



Transport Canada's FRMS Approach



Presentation Outline

- Transport Canada and Fatigue Risk Management
 - Elements of Transport Canada's FRMS Toolbox
 - FRMS Assessment Tools
 - TCCA and ICAO

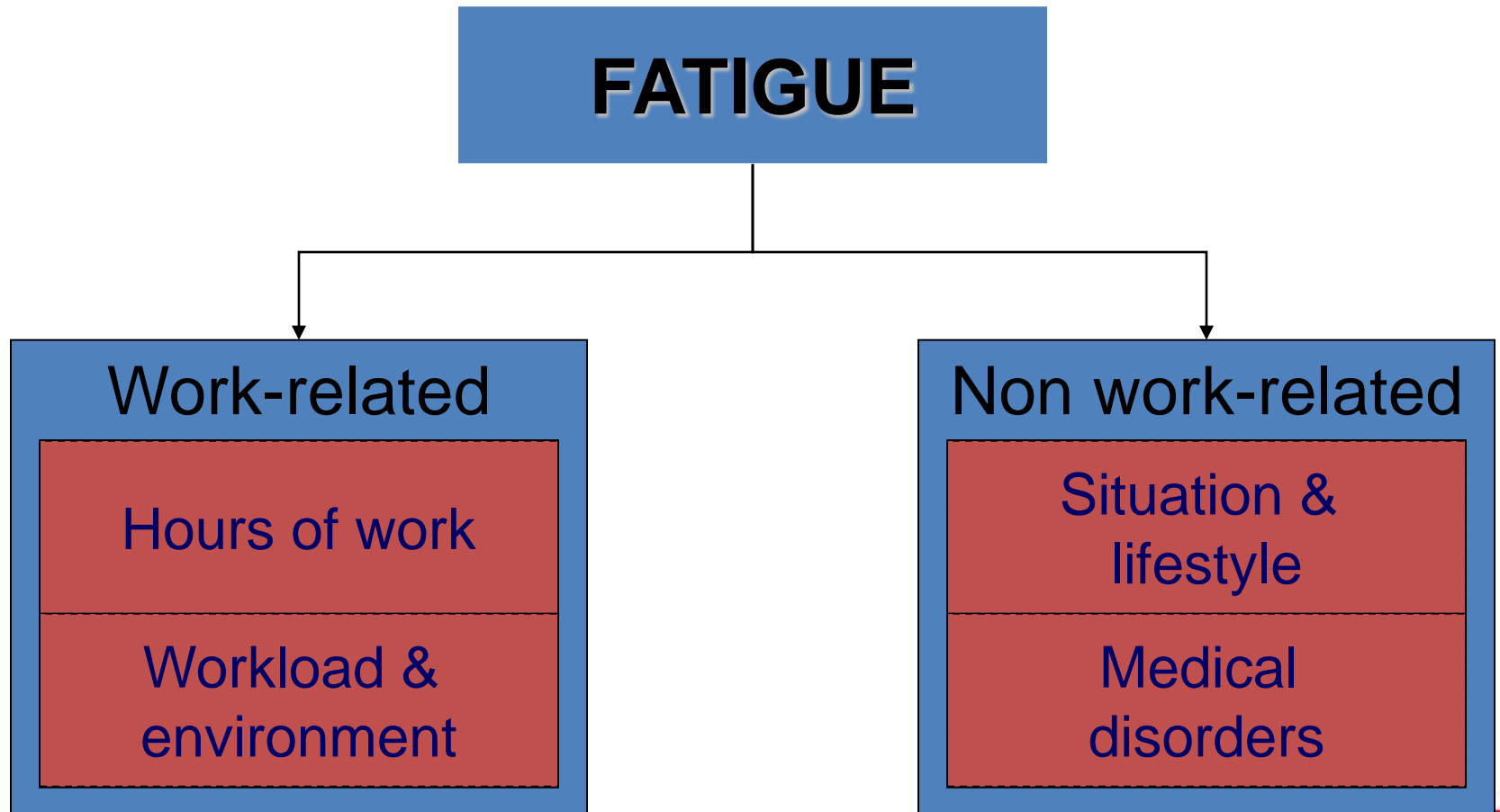
What is a Fatigue Risk Management System?



