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Fatigue Risk Management System
for the Canadian Aviation Industry

Policies and Procedures
Development Guidelines

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Notices

Une traduction de ce document est également disponible en français : *Système de gestion des risques liés à la fatigue pour le milieu aéronautique canadien : Lignes directrices pour l'élaboration de politiques et de procédures,* TP 14576F.

Preface

This document is part of the Fatigue Risk Management System (FRMS) Toolbox for Canadian Aviation developed by Transport Canada and fatigue consultants *edu.au* of Adeliade, Australia.

The FRMS toolbox includes the following components:

1   *FRMS for the Canadian Aviation Industry: An Introduction to Managing Fatigue*, TP 14572E: introductory material intended to raise awareness about fatigue

2.   *FRMS for the Canadian Aviation Industry: Fatigue Management Strategies for Employees*, TP 14573E: provides the knowledge and skills required to apply appropriate fatigue management strategies at the individual level

3.   *FRMS for the Canadian Aviation Industry: Employee Training Assessment*, TP 14574E: an optional module intended to assess employee competence in topics covered in the Fatigue Management Strategies for Employees workbook

4.   *FRMS for the Canadian Aviation Industry: Developing and Implementing a Fatigue Risk Management System*, TP 14575E: explains how to manage the risks associated with fatigue at the organizational level within a safety management system framework

5.   *FRMS for the Canadian Aviation Industry: Policies and 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

6.   *FRMS for the Canadian Aviation Industry: 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

7.   *FRMS for the Canadian Aviation Industry: 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

These documents are available on the Transport Canada web site at *www.tc.gc.ca.*

Contents

How to Use this Guide

A fatigue risk management system (FRMS) is an integrated set of management policies, procedures, and practices for monitoring and improving the safety and health aspects related to fatigue within your organization. This guide is intended to help you to build an effective fatigue risk management policies and procedures manual tailored to your specific operational requirements. Such a manual should provide both the overall governance policy for fatigue risk management, as well as a detailed framework for how fatigue will be managed on a day-to-day basis within the workplace.

Implementing an FRMS does not mean you need to create another set of documents. Some aspects of the policy may already be covered in your safety management system (SMS) manual. If this is the case, just cross-reference or copy the information in your FRMS manual.

In accordance with Canadian Aviation Regulations (CARs), the FRMS manual must clearly define:

- the level of senior management commitment
- the purpose and goals of the FRMS

- responsibilities of all employees for managing fatigue risk
- training requirements
- reporting procedures for fatigue-related hazards
- the fatigue reporting policy (any punitive actions that may be taken as a result of non-compliance, for example)
- a procedure for evaluation and continuous improvement of the FRMS.

This approach is in line with Transport Canada's guide to implementing a safety management system: *Safety Management Systems for Flight Operations And Aircraft Maintenance Organizations — A Guide to Implementation* (TP 13881E).

Each section of this guide has three components:

- *Introduction* — information about the purpose, theory and framework of the given FRMS policy component
- *Points to consider* — a summary of the main points to be covered in that section of the manual. 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 included in the given policy component section. These examples have been provided so that organizations can see the style of phrasing and content acceptable to Transport Canada. Each section of your policy manual should be tailored to the specific needs of your organization.

Each section of this FRMS guide is labelled as either *mandatory* or *recommended*:

- *mandatory* sections must be included in your document. The sample text provided in this guide should be reviewed and modified appropriately to suit your operation.

- *recommended* sections should be discussed with employees or your FRMS committee to determine whether they are appropriate and how they should be adapted to meet your operational requirements.

This guide follows the same organizational structure recommended for the FRMS policies and procedures manual.

CHAPTER 1

Introduction

1.1 Preamble (Mandatory)

The FRMS manual should include clearly defined policies, procedures, and practices to ensure that the risk of fatigue-related error is reduced as much as possible. The FRMS should be tailored to your operation. To ensure maximum effectiveness of your FRMS, the manual must reflect what you actually do.

The aim of implementing an FRMS is to institute a change in organizational culture that results in enhanced flight safety and a safer working environment. It is essential that organizations do not simply paraphrase generic FRMS policy statements but take the time to write their own. The FRMS manual should be used as the primary means of communicating to employees the FRMS policies and procedures to be followed as part of regular operations.

