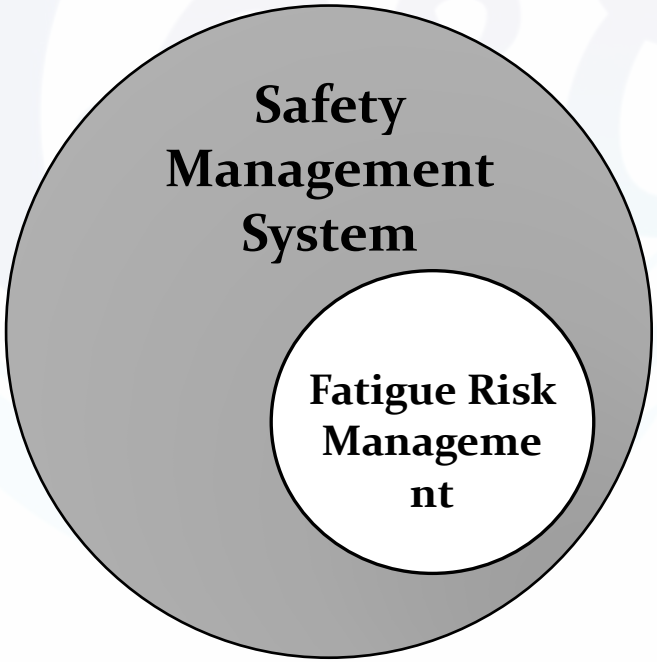
Level 5 Controls - Errors and Incidents

Level 5 controls consist of:

- Fatigue error or incident reporting system;
- Investigation procedures to determine whether fatigue was a cause of an incident;
- Review of fatigue management controls.

Fatigue Risk Management Systems FRMS

A fatigue risk management system (FRMS) can be part of a safety management system (SMS)



The Components of FRMS

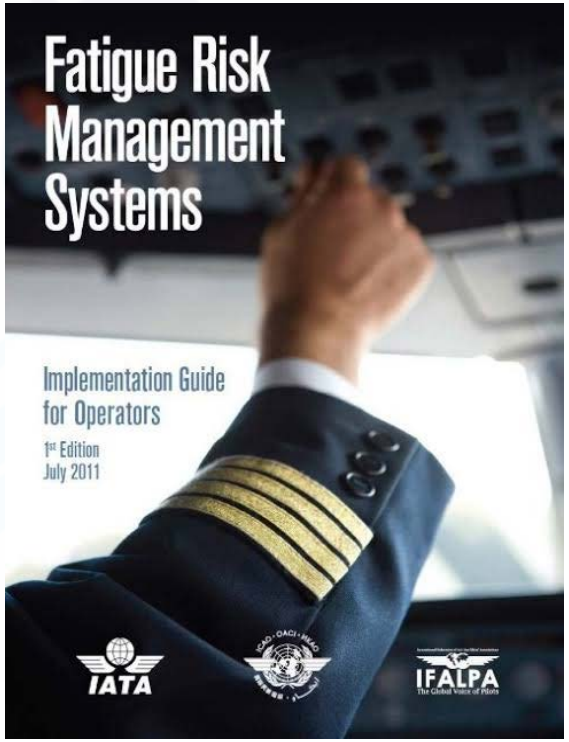
Description of the Guide

Aligned with ICAO's FRMS Manual for Regulators (Doc9966);

Provides comprehensive implementation guidance including scientific principles

Available on-line:

- www. iata.org
- www.icao.int
- www.ifalpa.org



Description of the Guide

- Summarizes supporting science;
- Explains the minimum requirements;
- Describes how to implement an FRMS;
- Provides operational examples of various means of compliance;
- Stresses the need for joint responsibility amongst all stakeholders.

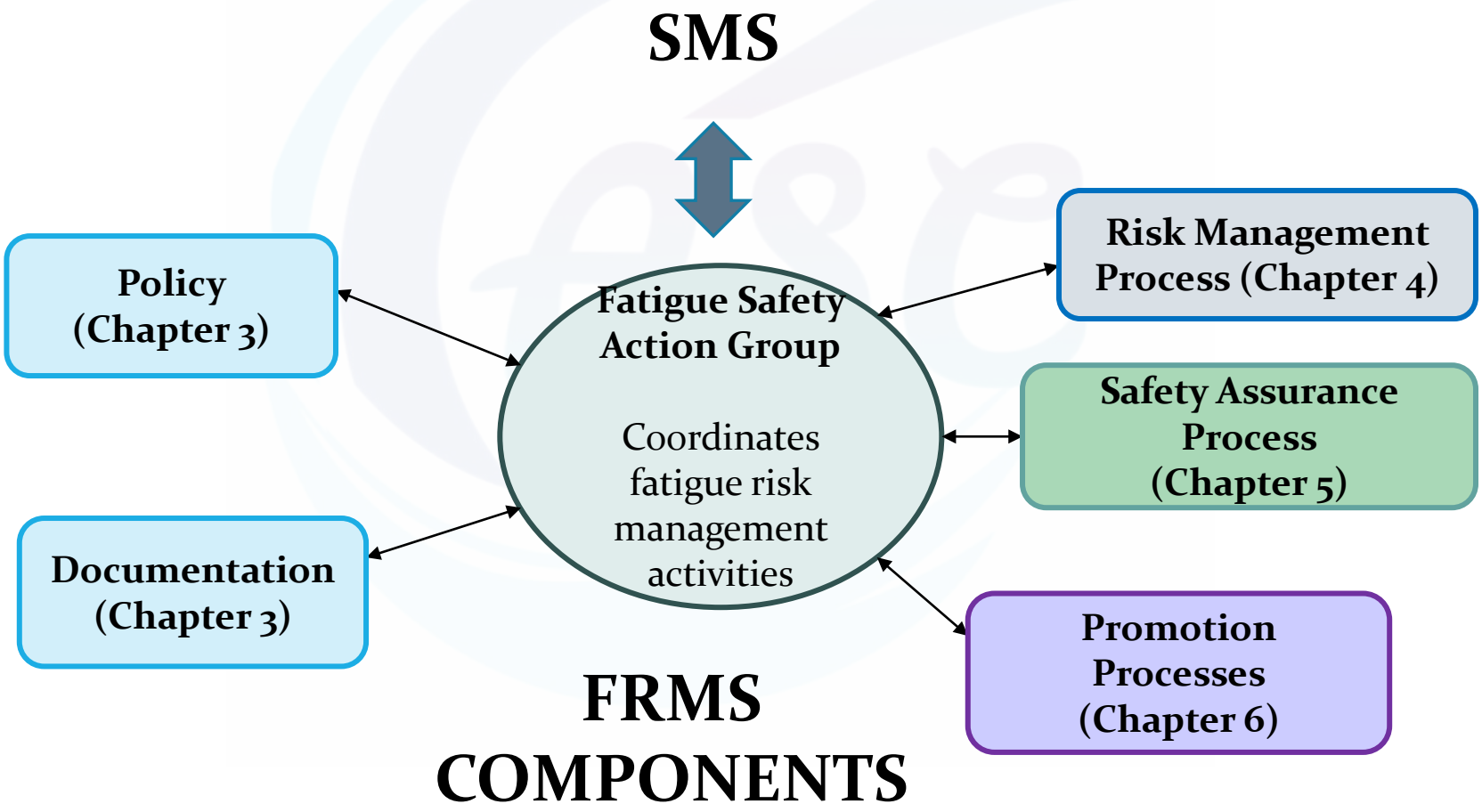
The Guide Content

- Introduction to FRMS
- Science for FRMS
- FRMS policy and documentation
- Fatigue Risk Management Processes
- FRMS Safety Assurance Processes
- FRMS Promotion Processes
- FRMS Implementation

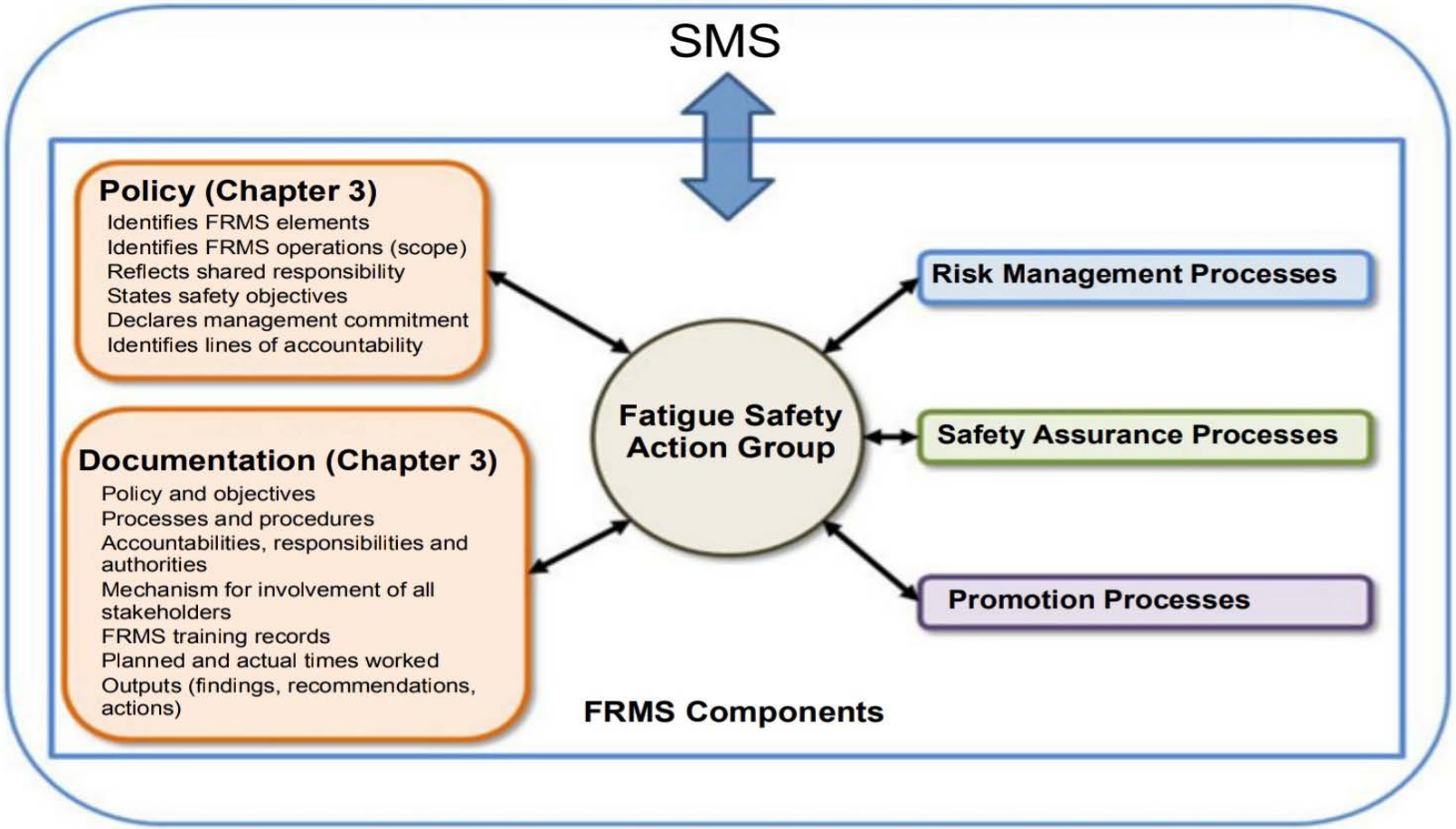
SMS and FRMS

SMS	FRM
Safety policy & objectives	FRM policy & documentation
Safety risk management	Fatigue risk management process • Identification of hazards • Risk assessment • Risk mitigation • Implementation
Safety assurance	Fatigue safety assurance • Monitor effectiveness of FRM • Management of change • Continuous improvement of FRM
Safety promotion	FRM promotion process • Training programmes • FRM communication plan