- A Fatigue Risk Management System is a *systematic method whereby an organization optimizes the risks associated with fatigue related error*



Causes of Fatigue





Joint Responsibility

FATIGUE

Organisational Responsibilities

Employee Responsibilities

Work-related

Hours of work

Workload &
environment

Non work-related

Situation &
lifestyle

Medical
disorders



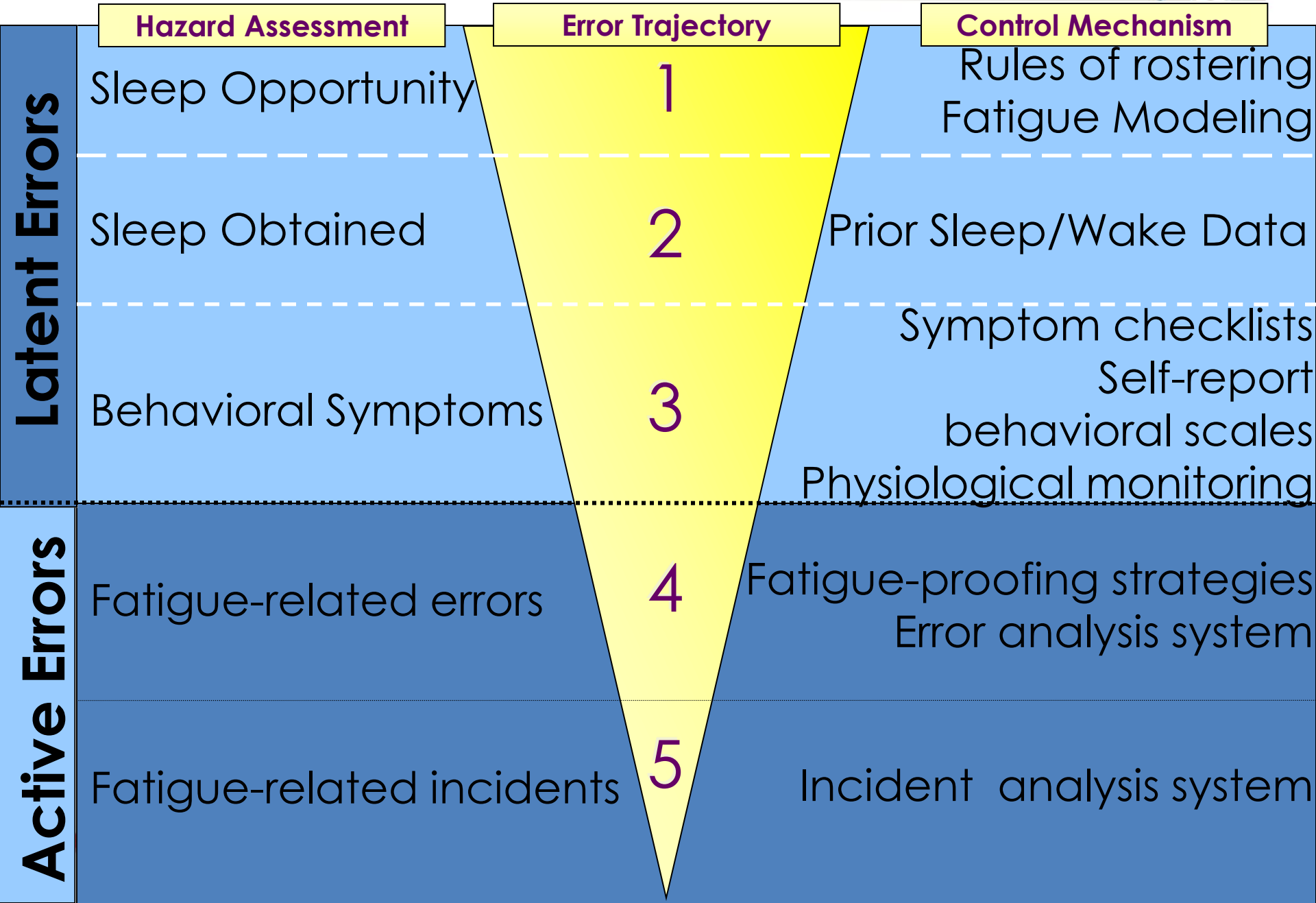
TC Approach

- Transport Canada proposed to adopt FRMS comprising three levels of activities:
 - Development of policy statements for the management of fatigue
 - Training and education programs for all employees
 - Fatigue audit systems to assess fatigue levels within an organization