You should review and update the FRMS manual one year after implementation, and on a set schedule thereafter (e.g., every two years). You will need to include a control process for amending documentation as per CAR documentation requirements.

Points to Consider

- Why is the organization implementing an FRMS?
- Who will be affected by implementation of the FRMS?
- What are the basic responsibilities of employees within the FRMS?
- How often will the FRMS policy be reviewed and updated?

SAMPLE TEXT

Section 1.1   Preamble (Mandatory)

- This FRMS manual is required by Part V of the Canadian Aviation Regulations (CARs) for [*insert company name*] trading as [*insert trading name if applicable*]. This manual applies to all personnel employed by the company in any capacity (full time, part time, casual, or contract). All personnel shall abide by the procedures contained in this manual.

  The CARs must be observed at all times whether or not they are specifically referred to herein. Should conflict occur between this document and the CARs, this manual will be regarded as secondary.

  The FRMS manual will be made available to and read by all personnel employed by [*insert company name*]. Each employee is required to sign the *Amendment Awareness Record* in the master copy held by the person responsible for the FRMS. This signature shall be regarded as proof that the employee has read and understood the FRMS policy, and will act in accordance with procedures outlined in the manual. The FRMS policy will be reviewed one year after implementation or at an interval acceptable to Transport Canada, and at least every two years thereafter to ensure the relevance and currency of all procedures. Accordingly, the person responsible for the FRMS shall sign and date the review record in the master copy showing that the review was completed and indicating whether amendments were made.

- The Fatigue Risk Management System (FRMS) policies and procedures manual provides [*insert company name*] employees with comprehensive directions concerning the handling of fatigue-related risk within the operational environment.

  The FRMS policies and procedures manual will be provided to everyone within the organization upon request. A revised amendment sheet will be issued with each amendment.

  The person responsible for the FRMS shall review the FRMS policy one year after initial implementation, and at least every two years thereafter.

1.2 Document Control
(Mandatory)

All Canadian civil aviation certificate holders are required by the CARs to amend the FRMS manual whenever it is necessary to do so. You should systematically create, circulate, and record any amendments to the FRMS policy. You may choose to use your current procedure for this or the one described in the sample text below. This text provides a basic amendment process for a simple FRMS manual. You may wish to add extra controls suitable for the size or complexity of your operation.

Points to Consider

- How will amendments to the FRMS policy be recorded?
- How will employees be informed about FRMS policy amendments?
- How will employee understanding of FRMS policy amendments be recorded?

SAMPLE TEXT

Section 1.2   **Document Control** (Mandatory)

The person responsible for the FRMS shall create and distribute amendments to the organization's FRMS policy. Line managers will be responsible for discussing details of FRMS policy amendments with employees at team safety meetings.

Once issued, the amendment shall be distributed according to the manual distribution list. The amendment number, date, policy section amended, description of changes, signature, and entry date shall be recorded in the appropriate place.

To maintain the integrity of the manual and to monitor amendments, the manual shall include a list of effective pages — pages that have been or may be amended and the date that they were last modified:

- List of effective pages
- Signature sheet
- List of parts
- Tables of contents for each part and section

All employees associated with [insert company names]'s FRMS must sign the Amendment Awareness Record as evidence of having read, understood and agreed to apply the procedures contained in the FRMS policy. All personnel who are required to sign must do so on joining the organization, and whenever an amendment has been made. It is the responsibility of the person responsible for the FRMS to ensure that each amendment is brought to the attention of all relevant persons.

1.3 Definitions and Abbreviations
(Mandatory)

It is important to provide employees with clear definitions of key concepts in the FRMS policy. This helps the organization to avoid confusion and function with clear goals. If the content of this section is covered in your SMS manual, you may chose to simply cross-reference it here rather than repeating the information.

Define the meaning of words and phrases unique to the FRMS policy only. For example, you may want to define the terms "management," "competent person," and "responsible person." Any terms or titles that you introduce in the manual should be defined here.

You must define "company" (operator/organization) as the legal entity referred to throughout the manual.