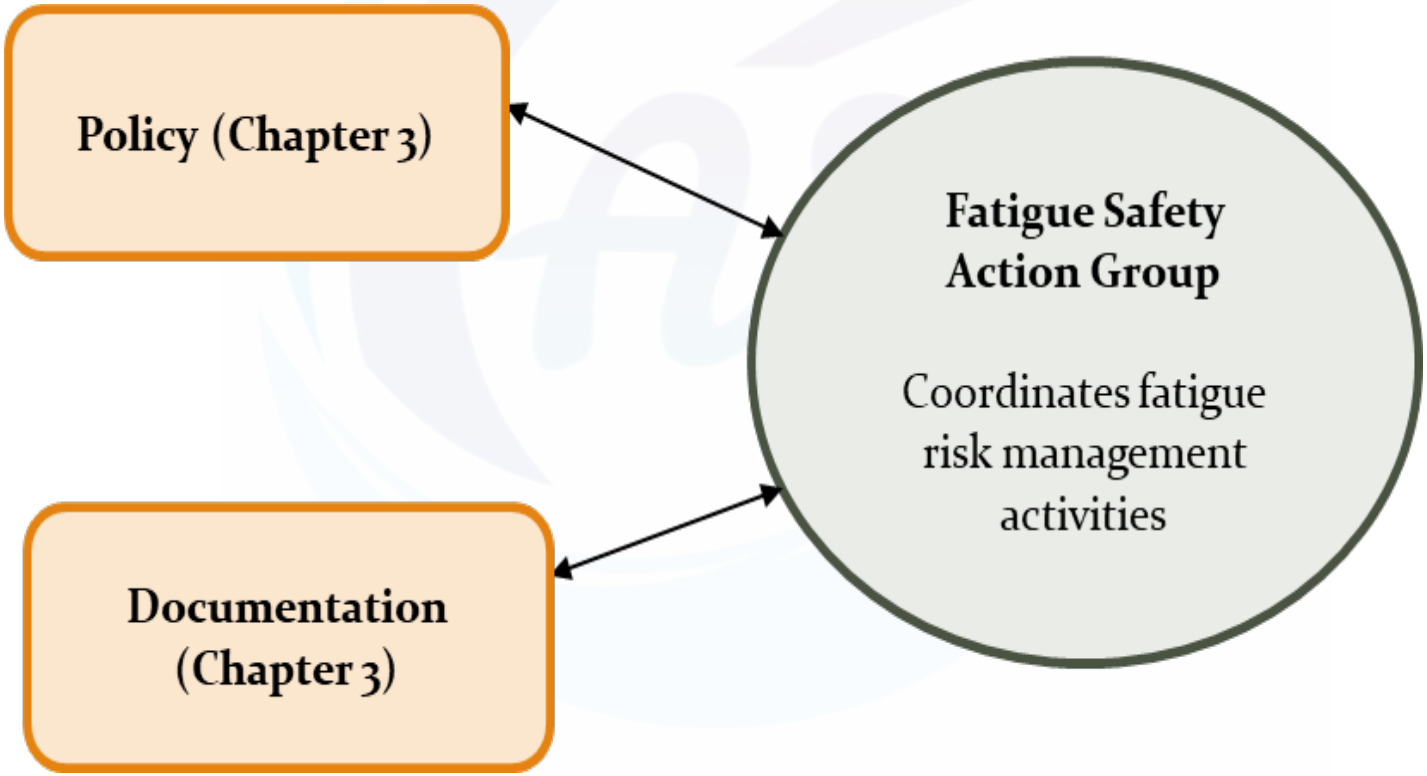
FRMS Framework



FSAG, Policy and Documentation



Getting Started



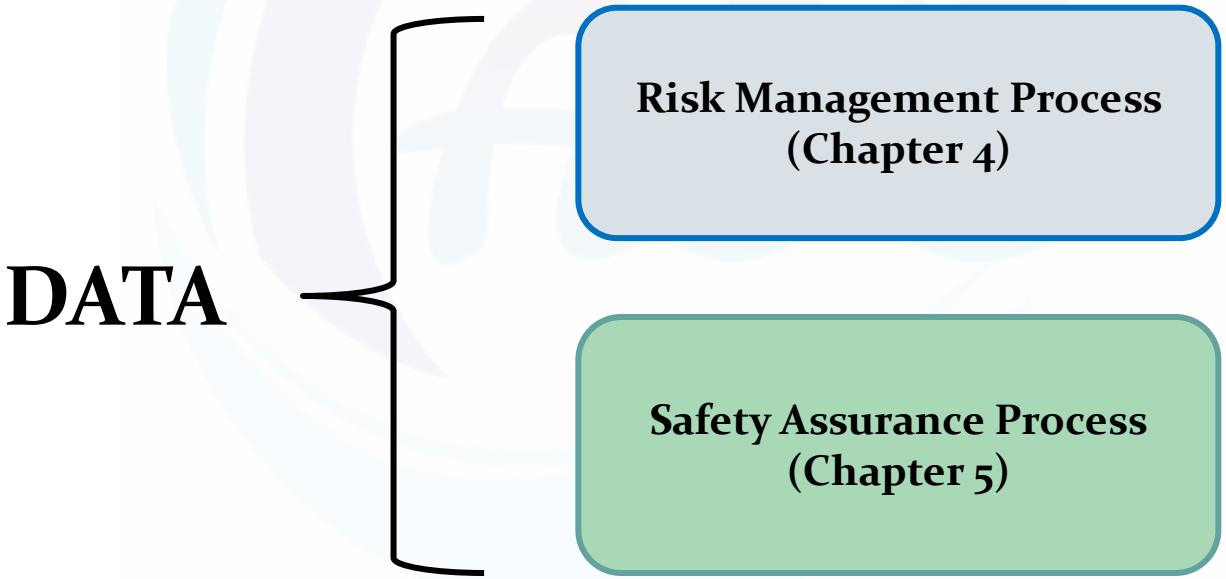
Getting Started .....Cont.

Fatigue Safety Action Group (FSAG)
Participants
Role

Fatigue Policy
Signatory
Content

Supporting Documentation
Owner
Content

Next Steps


DATA
Risk Management Process
(Chapter 4)
Safety Assurance Process
(Chapter 5)

Hazard

A quick revisit to SMS ….

The Fundamentals of Hazards

Hazard - Condition, object or activity with the potential of causing harm / injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

Consequence - Potential outcome(s) of the hazard.

Example:

A wind of 15 knots blowing directly across the runway is a hazard.

The potential that a pilot may not be able to control the aircraft during take-off or landing is one of the consequences of the hazard.

The Fundamentals of Hazards

People have a tendency to describe hazards as their consequence.

"Unclear airport signage" vs. "runway incursion“

Stating a hazard as consequence disguises the nature of the hazard may interfere with identifying other important consequences.

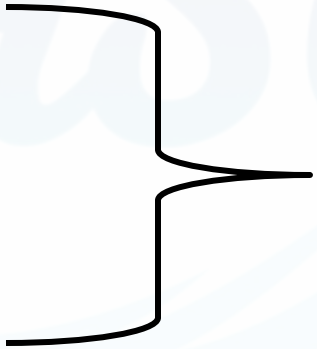
Adequately identified hazards:

- allow to determine the sources or elements of the hazard
- allow to evaluate the potential outcome.

The Fundamentals of Hazards

- What types of hazard exist?

- Natural Hazards
- Technical Hazards
- Economic Hazards
- Environmental Hazards



All these can impact an operation

The Fundamentals of Hazards

- **Natural hazards:**

  ✓Severe or adverse weather conditions

- **Technical Hazards:**

  ✓Technical or system failures

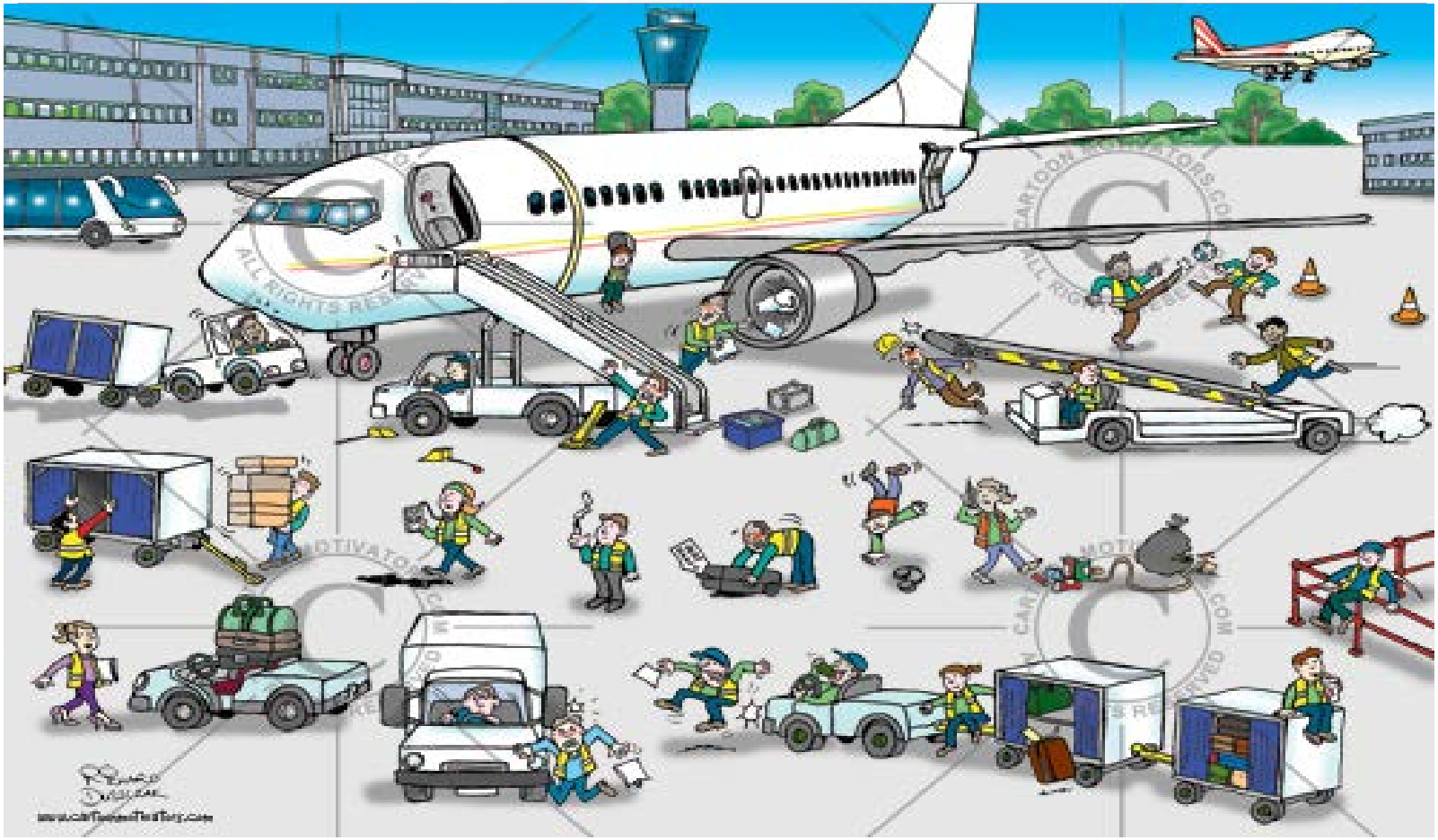
- **Economic Hazards:**

  ✓Recession, strong growth, cost increases

- **Environmental Hazards:**

  ✓Wildlife activity, fuel spills

Can you Identify the HAZARDS!!



Hazards Analysis

ABC of Hazard Identification ...

A - State the generic hazard (hazard statement)

- Foreign Object Damage (FOD)

B - Identify specific components of the hazard

- Debris
- Tools
- Etc …

C - Identify specific consequence(s) related to the components of the hazard

- Component Damage
- Engine Damage
- Etc ...

Key Characteristics of Fatigue: Each Contains a Hazard

Human fatigue can be defined as:

A physiological state of reduced mental or physical performance capability

Reduced Performance Capability

resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity)

Impairment

that can impair a person's alertness and ability to perform safety related operational duties.

Consequences

Task Demand

Identification of Hazards

- Reactive
- Proactive
- Predictive

Methods of Hazard Identification

Reactive Methods

- Assess the contribution of crewmember fatigue to safety reports and events;
- At what time of day did the occurrence take place?
- Was the crewmember's normal circadian rhythm disrupted?
- How many hours had the crewmember been awake at the time of the occurrence?
- Does the 72-hour sleep history suggest a sleep debt?