FRMS Structure & Strategy

Hazard Control Model





Six major aspects to an FRMS

1. Policies and Procedures

- Outline the commitment of organizational management to manage fatigue-related risk
- Detail the required procedures for managing fatigue at the operational level



Six major aspects to an FRMS

2. Responsibilities

- List personnel responsible for FRMS design, implementation, and maintenance
- Document responsibilities of individual employees and work groups



Six major aspects to an FRMS

3. Risk Assessment/Management
 - Scheduled versus actual hours of work
 - Individual sleep patterns
 - Symptom checklists
 - Error/incident reporting



Six major aspects to an FRMS

4. Training

- Promote knowledge in the workplace about risks, causes, and consequences of fatigue
- Ensure employees understand and can apply fatigue management strategies



Six major aspects to an FRMS

5. Controls and Action Plans
 - Toolbox of methods used within the FRMS, including error reduction techniques (“fatigue proofing”)
 - Clear decision trees for managers and employees to use when fatigue has been identified as a risk



Six major aspects to an FRMS

6. Audit and Review

- Documentation and data collection at regular intervals of how the FRMS works
- Review of the FRMS based on audit results



Contents of TC's FRMS Toolbox

- FRMS for the Canadian Aviation Industry:
Introductory Booklet (TP14572E)
- FRMS for the Canadian Aviation Industry:
Fatigue Management Strategies for
Employees (TP 14573E)
- FRMS for the Canadian Aviation Industry:
Employee Training Assessment (TP 14574E)



Contents of TC's FRMS Toolbox

- FRMS for the Canadian Aviation Industry:
Developing and Implementing a Fatigue Risk Management System (TP 14575E)

- FRMS for the Canadian Aviation Industry:
Policy and Procedures Development Guidelines (TP 14576E)



Contents of TC's FRMS Toolbox

- FRMS for the Canadian Aviation Industry:
Fatigue Audit Tools (TP 14577E)

- FRMS for the Canadian Aviation Industry:
Trainer's Handbook (TP 14578E)



An Introduction to Managing Fatigue, TP 14572E:

- Introductory material intended to raise awareness about fatigue
- Causes of fatigue
- Consequences of fatigue
- Strategies to manage fatigue
- It's about sleep stupid. How to get a good night's sleep



An Introduction to Managing Fatigue, TP 14572E:

- Napping
- Sleep disorders
- Drugs
- Fitness & health
- Staying alert
- Sleepy at work?
- The drive home



Fatigue Management Strategies for Employees, TP 14573E:

- provides the knowledge and skills required to apply appropriate fatigue management strategies at the individual level



Fatigue Management Strategies for Employees, TP 14573E:

- Working Non-Traditional Hours
- Fatigue
- Sleep
- Napping
- Food



Fatigue Management Strategies for Employees, TP 14573E:

- Water
- Caffeine
- Alcohol
- Nicotine
- Drugs
- Well-being



Fatigue Management Strategies for Employees, TP 14573E:

- Physical Exercise
- Social/Family Life
- Commuting
- Work Schedule Design
- Jet Lag
- Suggested Readings



Employee Training Assessment, TP 14574E:

- an optional module intended to assess employee competence in topics covered in the Fatigue Management Strategies for Employees workbook



Employee Training Assessment, TP 14574E:

- Fundamental Knowledge Questions
- Employee Logbook Instructions a record of how the employee employed the strategies
- Acceptable Responses to Fundamental Knowledge Questions
- Logbook Checklist
- Competency Assessment Results fundamental knowledge & logbook - satisfactory or not - what needs to be improved - acknowledgement by employee



Employee Training Assessment, TP 14574E:

- Online Employee Training: Competency-based, with Assessment Unit for Competency Certification
- Returning soon...