You may wish to include references or other information sources in this section.

Points to Consider

- What terms used in the FRMS policy could be ambiguous or unknown to the user?
- What words are likely to recur throughout the document as acronyms?

SAMPLE TEXT

Section 1.3   **Definitions and Abbreviations** (Mandatory)

All definitions contained in the CARs, the Aeronautical Information Publications, and the Transport Canada website apply wherever they appear in this document. The following definitions are provided for users' convenience:

DEFINITIONS

Accountable Executive — The individual responsible for operations or activities authorized under the civil aviation certificate and accountable for meeting the requirements of the Canadian Aviation Regulations (CARs). The accountable executive must have full control of the financial and human resources necessary for the activities and operations authorized under the certificate.

Actigraph — A small watch-like device worn on the wrist to measure movement and infer sleep/wake activity

Aerodrome — A defined area of land or water including any buildings, installations and equipment intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft

Body Mass Index (BMI) — Used to define nutritional status and is derived from the formula: weight (kg)/height (m)^2 or weight in kilograms divided by the square of height in metres. The standards are the same for men and women. The normal healthy range is 20-25. Obesity is taken to start at a BMI of 30 and gross obesity at 40. A BMI of 18-20 is defined as mild starvation and severe starvation begins when BMI falls below 16.

Circadian rhythm — Human beings are programmed to sleep during the night and to be active during the day. The sleep/wake cycle is a circadian rhythm. The term circadian comes from two Latin words, circa (about) and diem (a day). Thus, circadian rhythms refer to physiological functions that cycle over a day. Examples are the sleep/wake cycle, alertness and performance, body temperature, production of hormones like melatonin and cortisol, and heart rate. These rhythms are regulated by a biological clock in our brains. Circadian rhythms do not generally adjust easily to shift work.

Commute time — The time it takes for employees to travel between their worksite and home

Company — The term "company" is used generically, and may include a council, an individual, or a company.

Error — A safety-critical event that does not result in equipment damage, injury or death, but could potentially do so in different circumstances.

Facility — Premises used for the operation of aircraft on an aerodrome. These premises may be fixed or portable, and may include communication facilities.

Fatigue — An increased level of sleepiness associated with impaired cognitive and/or physical functioning that may, as a consequence, result in an elevated risk of error or accident. For the purposes of this policy, fatigue is due primarily to increased duration of wakefulness and/or reduced duration of sleep.

Fatigue audit — Where an electronic or manual tool is used to calculate the relative sleep opportunity for an "average" individual using work schedules as the primary data source.

Fatigue Audit InterDyne (FAID) — A commercial software package that calculates the relative sleep opportunity for a hypothetical "average" individual using scheduled working hours as the primary data input. The sleep opportunity (or FAID) score at any particular time is a weighted aggregate based on the timing and duration of work and non-work periods, the time of day when these occur, and social and family factors that may influence the propensity to sleep. Typically the result is expressed as a score between 0-150. Scores below

a task-specific threshold are generally considered to provide an adequate sleep opportunity. Scores over the threshold are generally considered to provide a reduced sleep opportunity and require significant additional levels of hazard control. In general the level of control required is proportional to the degree to which the FAID score exceeds the threshold.

Fatigue or error proofing — Strategies to reduce the likelihood or consequence of an incident when employees are required to work through periods of high fatigue

Fatigue reduction — Strategies to reduce the likelihood of employees being at risk of making a fatigue-related error while at work

Person responsible for the FRMS — Person(s) with specific responsibilities under this document

Hazard — A source of potential error, incident, or situation with a potential to cause damage to equipment or result in injury or death

Incident — A safety-critical event that results in equipment damage, injury, or death

Legal entity — A person having legal personality (capable of enjoying and being subject to legal rights and duties). A legal entity may be:

- a natural person, or a group of natural persons
- an incorporated company or association, or a group of such companies or associations
- a body, corporate or politic, created by statute

Non-work related causes of fatigue — Factors contributing to a state of fatigue for which an individual employee is primarily responsible

Organization — Has the same meaning as "company"

Operator — Has the same meaning as "company"

Owner — The legal entity holding the Civil Aviation Document (CAD)

Policy — Refers to the current FRMS policies and procedures document

Recovery sleep — The sleep obtained away from the workplace enables the employee to recuperate from the work period and begin to pay back any sleep debt accumulated while on shift.