Methods of Hazard Identification

Proactive Methods

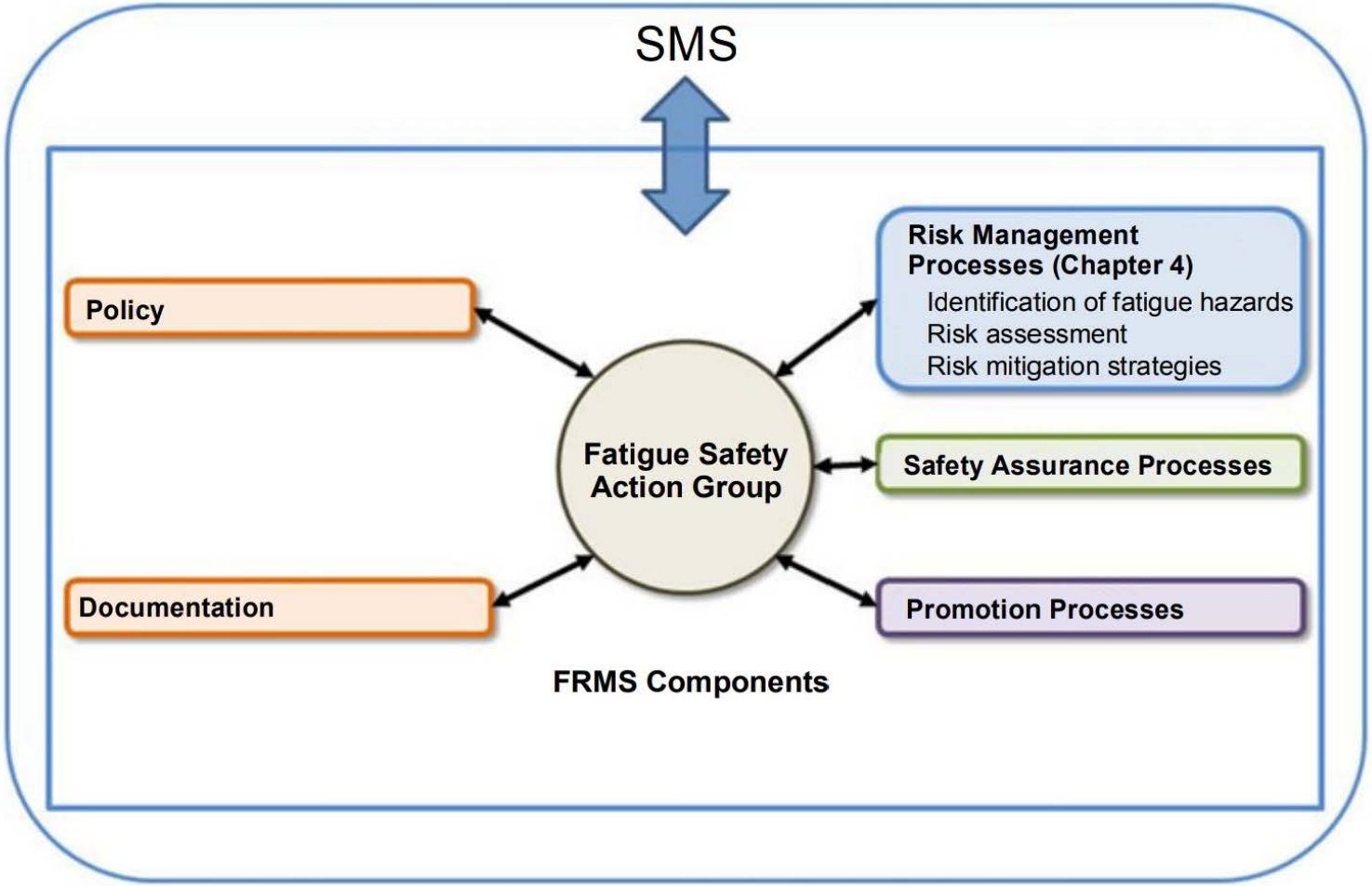
- Monitor fatigue levels in an operation
- Self-reporting of fatigue risks;
- Crew fatigue survey;
- Relevant flight crew performance data;
- Available safety databases and scientific studies;
- Analysis of planned versus actual time worked;
- Sleep monitoring (sleep diary, actigraphy, polysomnography).

Methods of Hazard Identification

Predictive Methods

- Identify areas of future fatigue related risks
- Previous experience;
- Evidence-based scheduling practices;
- Bio-mathematical models.

FRM Processes



FRM Processes

What they do:

- Identify where fatigue is a hazard;
- Assess the level of risk that given fatigue hazard represents;
- If necessary, put in place controls and mitigation strategies, and monitor to make sure that they manage the risk at an acceptable level.

Risk Management Fundamentals

Risk -The assessment, expressed in terms of predicted probability and severity, of the consequence(s) of a hazard taking as reference the worst foreseeable situation.

Example:

A wind of 15 knots blowing directly across the runway is a hazard.

The potential that a pilot may not be able to control the aircraft during take-off or landing is one of the consequences of the hazard.

The assessment of the consequences of the potential loss of control of the aircraft by the pilot expressed in terms of probability and severity is the risk.

Risk Management Fundamentals

What is it?

The identification, analysis and elimination, and/or mitigation to an acceptable level of risk that threatens the capabilities of an organization.

What is the objective?

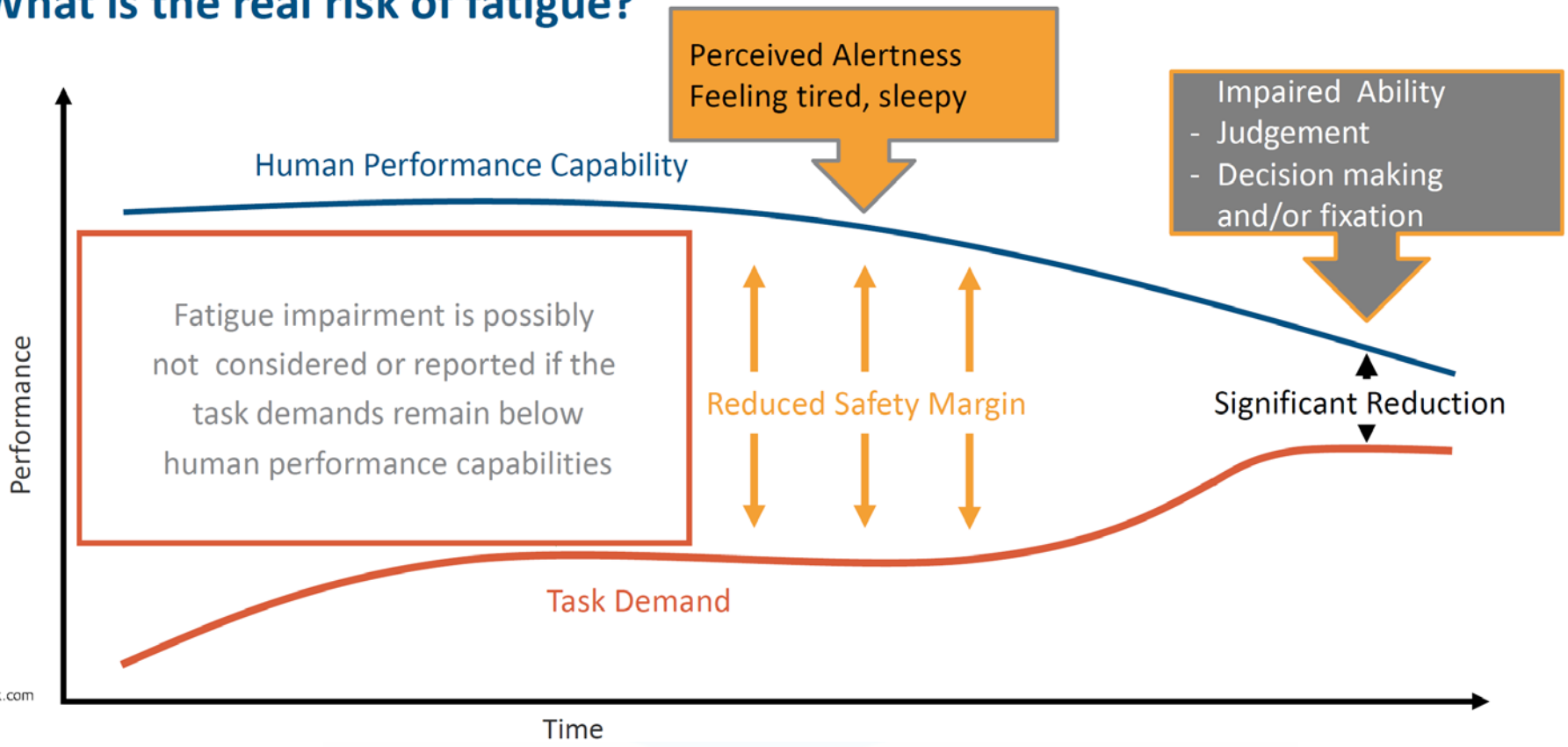
Aims at a balanced allocation of resources to address all risks and viable risk control and mitigation.

Why is it important?

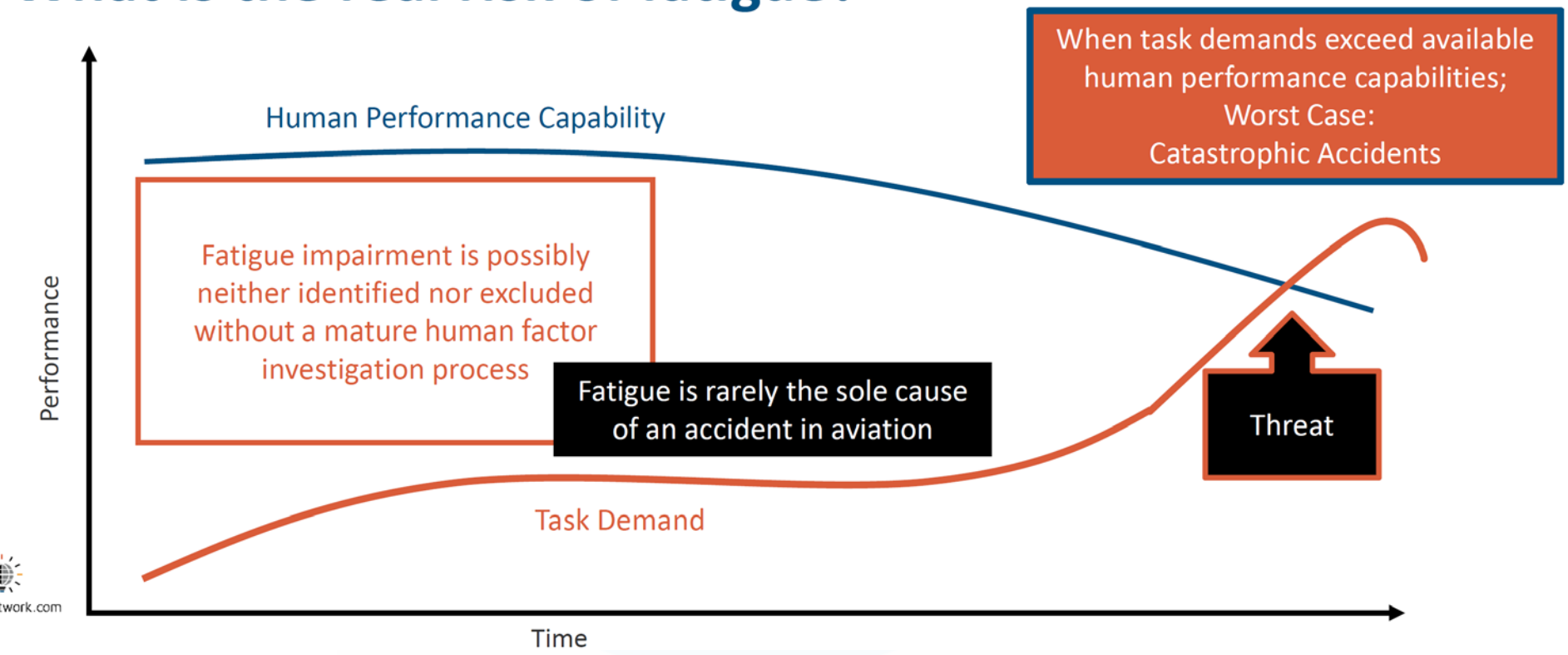
A key component of Safety Management Systems.

Data-driven approach to safety resources allocation, thus defensible and easier to explain.

What is the real risk of fatigue?



What is the real risk of fatigue?



Probability and Severity

•**Probability:**

The likelihood that an (unsafe) event or condition might occur …

•**To assess the probability of an occurrence, answer the following:**

- ✓ Is there a **history of occurrences** like the one being assessed or is this an isolated event?
- ✓ What other elements of the system, or similar type of components may have **similar defects**?
- ✓ How **frequently** is the system component in question used?
- ✓ How **many people** must use the specific system component?

Elements of Risk

Severity

Probability

Risk is the combination of probability (P) and severity (S), often expressed as P x S when using a numerical scale or tolerability matrix.