Developing and Implementing a FRMS - TP 14575E:

- explains how to manage the risks associated with fatigue at the organizational level within a safety management system framework



Developing and Implementing a FRMS -TP 14575E:

- Overview of Fatigue Risk Management
- Responsibility for Managing Fatigue under an FRMS
- Policies and Procedures
- Training and Education



Developing and Implementing a FRMS - TP 14575E:

- **Level 1 Controls: Providing Sufficient Sleep Opportunity**
 - Assessing Schedules for Adequate Sleep Opportunity
 - Fatigue Modeling
 - Designing the Ideal Shift System
 - Considerations to Maximize Sleep Opportunity in Designing Work Schedules



Developing and Implementing a FRMS - TP 14575E:

- **Level 2 Controls: Assessing Actual Sleep**
 - Assessing Adequacy of Level 1 Controls
- **Level 3 Controls: Assessing Symptoms of Fatigue**



Developing and Implementing a FRMS - TP 14575E:

- **Level 4 and 5 Controls: Fatigue Proofing and Reporting Incidents and Accidents**
 - Level 4: Fatigue-Proofing Strategies
 - Level 5: Incident Investigation – Asking the Right Questions



Developing and Implementing a FRMS - TP 14575E:

- Internal FRMS Audit
- Resources



Policies & Procedures Development Guidelines, TP 14576E:

- proposes a policy structure while providing examples and guidelines to help organizations through the process of designing fatigue risk management policies and procedures



Policies and Procedures Development Guidelines, TP 14576E:

Each section of the policy document is divided into three sections:

- ***Guidance notes***: information about the purpose, theory and framework of the given policy component



Policies & Procedures Development Guidelines, TP 14576E:

- ***Points to Consider:*** a summary of the main points to be considered in the given policy component. These have been framed as questions, which can be used as a framework for discussing the core components of an FRMS in consultation workshops
- ***Sample Text:*** examples of what might be considered in a policy component section



Policies & Procedures Development Guidelines, TP 14576E:

Example:

Responsibilities of Company Personnel

Guidance: You must ensure that responsibilities for fatigue risk management are specified in the organizational structure. This is likely to include:

- Safety Manager
- Person Responsible for the FRMS
- The SMS/FRMS Committee
- Employees



Policies & Procedures Development Guidelines, TP 14576E:

Example -

Points to Consider:

- What are the specific expectations and responsibilities of each subgroup of employees for managing fatigue within the context of the FRMS?
- How do those responsibilities fit within the organizational structure?



Policies & Procedures Development Guidelines, TP 14576E:

Sample Text: Accountable Executive

The Accountable Executive is responsible for oversight of minimizing the risks associated with work-related fatigue. Accordingly, the Accountable Executive will:

- Encourage a workplace culture to manage fatigue-related risk effectively
- Advise Transport Canada of any changes to the FRMS
- Provide oversight and direction to the person responsible for the FRMS and/or committee during FRMS design, implementation and review
- Provide appropriate resources to effectively implement and maintain the FRMS
- Ensure compliance of the organization with the FRMS policy.



Introduction to Fatigue Audit Tools, TP 14577E:

Provides an overview of tools available to employers to help determine whether scheduling provides employees with adequate opportunities to get sufficient sleep.



Introduction to Fatigue Audit Tools, TP 14577E:

Introduction

- Designing a work schedule
- Providing adequate sleep opportunity

Automated Fatigue Audit Systems

- Fatigue Audit InterDyne (FAID)
- Sleep, Activity, Fatigue and Task Effectiveness (SAFTE)
- Fatigue Avoidance Scheduling Tool (FAST)
- System for Aircrew Fatigue Evaluation (SAFE)
- Boeing Alertness Model (BAM)



Introduction to Fatigue Audit Tools, TP 14577E:

FAID: Applying a biomathematical model

www.interdynamics.com



Introduction to Fatigue Audit Tools, TP 14577E:

Manual Fatigue Audit System

- Total hours per 7 days
- Maximum shift duration
- Minimum time off between shifts
- Total hours of night work scheduled for the seven-day period
- Long break within 7 days