Regulator — Transport Canada

Risk — A calculation of consequence (potential loss) and likelihood (probability/frequency) of a potential incident

Shift work — Any work schedule that requires the employee to work at night (between 9 p.m. and 7 a.m.), in the afternoon/evening (after 5 p.m.), weekends (Saturdays/Sundays), very early hours (pre 6 a.m. starts), or longer than eight hours (including managers with flexible schedules that may require them to take work home, come in early and go home late, be on call, and carry a pager they never turn off).

Sleep — A reversible state of perceptual disengagement from, and unresponsiveness to, the environment.

Sleep apnea — A respiratory sleep disorder that causes multiple awakenings during sleep and, as a consequence, reduces the recuperative value of sleep and increases levels of fatigue. In severe cases it has also been associated with significant cardiovascular disease and long-term health problems.

Sleep debt — Occurs when an employee does not obtain adequate restorative sleep. A sleep debt can accumulate over a period of days. This debt may result in impaired performance, reduced alertness, and higher levels of sleepiness and fatigue. A sleep debt can only be repaid with recovery sleep.

Sleep deprivation — Loss of sleep that can occur either acutely (loss of a complete night's sleep) or partially (some sleep lost each night over a period of nights). Both result in reduced levels of alertness and performance.

Sleep duration — The period between the onset of sleep and waking, less awakenings.

Sleep inertia — The impairing effect of sleep on cognitive performance immediately after waking up.

Sleep opportunity — The time during a 24-hour period that a person has available for sleep. Hours of work together with commute times generally dictate the duration of sleep opportunity. Scheduling and type of work dictates whether the sleep opportunity is regular, irregular, predictable, or unpredictable.

Sleep length — The total amount of sleep obtained during each sleep period.

Sufficient sleep — The average person requires 6 hours sleep per night before experiencing fatigue-related performance decrements.

Work-related causes of fatigue — Factors contributing to a state of fatigue for which the organization is primarily responsible.

ABBREVIATIONS

CAD — Civil Aviation Document

CARs — Canadian Aviation Regulations

IFLS — Individual Fatigue Likelihood Score

FLS — Fatigue Likelihood Score

FAID — Fatigue Audit InterDyne

FRMS — Fatigue Risk Management System

SMS — Safety Management System

For operational abbreviations refer to the CARs.

1.4 Relevant Operational Publications
(Mandatory)

This section is required when additional documents are relevant to your FRMS. You may wish to include references to regulatory material cited in this manual.

NOTE: If data such as accident statistics are included, they must be kept up to date.

Points to Consider

- Does the FRMS manual refer to any existing regulatory material or company documents?

SAMPLE TEXT

Section 1.4　　　　**Relevant Operational Publications** (Mandatory)

This manual makes reference to the following Transport Canada publications:

- The Canadian Aviation Regulations (CARs)
- *Safety Management Systems for Flight Operations And Aircraft Maintenance Organizations — A Guide to Implementation*, Transport Canada, 2002. TP 13881

CHAPTER 2

Manual Control and Organization

2.1 Company Operations (Mandatory)

You must provide details of the legal entity (as shown on your Civil Aviation Document) and its trading name (if applicable) in the opening paragraph. A copy of this FRMS policy manual must be placed at each location identified in the distribution list (see Section 1.2).

If the content of this section is already covered in your SMS documentation, you may chose to simply cross-reference it here rather than repeating the information.

Points to Consider

- What is the legal and contact information of the company referred to in this FRMS policy (i.e., address, telephone, fax, e-mail, website, operating certificate, operating licence number)?

SAMPLE TEXT

Section 2.1 **Company Operations** (Mandatory)

The legal entity referred to in this FRMS policy manual is the operator of [*insert company name*]. The organization's coordinates are shown below:

- Address on Civil Aviation Document
- Postal Address
- Telephone
- Fax
- E-mail

A copy of the company's Civil Aviation Document (CAD) is attached in Appendix X of this manual *or* A copy of the company's Civil Aviation Document (CAD) is included in section X of the SMS manual.