Probability

Probability of occurrence		
Qualitative definition	**Meaning**	**Value**
Frequent	Likely to occur many times (has occurred frequently)	**5**
Occasional	Likely to occur some times (has occurred infrequently)	**4**
Remote	Unlikely, but possible to occur (has occurred rarely)	**3**
Improbable	Very unlikely to occur (not known to have occurred)	**2**
Extremely improbable	Almost inconceivable that the event will occur	**1**

Probability and Severity

To assess the severity of an occurrence, answer the following:

- **How many lives may be lost?**
  - ✓Employees
  - ✓Passengers
  - ✓General public
- **What is the environmental impact?**
  - ✓Physical disruption of natural habitat
- **What is the severity of the property or financial damage?**
  - ✓Direct operator property loss
  - ✓Damage to aviation infrastructure
  - ✓Third party damage
  - ✓Financial impact and economic impact
- Are there **organizational, management or regulatory implications** that might generate larger threats to public safety?
- What are the likely **political implications** and/or **media interest**?

Severity

Severity of occurrence		
Aviation definition	**Meaning**	**Value**
Catastrophic	- Equipment destroyed. - Multiple deaths.	**A**
Hazardous	- A large reduction In safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely. - Death or serious injury, - Major equipment damage	**B**
Major	- A significant reduction In safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of increase in workload, or as a result of conditions impairing their efficiency. - Serious Incident. - Injury to persons.	**C**
Minor	- Nuisance - Operating limitations. - Use of emergency procedures - Minor incident	**D**
Negligible	Little consequence	**E**

Risk Assessments

In order to assess the risk, it must be evaluated by probability and severity

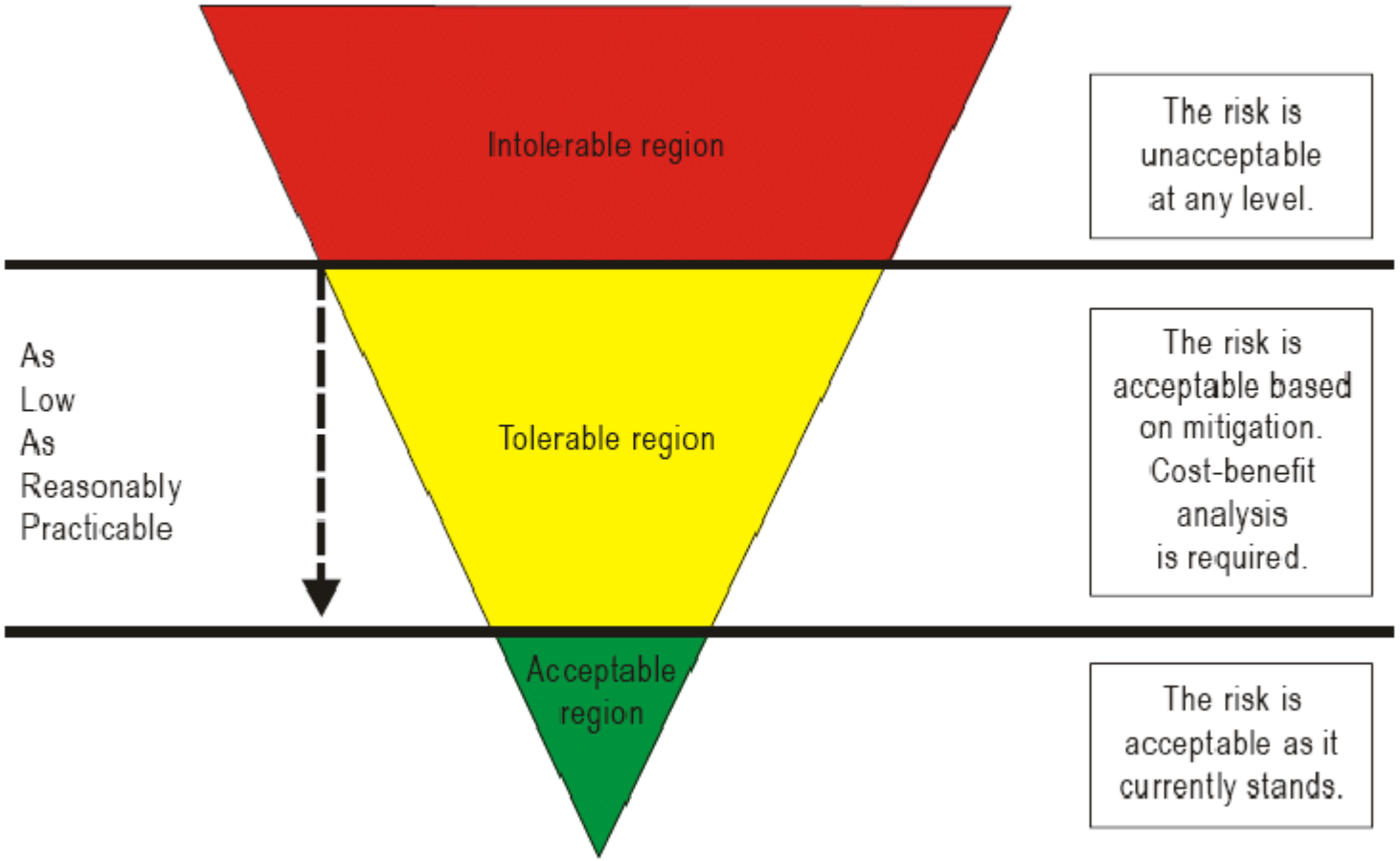
Colored Cells are the Risk Categories	Low Risk	Medium Risk	High Risk

Frequency of Scenario	Severity of Consequences		
	Low Severity	Medium Severity	High Severity
High Frequency	Medium	High	High
Medium Frequency	Low	Medium	High
Low Frequency	Low	Low	Medium

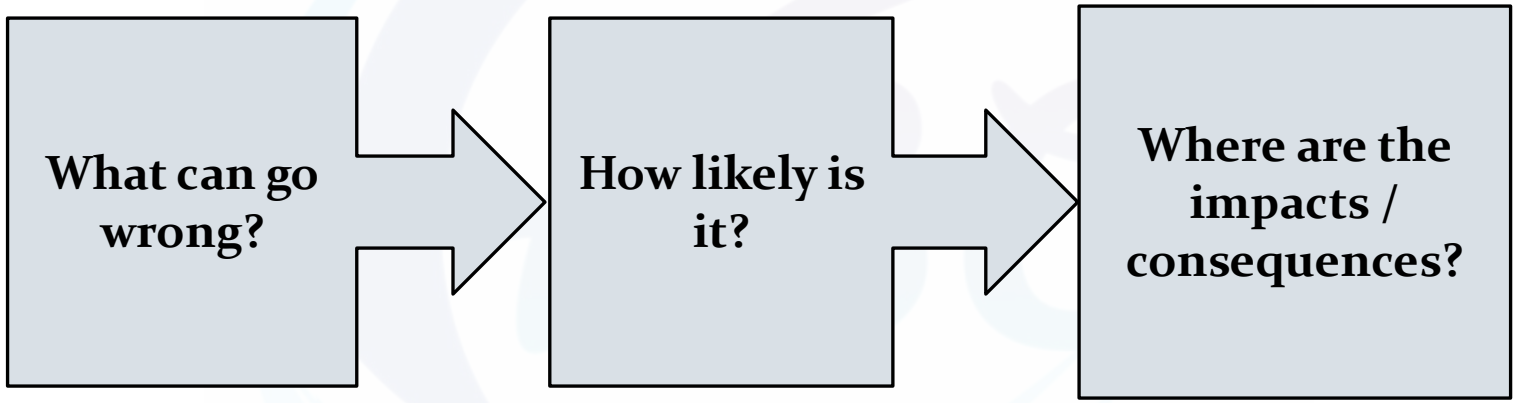
Likelihood \ Impact	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

The use of a risk matrix allows the level of risk for each hazard to be easily identified - many different risk matrices exist

Risk Management Fundamentals



Risk Assessment - Discussion



Safety Risk Severity [ICAO SMM Doc 9859 Figure 2-12]		
Severity	**Meaning**	**Value**
Catastrophic	- Multiple deaths - Equipment destroyed	A
Hazardous	- A large reduction in safety margins, physical distress or a workload such that crewmembers cannot be relied upon to perform their tasks accurately or completely - Serious injury - Major equipment damage	B
Major	- A significant reduction in safety margins, a reduction in the ability of crewmembers to cope with adverse operating conditions as a result of increase in workload, or as a result of conditions impairing their efficiency - Serious incident - Injury to persons	C
Minor	- Nuisance - Operating limitations - Use of emergency procedures - Minor incident	D
Negligible	- Little consequences	E

FRMS – Risk assessment

Assessing fatigue risks is a complex process:

- Complex interaction between fatigue and performance.
  Fatigue is rarely the only cause of an event, but it is often a contributing factors.

- Methods need to be used with full knowledge of potential and limitations.

- Fatigue management is under continuous development: fatigue risk assesment processes might change as more experience in fatigue management is achieved all over the world.

FRMS – Risk assessment Methods

A risk assessment matrix can be used to calculate fatigue safety risk.

Safety risk is defined as the projected likelihood and severity of the outcome from an existing hazard

When managing fatigue risks, different severity classification are needed. Examples are:

- Subjective sleepiness scale (Samn-Perelli, KSS)
- Bio-mathematical models (Not to be used as a stand alone method!)
- Assessing the number of relevant fatigue factors associated with a specific duty or work pattern

Samn - Perelli subjective fatigue scale	
1	Fully alert; wide awake; Extremely peppy
2	Very lively; Responsive but not at peak
3	Ok; Somewhat fresh
4	A little tired; Less than fresh
5	Moderately tired; Let down
6	Moderately tired; Very difficult to concentrate
7	Completely exhausted; Unable to function effectively

Adaptation of SAM FORM 202

Adapted by: *Estimating aircrew fatigue: a technique with application to airlift operations*
Samn - Perelli (1982)

Crew Status Check (SAM Form 202)	Predicted Effect of Fatigue on Performance
1 - 3	Sufficiently alert. No performance impairment due to fatigue.
4	Mild fatigue. Performance impairment possible but not significant. Treat as class IV.
5 - 6	Moderate to severe fatigue. Some performance impairment probably occurring. Flying duty permissible but not recommended.
7	Severe fatigue. Performance definitely impaired. Flying duty not recommended. Safety of flight in jeopardy.

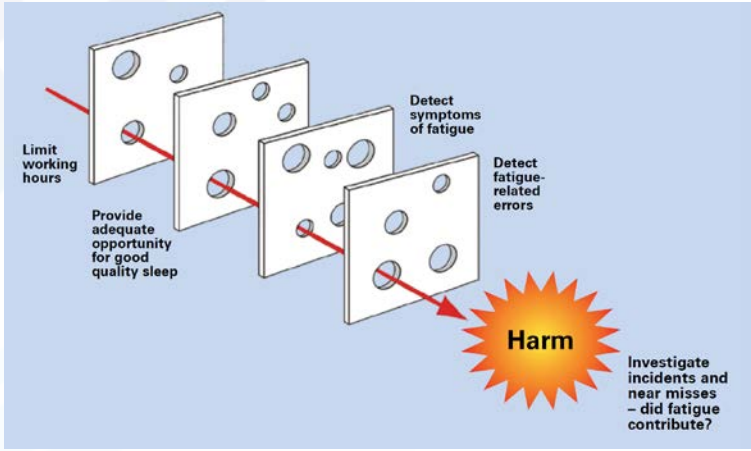
Risk Mitigation

Companywide measures are sufficient to manage the majority of the risk, case-specific additional controls may be required to ensure sufficient layers of defence. For instance, these may include:

Review of sleep quality and quantity and the identification of improvement measures.

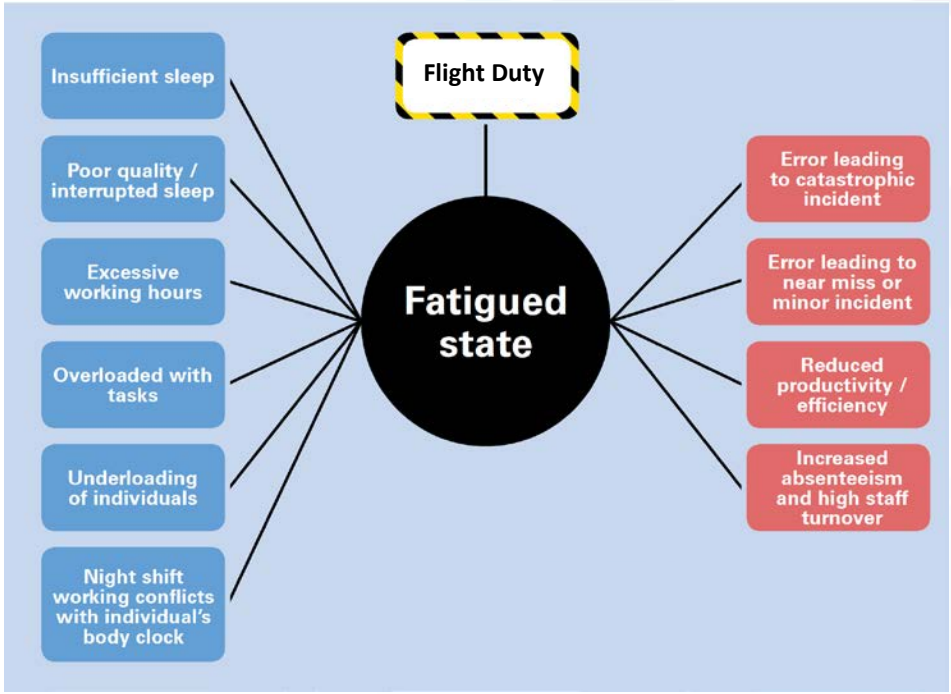
The dynamic assessment of fatigue symptoms by the individual, his peers or supervisor.