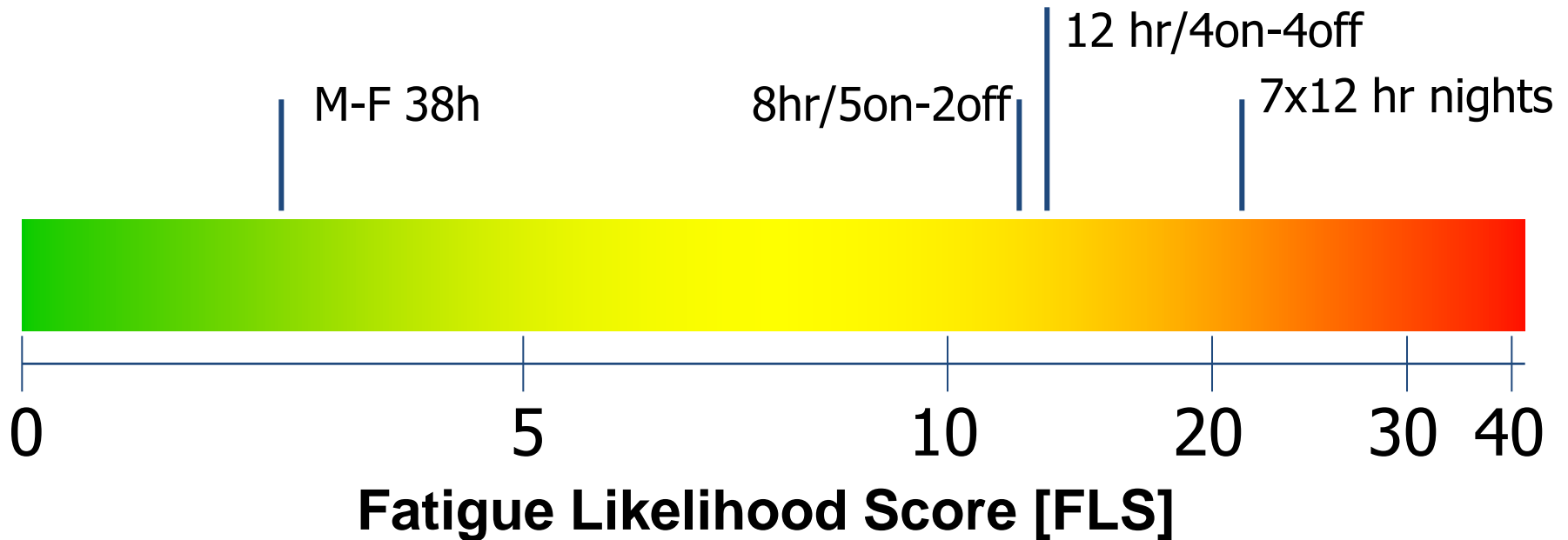


Work-Related Fatigue Likelihood Assessment

Schedule Dimension	0	1	2	4	8
Max Hours per 7days	≤ 36h	36-43h	44-47h	48-54h	55+
Maximum Shift Duration	≤ 8h	8-10h	10-12h	12-14h	≥14h
Minimum 'Short Break' Duration	≥16h	16-13h	12-10	10-8h	≤ 8h
Max Hours of Night Work per 7 Days	0h	1-8h	8-16h	16-24h	≥24h
'Long Break' Frequency	≥ 1/7d	≤ 1/7d	≤ 1/14d	≤ 1/21d	≤ 1/28d