2.2 Outline of Organizational Structure (Mandatory)

You must provide an outline of your organizational structure. If you have provided this information in your operations or SMS manual, you may refer to it here, remembering that you must add the position of "person responsible for the FRMS" and/or "FRMS Committee." The information may be provided in text or table format.

You must also include a reference to the legal entity named in Section 2.1 who holds the CAD to which this FRMS policy applies. The name of the legal entity should be the same as listed on the CAD.

Note: if any information changes, such as the company address, you are required to amend your SMS manual and notify Transport Canada accordingly.

You must state that this manual is available for Transport Canada's inspection at the location specified in Section 1.2.

Points to Consider

- How many layers of management are there in the hierarchy of the organization?
- Who is directly responsible for each group of employees?
- Where does fatigue risk management fit within the organizational structure?
- How is the accountable executive notified of fatigue-related issues?

SAMPLE TEXT

Section 2.2   Outline of Organizational Structure (Mandatory)

This organization operates with the positions described below. A reporting structure is implied by the arrangement of the names in this structure, i.e., each position reports to and is accountable to the position immediately above.
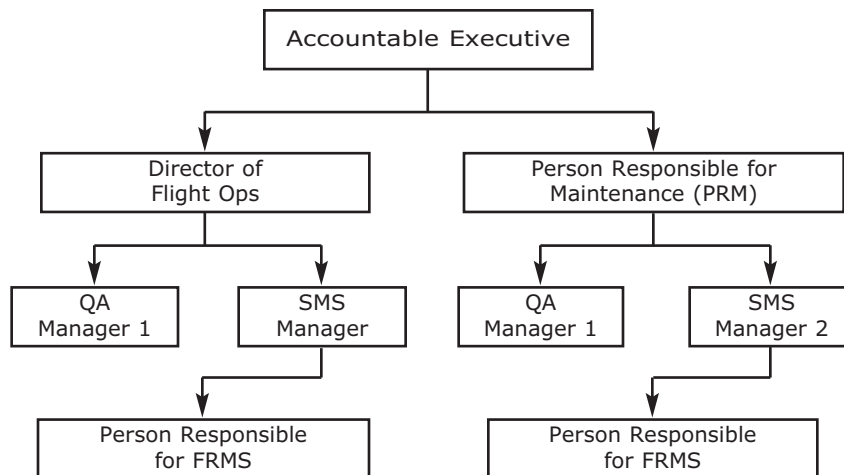
2.3 Responsibilities of Company Personnel (Mandatory)

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

If there are other positions in the organization with responsibilities related to the FRMS, they should be included here. You may choose to define the roles and responsibilities of those positions here or elsewhere in the document, cross referencing them to this section.

The person responsible for FRMS may be the Accountable Executive, the person responsible for maintenance, or — in a small organization — the director of flight operations. In larger organizations, responsibility is likely delegated to a specific position, individual, or committee. It is important, however, to designate one person as having primary responsibility for directing the FRMS.

The responsibilities of each position under the FRMS should be outlined here. You can add the responsibilities of employees to the organization chart, or you can add them in point form below the chart.

Points to Consider

- What are the specific duties 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?

SAMPLE TEXT

> **Section 2.3   Responsibilities of Company Personnel** (Mandatory)
>
> **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 policy
> - 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