Flexible strategies for reacting to fatigue, such as exercise, short breaks or task rotation.

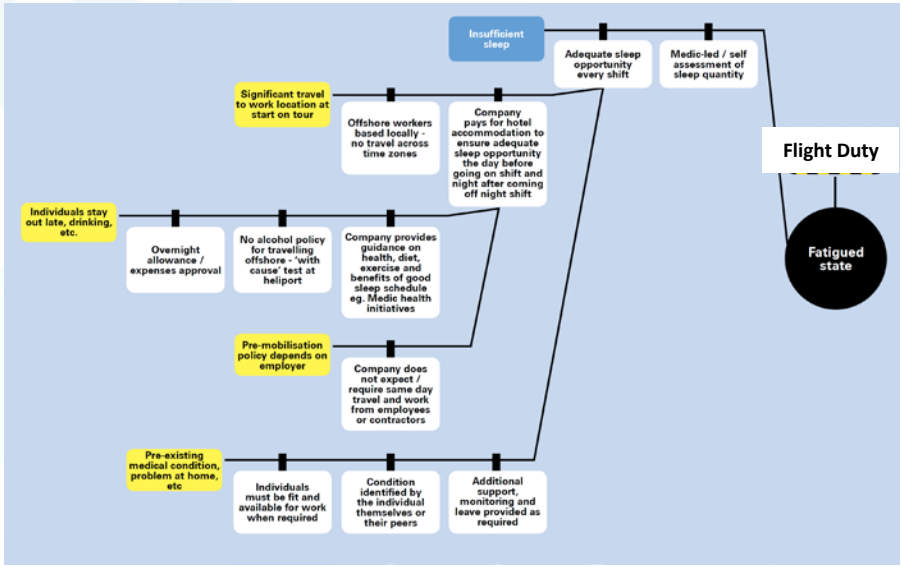


FRMS Using Bowties

The bowtie provides an easy-to-use template for an organisation to assess its fatigue management arrangements



Reduce fatigue risk to ALARP levels



FRMS – Risk mitigation

Risk assessment determines whether or not risk mitigation is required

Mitigations are costly in terms of HR, time, money

Need for a careful selections of fatigue risks to be mitigated, going beyond duty and rest times!

slido

Who decides what is acceptable risk? What are the factors that affect acceptability?

ⓘ Start presenting to display the poll results on this slide.

Issues of Acceptable Risk

There is no practical definition because:

- Its perception varies among industries (Automobile industry/Aeronautical industry)
- It is very hazard specific (Nuclear accidents)
- Even government agencies are not consistent
- Transport/Pharmaceutical
- There are contemporary comparisons that can be made
- Other countries, international organizations (ICAO)

Factors Affecting Risk Acceptance

- Familiarity: Flight crew or passengers;
- Frequency: Flying every day or once per year;
- Control: Driving or sitting in the back seat;
- Media attention: Aircraft accident or car accident;
- Consequence: Catastrophic (nuclear accident) or minor (power failure).

Acceptable Risk

Risk may be assessed as acceptable if:

Politicians decide it is acceptable;

The cost of reducing the risk is prohibitive;

It is comparable to some other accepted standard of acceptable risk;

It falls below a defined probability which has been accepted as a measure of tolerable risk .

slido

Which of the following will NOT help you to manage fatigue in the long term?

ⓘ Start presenting to display the poll results on this slide.

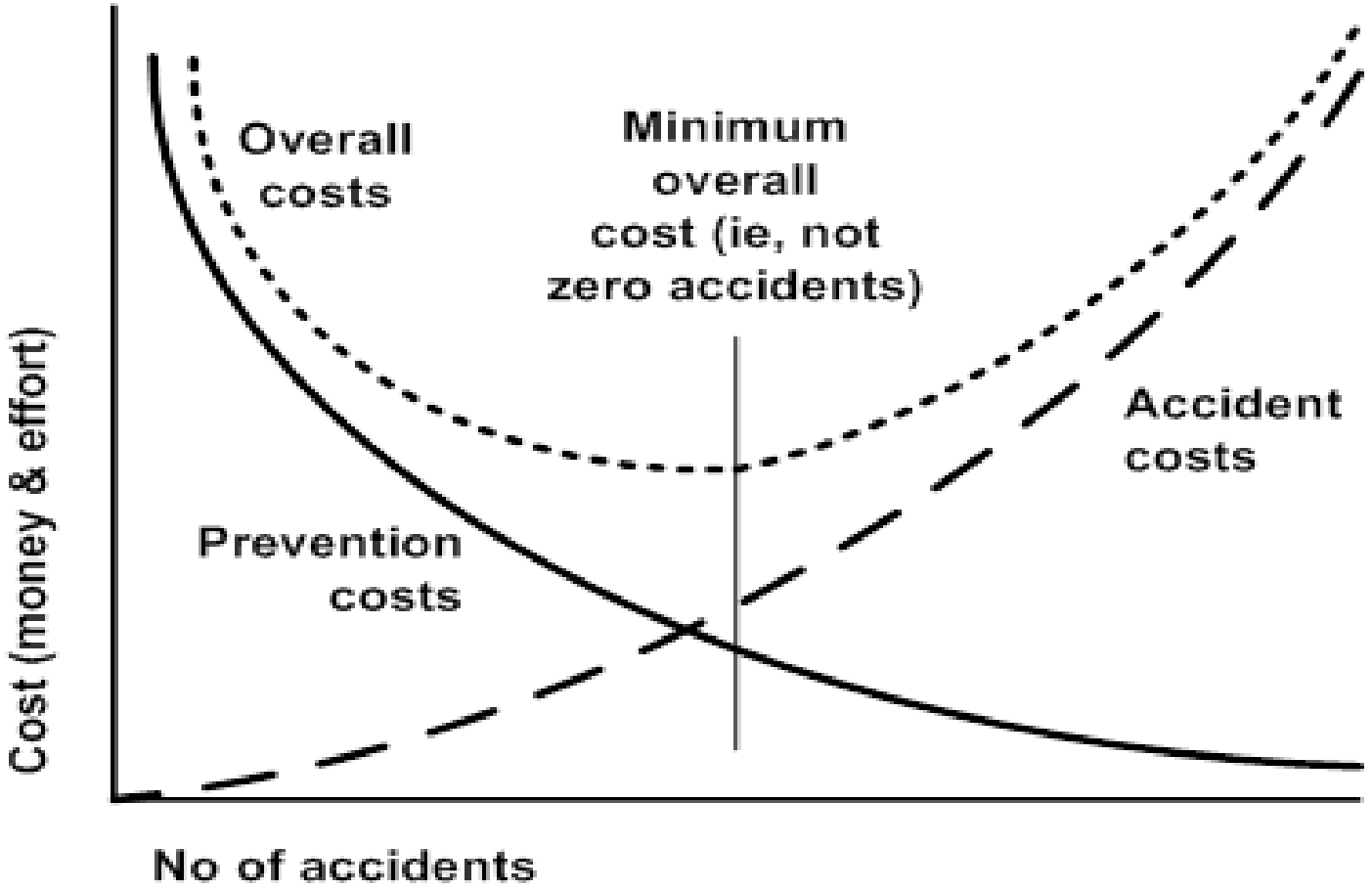
Safety objectives

"As Low As Reasonably Practicable" {ALARP)

When the degree of risk in a particular activity or environment can be balanced against the time, trouble, cost and physical difficulty of taking measures to avoid or reduce the risk. If these are so disproportionate to the risk that it would be unreasonable for the people concerned to have to incur them to prevent it, they are not obliged to do so.

Ref. Edwards vs NCB [1949] 1 All ER 743

Total costs (Cost of Safety/Cost of Accidents)



As a reminder

• There is no such thing as absolute safety- In aviation it is not possible to eliminate all risks.

• Risks can be managed to a level "as low as reasonably practicable" (ALARP)

• Risk mitigation must be balanced against:

-time

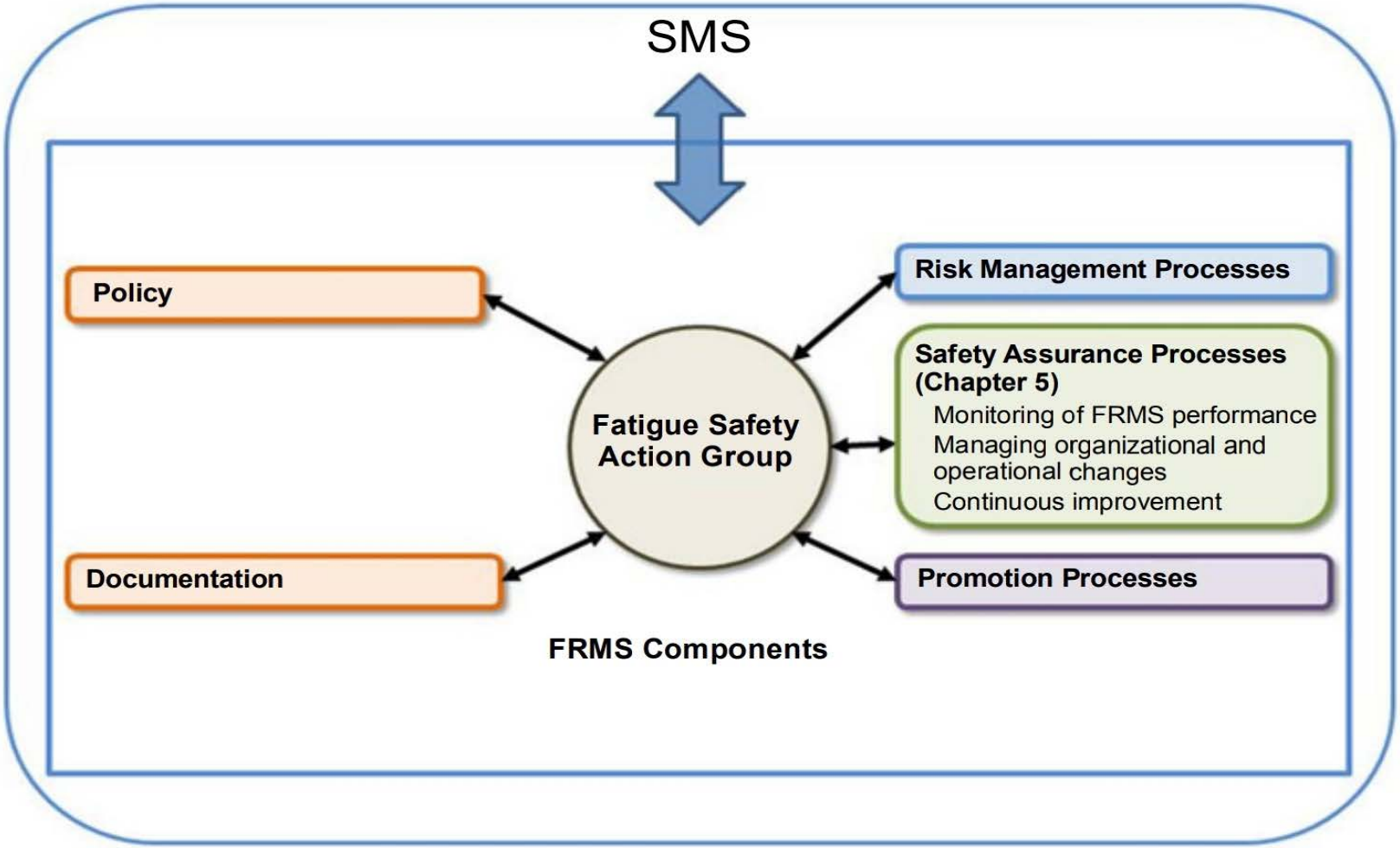
-cost

-difficulty of taking measures to reduce or eliminate the risk (i.e. managed).