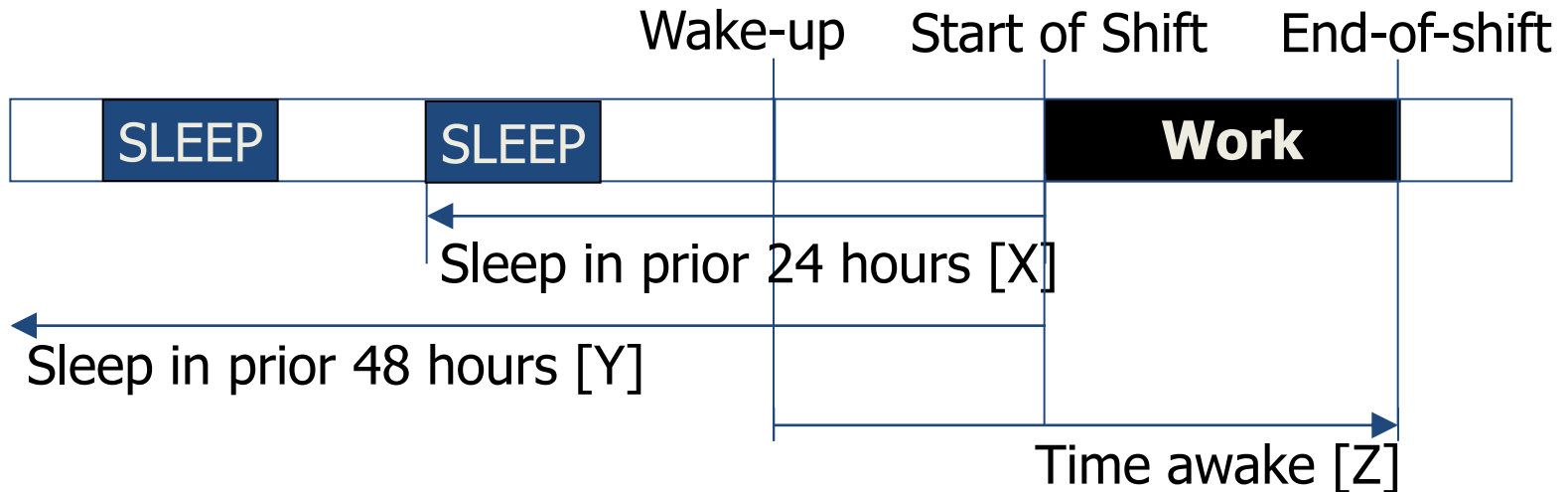
Estimating Fatigue Likelihood



The point score associated with an assessment of each of the 5 dimensions of the roster can be calculated and rated on the scale above. It may be possible to regulate that rosters with a FLS greater than 5 require significant controls beyond level 1



Prior Sleep & Wake Rules



X = Sleep in
Prior 24 Hrs

Y = Sleep in
Prior 48 Hrs

Z = Time Since
Last Sleep

As prior sleep decreases and prior wake increases the likelihood of fatigue [symptoms, errors and incidents] also increases. In general, **X** should be greater than threshold [5], Y should be greater than threshold [12] and **Z** should be less than Y



Mutual Obligation using Prior Sleep/Wake Rule

- **[the start rule]** Must obtain X [5] hrs sleep in the 24hrs prior, and Y [12] hrs sleep in the 48hr prior to commencing work.
- **[the finish rule]** The period from wake-up to the end of shift should not exceed the amount of sleep obtained in the 48 hrs prior to commencing the shift
- **[the action rule]** If either rule is broken, fatigue is a potential problem and the individual should notify their line manager and the organization should engage in an auditable risk reduction action



Calculate Fatigue Likelihood Score

- An example scoring system [n.b. the points are arbitrary]
 - Add **4 points** for every hour of sleep below the **24 hour** prior sleep threshold [X]
 - Add **2 points** for every hour of sleep below the **48 hour** prior sleep threshold [Y]
 - Add **1 point** for every hour of work beyond the **prior wake** threshold [Z]
 - **Sum and refer to decision tree to determine appropriate response.**



Example Decision Tree

Score	Agreed Response
< A	Do nothing unless higher level hazards are present
A-B	Document locally with supervisor and undertake approved individual countermeasures. Self monitoring for symptoms, napping, strategic caffeine, team monitoring by colleagues, task rotation
B-C	Document externally by supervisor. Organize supervisory checks. Complete symptom checklist, task re-assignment
C+	Document externally, do not engage in any risky behaviors. Do not commence shift until fit for work



Trainer's Handbook, TP 14578E:

In addition to a training presentation on fatigue, fatigue management systems, and individual fatigue management strategies, the package includes background information for delivery of the workshop, learning outcomes, and questions frequently asked by participants



Trainer's Handbook, TP 14578E:

How to Use This Handbook

- Purpose of the Trainer's Handbook
- Format of the Training
- Slideshow Presentation
- Speaking Notes
- Prepare for the Workshop
- Training Techniques



Assessing FRMS

- Advisory Circular (AC) SUR-001
 - the Development and Implementation of Fatigue Risk Management Systems in the Canadian Aviation Industry
 - Introduction to FRMS
 - Gap analysis tool



Example of GAP Analysis Tool

1.1 Fatigue Risk Management Policy

- A fatigue risk management policy is in existence and appropriate to the size and complexity of the organisation.
- The organisation has based its fatigue risk management system on the fatigue risk management policy.
- The fatigue risk management policy is approved by the accountable executive
- The fatigue risk management policy is promoted by the accountable executive
- The fatigue risk management policy is reviewed periodically
- The fatigue risk management policy is communicated to all employees with the intent that they are made aware of their individual safety obligations.
- There is a clear declaration of commitment to managing fatigue-related risk.



Assessing FRMS

- Staff Instruction (SI) SUR-007
- Fatigue Risk Management System Assessment Guide
- Determines compliance and effectiveness



Assessing FRMS

- Assesses compliance and effectiveness
- Comprises:
 - » Expectations – framework of what you expect to see
 - » Questions – open ended, all levels in the organization
 - » Scoring Criteria – 1-5 score, 3 = compliance
- Inspectors will use FAID to make an initial determination of whether a schedule is acceptable or not



FRMS Framework

- 1 Fatigue Risk Management Plan
- 2 Fatigue Risk Management Controls
- 3 Fatigue Risk Management Oversight
- 4 Training
- 5 Documentation

Questions Related to the Expectations of a FRMS



Example

- 2.2 Personal Fitness for Duty—Prior Sleep and Wake
- **To employees:**
- How much sleep does the organization require you to obtain prior to commencing work? (prior 24 & 48 hours)
- What actions are you expected to take if you have not obtained sufficient sleep prior to commencing work?



Assessing FRMS

AC SUR-001 & SI SUR-007 are available in
the “Online Reference Centre”

<http://www.tc.gc.ca/eng/civilaviation/menu.htm>

TCCA's FRMS and the ICAO Framework



- Transport Canada believes the toolbox is fully compliant with the ICAO FRMS Framework

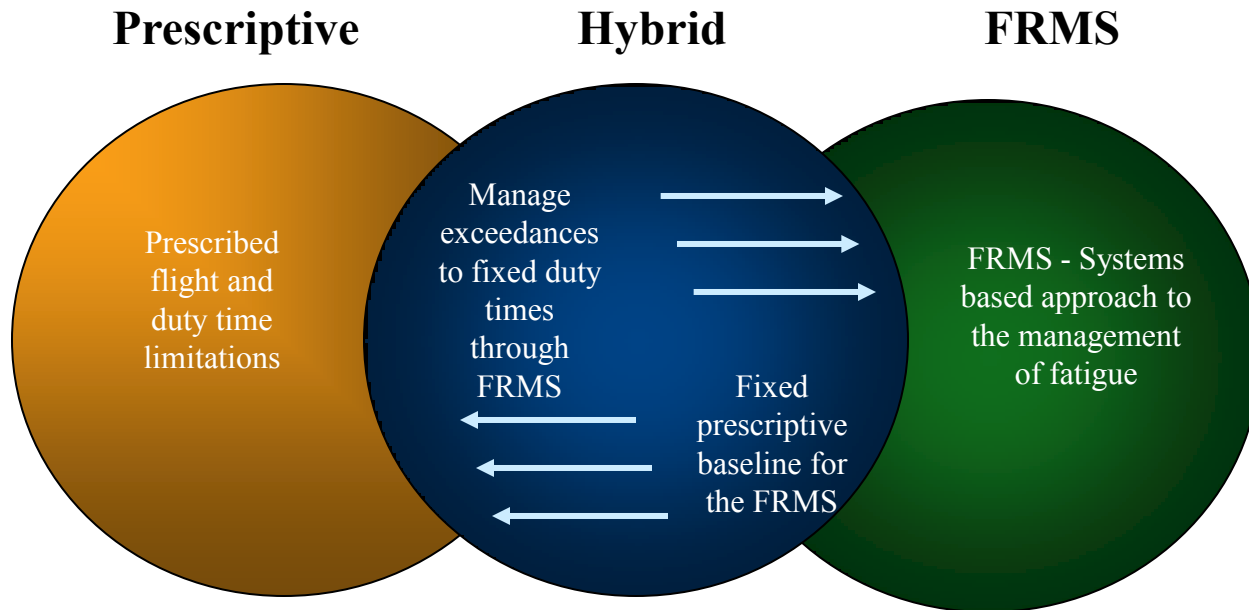


TCCA Flight Crew Work Group

- Working Group formed in 2010
- 10 meetings so far
- Objectives: Review the existing FDT requirements
- Draft FRMS and hybrid FDT/FRMS requirements
- Working Group report expected 2012



Expected Outcomes



Need more information?



For additional information related to TC's FRMS Toolbox contact:

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or

<http://www.tc.gc.ca/eng/civilaviation/standards/sms-frms-menu-634.htm>