• Effective risk management seeks to maximize the benefits of accepting a risk (a reduction in time and cost) while minimizing the risk itself.

• Communicate the rationale for risk decisions to gain acceptance by stakeholders affected by them.

FRMS Safety Assurance

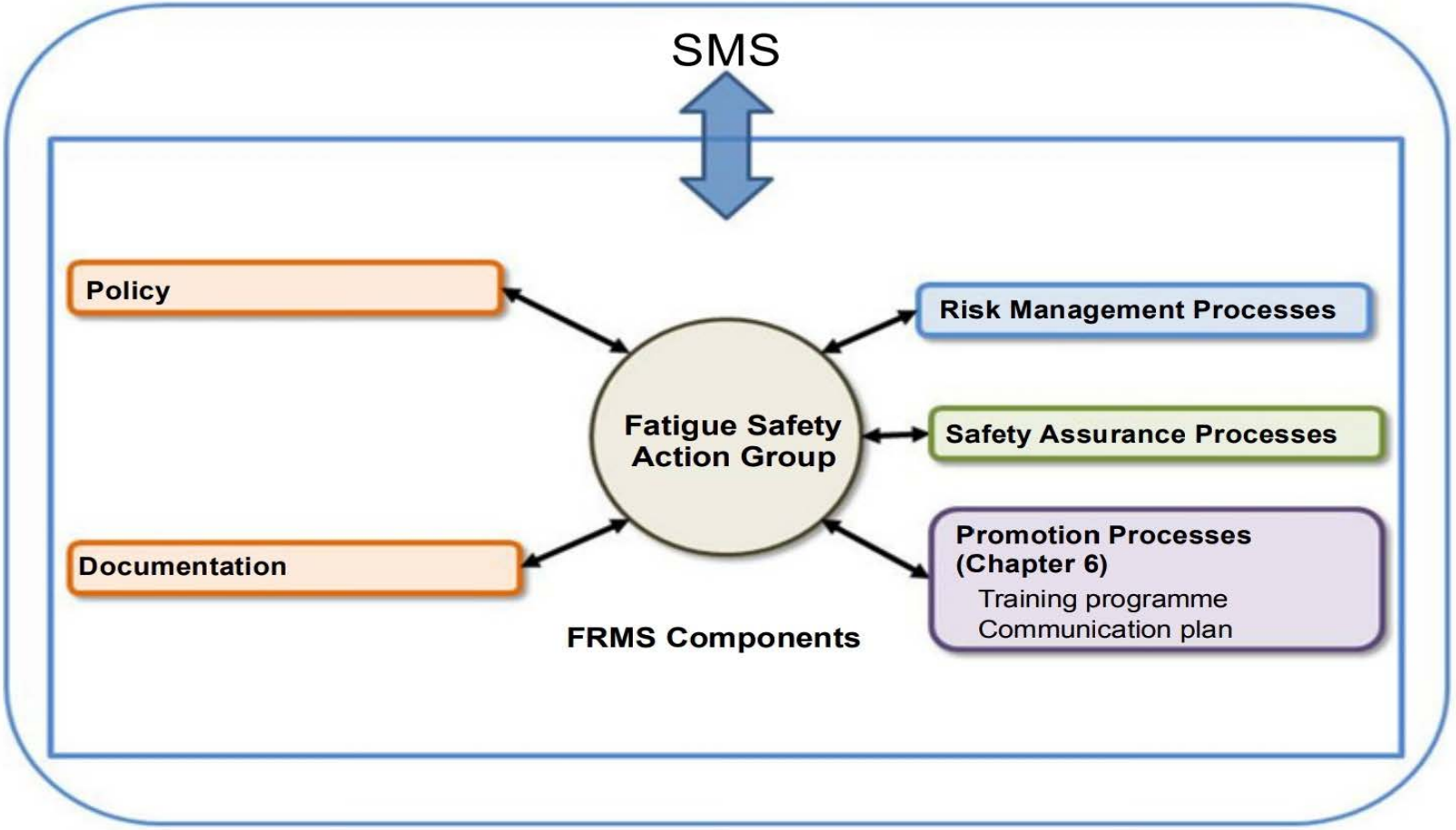


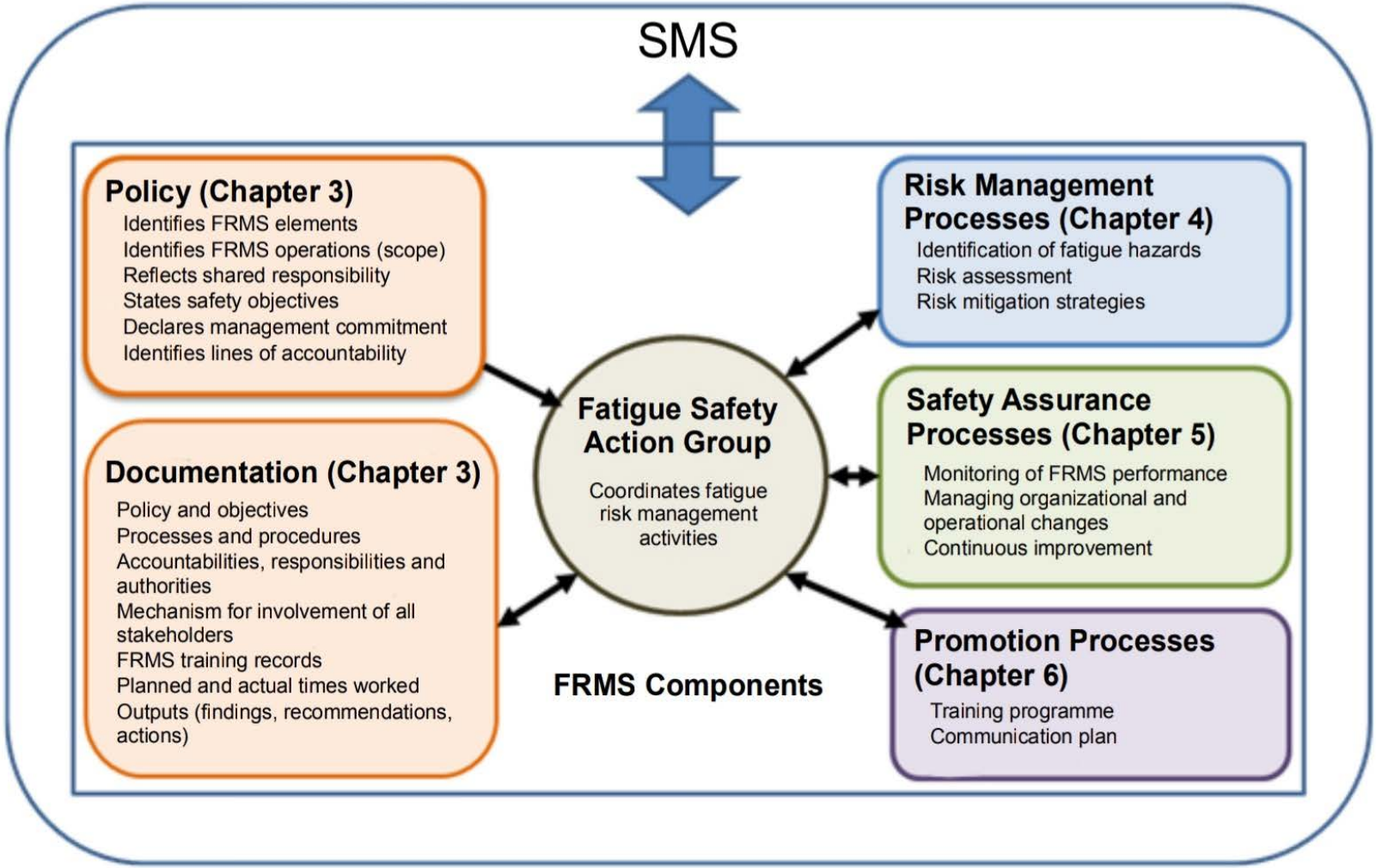
FRMS Safety Assurance Processes

What they do:

- Check that the FRMS is functioning as intended;
- Check that it is meeting the safety objectives defined in the FRMS policy;
- Check that it is meeting regulatory requirements;
- Identify where changes in the operating environment have the potential to increase fatigue risk;
- Identify areas for improvement in the management of fatigue risk (continuous improvement of the FRMS).

FRMS Promotion Process



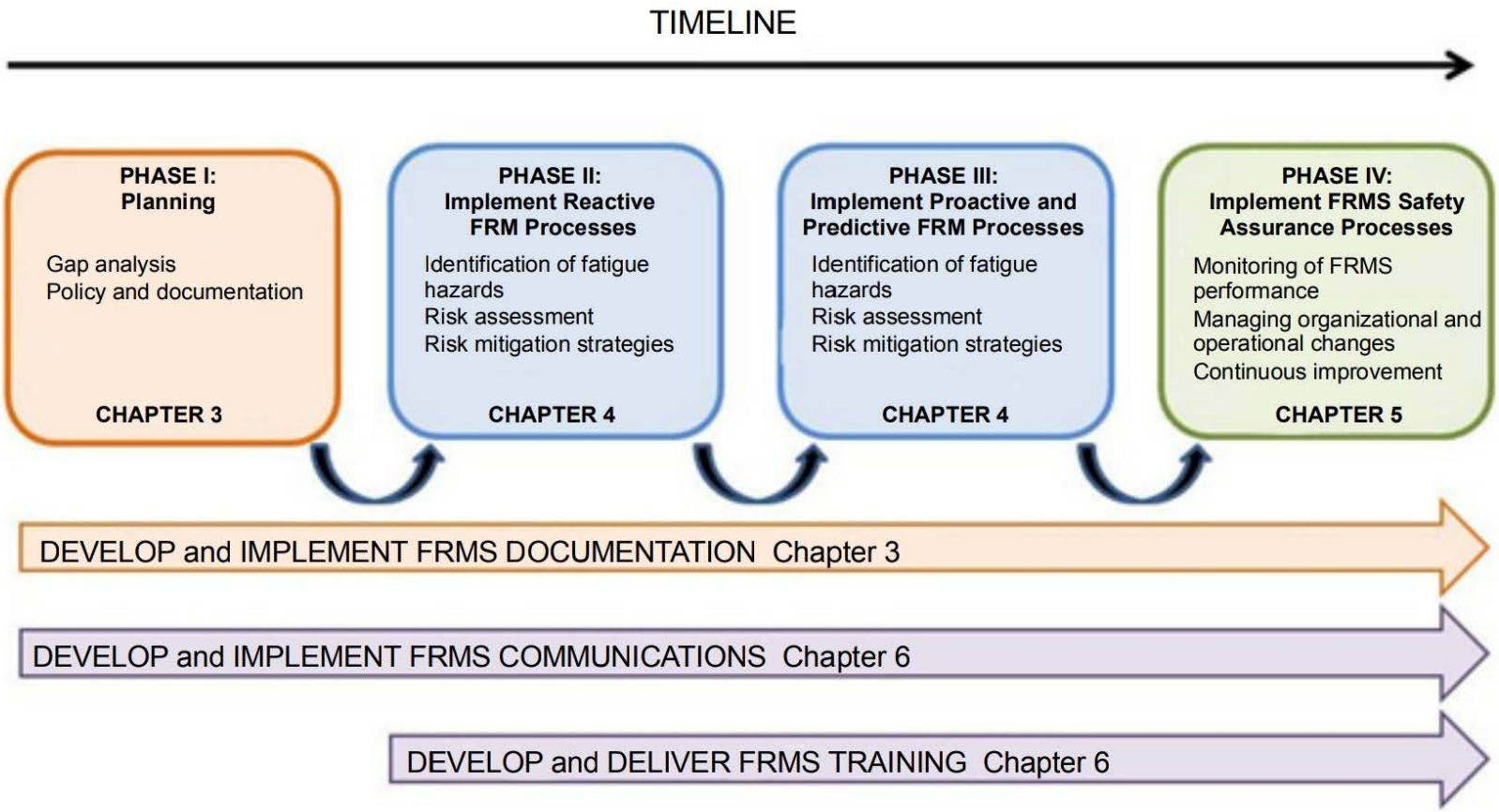

SMS
Policy (Chapter 3)
Identifies FRMS elements
Identifies FRMS operations (scope)
Reflects shared responsibility
States safety objectives
Declares management commitment
Identifies lines of accountability
Documentation (Chapter 3)
Policy and objectives
Processes and procedures
Accountabilities, responsibilities and authorities
Mechanism for involvement of all stakeholders
FRMS training records
Planned and actual times worked
Outputs (findings, recommendations, actions)
Fatigue Safety Action Group
Coordinates fatigue risk management activities
FRMS Components
Risk Management Processes (Chapter 4)
Identification of fatigue hazards
Risk assessment
Risk mitigation strategies
Safety Assurance Processes (Chapter 5)
Monitoring of FRMS performance
Managing organizational and operational changes
Continuous improvement
Promotion Processes (Chapter 6)
Training programme
Communication plan

Phased-In Implementation

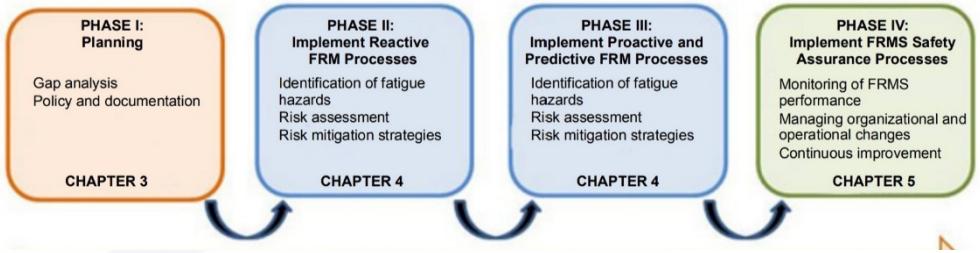
FRMS: Phased-in Implementation

- There is no 'off-the-shelf' version of an FRMS that will suit all operators ;
- An FRMS needs to be developed, understood and managed by people who have comprehensive experience in the complex operational environment to which it will apply;
- A fully functioning FRMS doesn't happen overnight;
- Implementation is necessarily accomplished in phases.

Phased Implementation

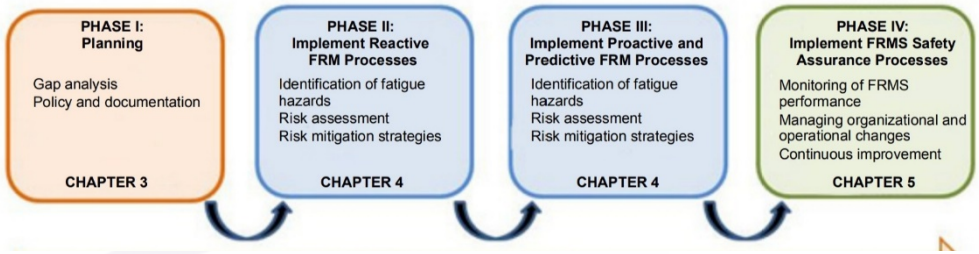


Phase I



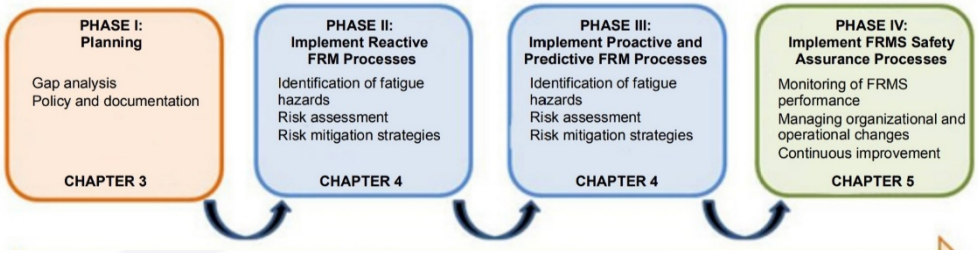
- Gap analysis;
- FRMS Policy Statement;
- FRMS implementation plan;
- FRMS documentation plan;
- FRMS communication plan;
- Allocation of financial and human resources;
- Fatigue Safety Action Group (or equivalent) established.

Phase II



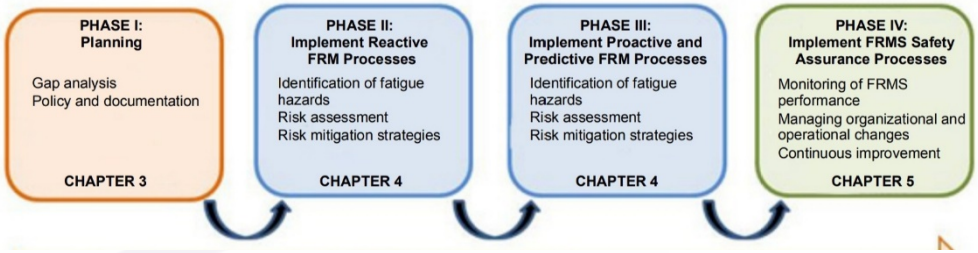
- FRM processes based on reactive hazard identification are operational;
- FRMS documentation processes are established;
- FRMS training activities are established;
- FRMS communication processes are established;
- The operator is ready to undertake coordinated safety analyses of this first version of the FRMS ..

Phase III



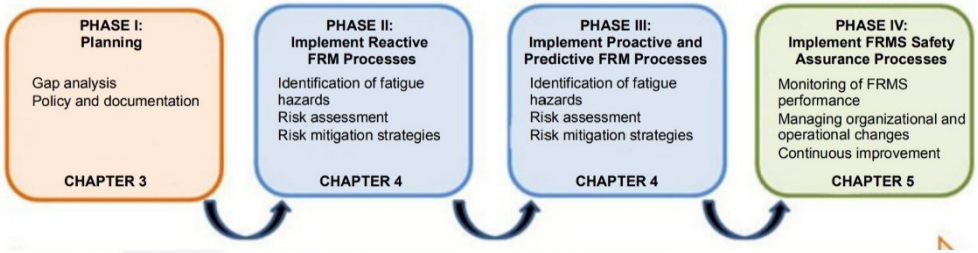
- FRM processes based on reactive, proactive, and predictive hazard identification are operational;
- FRMS documentation processes are established;
- FRMS training activities are established;
- FRMS communication processes are established;,
- The operator is ready to undertake coordinated safety analyses of this version of the FRMS.

Phase IV

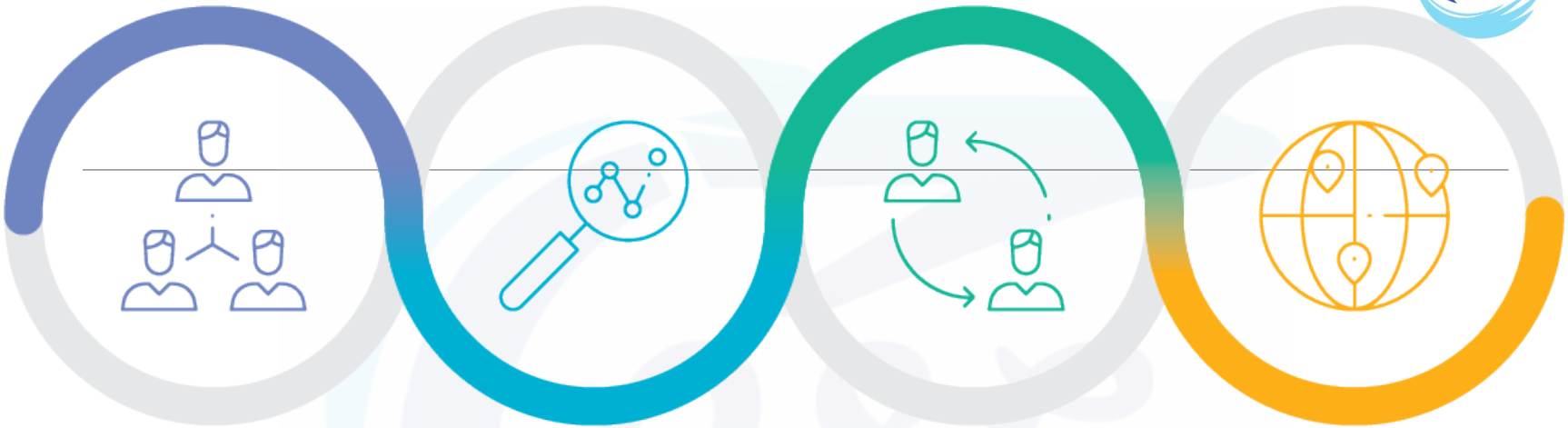


- Roles and responsibilities for assuring the safety performance of the FRMS are established;
- The necessary authorities and communication channels are active;
- FRMS safety performance indicators have been developed and agreed on;
- The procedures and processes for periodic evaluation of the safety performance indicators are established.

Phase IV..cont.



- Appropriate feedback is established between the FRM processes and the FRMS safety assurance processes;
- FRMS documentation processes are fully implemented;
- FRMS training processes are fully implemented;
- FRMS communication processes are fully implemented.



ESCALATE

- Raise to the board or an independent safety committee for fatigue monitoring

IDENTIFY

- Establish an enhanced Fatigue Risk Management System (FRMS)
- Promote a culture of reporting and recognize cultural barriers to reporting
- Determine causes of fatigue and distinguish treatments

MITIGATE

- Clarify accountability; build trust and transparency around fatigue management
- Review OTP causes where they impact crew fatigue
- Create a realistic, reliable, and resilient schedule; incorporate fatigue review into end-to-end planning
- Improve ability to manage fatigue in operational recovery

TRACK & SUPPORT

- Invest in systems, tools, and training
- Embed reporting and agree thresholds or flags for action
- Provide technology and processes to support fatigue management

What FRMS is not?

It isn’t just a model

It isn’t a negotiating tool

It isn’t the job of just one party

It isn’t a set of manuals

It isn’t a cost-cutting tool

It isn’t a way to get rid of limits

THINGS THE FRMS POLICY MUST COVER
Shared responsibility

Shared responsibility of management, flight and cabin crews, and other involved personnel;

Safety objectives of the FRMS;

Signed by the **accountable executive** and communicated/endorsed to all relevant areas

THINGS THE FRMS POLICY MUST DECLARE

Management commitment to:

effective safety **reporting**;

provision of adequate **resources**for the FRMS;

continuous improvement of the FRMS;

Clear **lines of accountability** for management, flight and cabin crews, and all other involved

Require **periodic review** to ensure it remains relevant and appropriate

Willingness to Report

Know how and when to report

Effective mechanism (available, not too difficult)

Trust –consequences, jeopardy, confidentiality, purpose of collection

Motivation –action, communication= “effective reporting culture”

Fatigue observed

vs Duty not completed due fatigue

vs Incident occurred with fatigue

Example

Simple

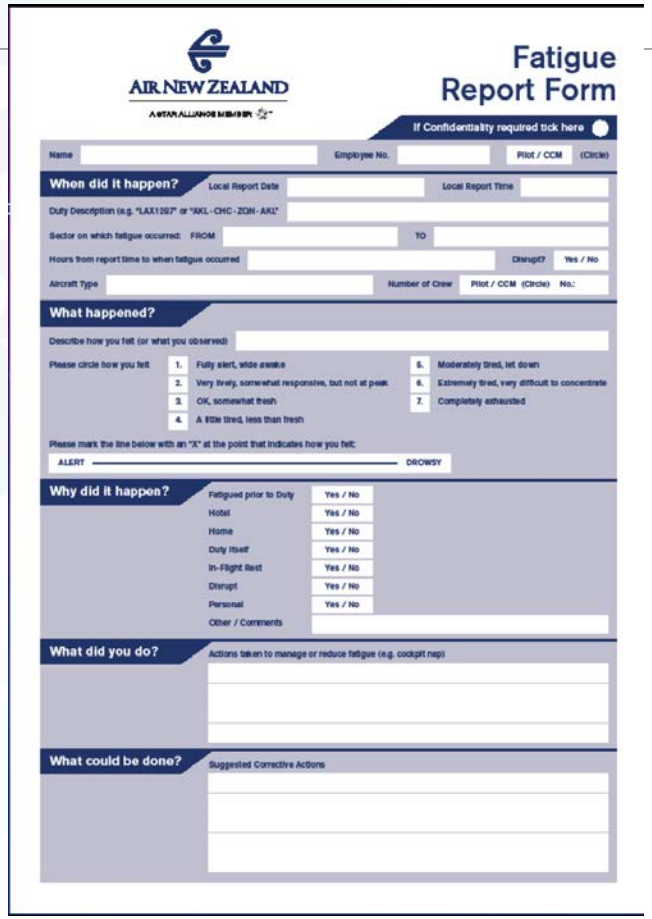
Roster attached

To Ops integrity first

De-identified if requested

To managers for early action

FSAG review trends monthly



AIR NEW ZEALAND

A STAR ALLIANCE MEMBER

Fatigue Report Form

If Confidentiality required tick here

Name | Employee No. | Pilot / CCM (Circle)

When did it happen?

Local Report Date | Local Report Time

Duty Description (e.g. "LAX1297" or "AKL - CHC - ZQN - AKL"

Sector on which fatigue occurred: FROM | TO

Hours from report time to when fatigue occurred | Disrupt? Yes / No

Aircraft Type | Number of Crew | Pilot / CCM (Circle) No.:

What happened?

Describe how you felt (or what you observed)

Please circle how you felt

1. Fully alert, wide awake
2. Very lively, somewhat responsive, but not at peak
3. OK, somewhat fresh
4. A little tired, less than fresh
5. Moderately tired, let down
6. Extremely tired, very difficult to concentrate
7. Completely exhausted

Please mark the line below with an "X" at the point that indicates how you felt:

ALERT ——— DROWSY

Why did it happen?

Fatigued prior to Duty	Yes / No
Hotel	Yes / No
Home	Yes / No
Duty itself	Yes / No
In-Flight Rest	Yes / No
Disrupt	Yes / No
Personal	Yes / No
Other / Comments	

What did you do?

Actions taken to manage or reduce fatigue (e.g. cockpit nap)

What could be done?

Suggested Corrective Actions

Fatigue Report Handling

Simple form

- Anonymity –important in early stages
- Manager response
- Look collectively more than individually
- Non-punitive
- NotFSAG role to “rule out” fatigue
- “Play the ball and not the player”

7- Internal FRMS Audit

Ideally, an internal FRMS audit should be conducted one year after the initial implementation, and every two years after that.

Internal audits are generally conducted by the safety manager or by an external consultant.

it is essential that individuals be involved in the audit

7-1 Internal FRMS Audit

After the review, senior management and the FRMS committee should meet to review and discuss the findings and plan any potential changes to the FRMS.

1. Policy
2. FRMS Committee (or person responsible for the FRMS)
3. Implementation Process
4. Communication and Consultation
5. Schedules and Actual Hours of Work
6. Assessment of Actual Sleep Obtained
7. Development of Training Program
8. Delivery of Training
9. Internal Audits
10. Incident and Accident Investigation

8- FAQ

D. What are the key processes of an FRMS?

I. Hazard identification - a method for identifying hazards related to your organization;

II. Risk management – a standard approach for assessing risks and for applying risk controls;

III. Performance measurement - management tools for analyzing whether the organization‘s Risk goals are being achieved; and

IV. Assurance – processes by which an operator can monitor the risk and controls in place to ensure that they are being followed and test that they are achieving a robust treatment of fatigue risks. This process, amongst other things, ensures continuous improvement.

8- FAQ

E. What are the roles and responsibilities within the FRMS?

I. The senior manager/accountable executive is accountable for establishing the FRMS and allocating resources to support and maintain an effective FRMS;

II. Management is responsible for implementing, maintaining and adhering to FRMS processes in their area; and

III. Employees are responsible for arriving to work well-rested to every extent possible, for identifying fatigue risks, including assessment of their own fatigue levels and reporting them.

8- FAQ

F. How will FRMS benefit my organization?

I. Provides for more informed decision-making;

II. Reduces fatigue risk by avoiding incidents/ accidents;

III. Provides for better crew rostering that will result in increased efficiencies and reduced costs;

IV. Strengthens corporate culture; and

V. Demonstrates corporate due-diligence.

8- FAQ

G. What key qualities are evident in organizations with an effective FRMS?

I. A top-down commitment from management and a personal commitment from all employees to achieve performance goals;

II. A clear roadmap of what the FRMS is and what it is supposed to accomplish;

III. An established practice of open communication throughout the organization that is comprehensive and transparent, and where necessary, non-punitive; and

IV. An organizational culture that continuously strives to improve.

8- FAQ

H. What FRMS is not:

I. Self-regulation / de-regulation;

II. A stand alone department;

III. A substitute for oversight; or

IV. An undue burden.

8- FAQ

I. What FRMS does:

I. Builds on existing processes;

II. Integrates with other management systems by tailoring a flexible regulatory

III. Framework to your organisation; and

IV. Demonstrates good business practice.

8- FAQ

J. What‘s else does an FRMS need?

I. A Safety Promotion system is a vital element of an FRMS.

II. Education and Awareness training programmes for all staff throughout the organization.

III. Effective and confidential fatigue reporting processes are essential.

8- FAQ

K. What‘s the difference between FRMS and regulatory compliance?

I. FRMS focuses on the specific fatigue risk aspects of the operation.

II. Regulatory compliance focuses on the broad generic regulations taking no account of the specific operation.

III. While regulatory compliance focuses on conformity, FRMS focuses on operator

IV. specific fatigue hazards. Both non-conformities and hazards can impact safety.

8- FAQ

L. What is the relationship between FRMS and SMS?

While an operator‘s FRMS and SMS must work in a coordinated manner, it is up to the operator to determine how to best integrate these two management systems.

The operator may well choose to incorporate their FRMS within their SMS, or they may choose to have two separate but complimentary systems which talk to each other so that the necessary focus of each is not compromised, at least during the initial phases of implementation of these systems.

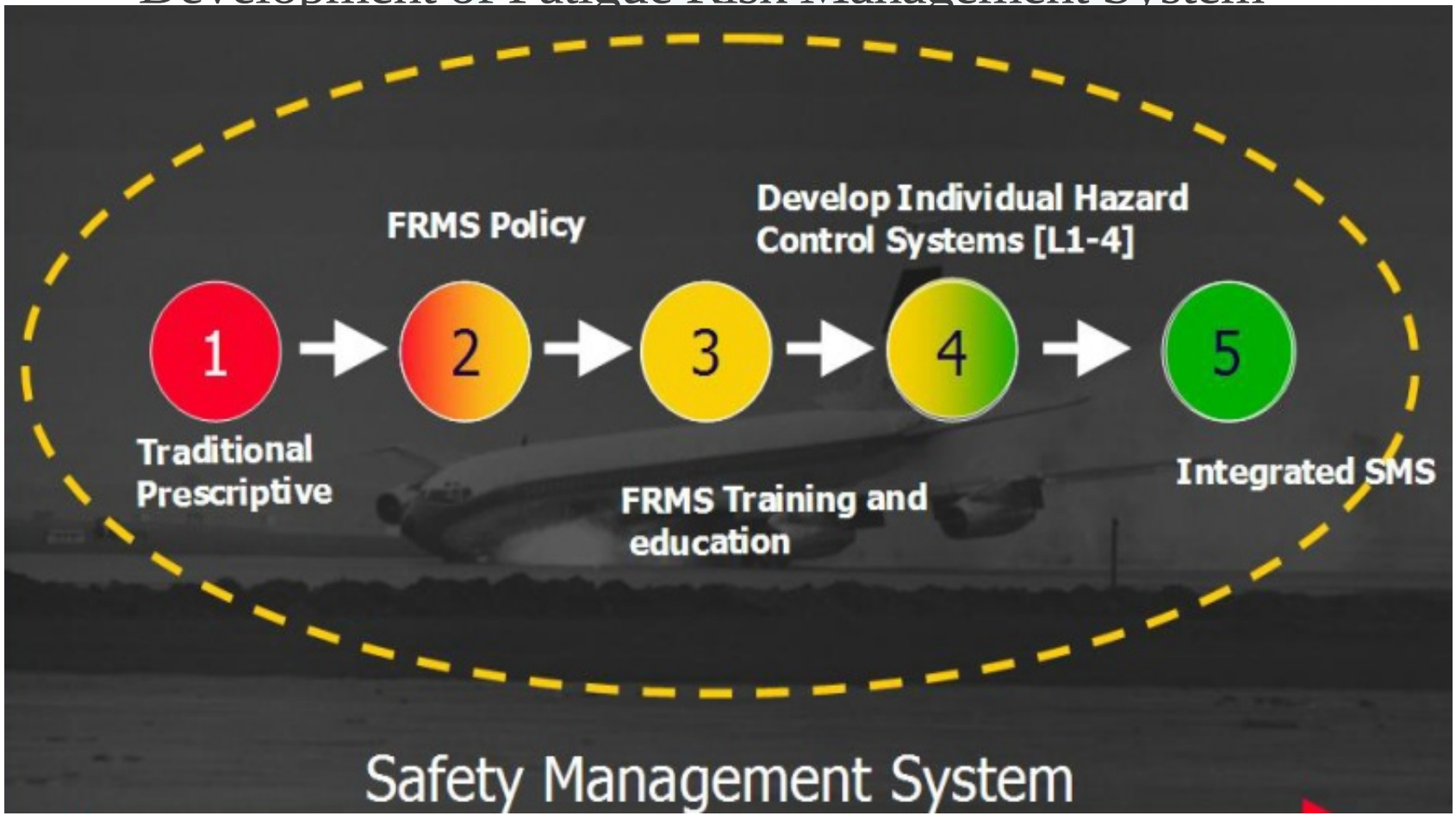
However, the importance of coordinating the two systems cannot be over emphasised in order to avoid overlooking a hazard or mismanaging a risk.

8- FAQ

M. What is the relationship between FRMS and SMS?

For example, from an SMS viewpoint, a succession of ground proximity warnings at the same point, on the same approach, and on the same flight number, may well be attributed to inadequate pilot training in altitude management and maintenance of the localizer and glide slope. It may not be as obvious that the succession of ground proximity warnings occurred on flights that were part of a particularly fatiguing sequence that resulted in tired pilots not paying enough attention. Both possibilities need to be considered and therefore the two systems designed to do this cannot work in isolation.

Development of Fatigue Risk Management System



Personal Fatigue Countermeasures

Module Three

What strategies do you use to stay alert when you're working?

Get the Sleep You Need

Set up your bedroom for sleeping

- Make it as dark as possible
- Make sure the temperature is right: 18° C to 24°C
- Move distractions to another room
- Make sure you won't be disturbed

Good Sleeping Habits

- Keep to a regular bedtime routine
- Wind down before trying to sleep
- Don't toss and turn waiting to fall asleep
- Adjust your bedtime gradually if your shift changes

Take a Nap

- Naps can supplement sleep, not replace it;
- Naps 10 minutes or longer can improve alertness, communication and mood;
- The value of a nap doesn't depend on the time of day;
- Allow 5 to 20 minutes for sleep inertia to pass.

Drink Plenty of Fluids

- Dehydration slows you down and increases feelings of sluggishness;
- Working in heat, air conditioning, or at night can be dehydrating;
- Drinking coffee, tea, soft drinks, or alcohol, and eating salty foods can make you feel thirstier;
- Adults should drink at least 2 liters of fluid a day.

Make Smart Use of Caffeine

- Has stimulant effects that can improve alertness and performance;
- Best used strategically-only when you really need help-staying awake;
- Takes 20 minutes to take effect and the effects can last up to 6 hours;
- You can develop both a dependence and a tolerance.

Caffeine

Caffeine content of common foods/drinks

Coffee (250 mL)	
Instant	65-100 mg
Drip	115-175 mg
Brewed/Espresso	80-135 mg
Soft drinks	
Coke/Pepsi (340 mL)	50 mg
Jolt (500 mL)	100 mg
Red Bull (200 mL)	80 mg
Tea (250 mL)	
Green tea	8-30 mg
Regular	50-70 mg
Most chocolate bars	20-40 mg
NoDoz, 1 regular strength tablet	100 mg

Eating Right

- Maintaining blood sugar levels is key to controlling ups and downs in energy levels.
- Eating low-fat, high-protein foods can actually increase alertness.
- High-fat foods can slow you down.
- High-sugar foods can cause your blood sugar to rise and fall quickly.

Eating Right

High Glycemic Index (GI) Foods

French fries, doughnuts, muffins, bread (white or whole grain), Cornflakes, rice (white or quick brown), cakes

Low GI Foods

Fish (canned in water), low-fat dairy (cottage cheese, yoghurt), lean meat (steak, chicken breast, lamb), pasta, All-Bran, porridge, hard boiled eggs, peanuts, lentils, fresh fruit

Physical Exercise

- Good for your overall health
- Can help you sleep better and feel more rested
- Helps relieve stress, boost your health, strengthen your immune function, and improve muscle tone and strength
- Any activity that keeps your heart rate elevated for at least 20 minutes is good

A Healthy, Balanced Life

- Get enough sleep
- Spend time with friends and family
- Enjoy time for yourself
- Stay fit and healthy

SAFETY IS THE RESPONSIBILTY OF ALL

Fatigue makes fools of us all. It robs you of your skills and your judgment, and it blinds you to creative solutions. It's the best-conditioned athlete, not the most talented, who generally wins when the going gets tough.

Harvey Mackay


Oops..I'm drifting off here..
But, before I do...I just want to wish you a Good Night!

Any Questions

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