PERSON/COMMITTEE RESPONSIBLE FOR THE FRMS

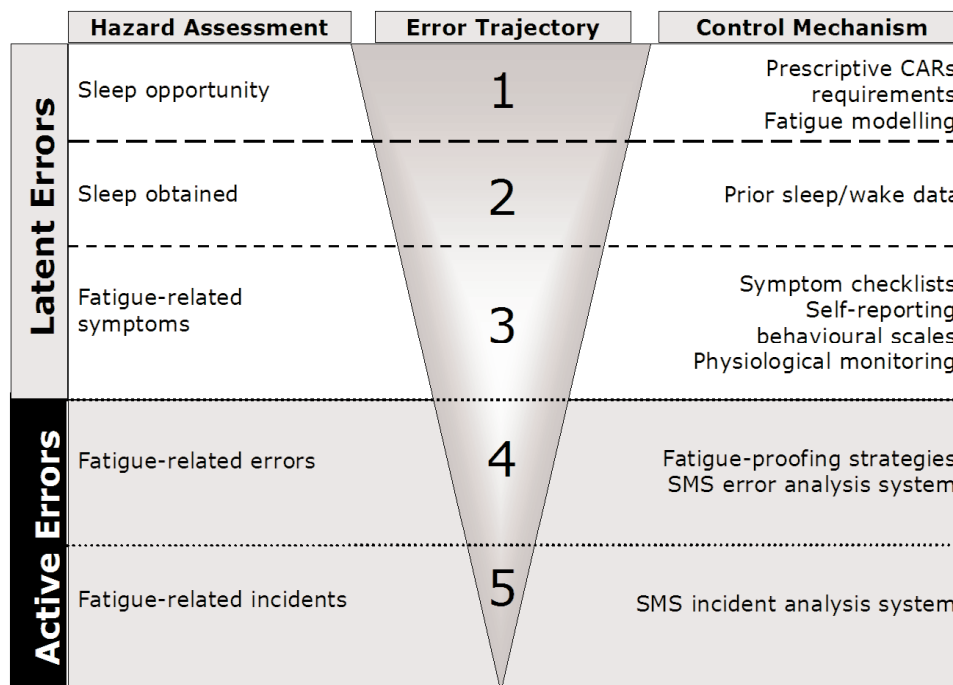The responsibilities of the person and/or committee responsible for the FRMS are to:

- report directly to the manager responsible.
- liaise with appropriate local safety committees within the organization to ensure consistency with other safety policies and procedures.
- design/tailor and implement an appropriate FRMS to identify, assess, and manage the risks associated with fatigue. This should be developed in conjunction with employees and their representatives (e.g., unions). This FRMS shall be reviewed on a regular basis to reflect changes in work and improvements in methods of fatigue management. The person and/or committee responsible for the FRMS shall also ensure that there is an appropriate reporting process and a designated person accountable for each area of operation. The designated person(s) will report to the person responsible for the FRMS as appropriate.
- ensure that all employees and contractors for whom fatigue is a potential safety hazard successfully complete a competency-based training program that enables them to:
    - identify the risks associated with fatigue
    - identify and implement appropriate strategies for minimizing fatigue-related risk
    - determine whether their behaviour is consistent with appropriate fatigue management plans
- develop an appropriate management system for:
    - quantifying and reporting the risks associated with work practices
    - determining the extent to which fatigue may contribute to accidents and human errors in the workplace
    - determining compliance with the FRMS
- review, monitor, and improve fatigue risk management practices in response to information obtained through feedback processes.

EMPLOYEES

Employees are responsible for minimizing the risks associated with non-work sources of fatigue. All employees are responsible for:

- ensuring they understand and fulfill their responsibilities with respect to appropriate sections of the FRMS
- ensuring they successfully complete all relevant training
- using their training to identify, report, and manage any actual or potential risks linked to fatigue
- using their scheduled time away from work to obtain an amount of sleep sufficient to minimize the risks of fatigue-related accidents and injuries. The definition of sufficient sleep is given in section 3.4.
- informing the appropriate individual if they have not obtained sufficient sleep. Appropriate individuals are identified in the fatigue risk management plan (section 3.7).

Fatigue Risk Management System

Hazard Assessment	Error Trajectory	Control Mechanism
Latent Errors — Sleep opportunity	1	Prescriptive CARs requirements Fatigue modelling
Sleep obtained	2	Prior sleep/wake data
Fatigue-related symptoms	3	Symptom checklists Self-reporting behavioural scales Physiological monitoring
Active Errors — Fatigue-related errors	4	Fatigue-proofing strategies SMS error analysis system
Fatigue-related incidents	5	SMS incident analysis system

Five-Level Fatigue Hazard Control Model

3.1 Preface (Mandatory)

An effective fatigue risk management plan should take a systems approach to minimizing fatigue-related incidents. The FRMS section of this policy tool is based on the five-level error trajectory (see *Developing and Implementing a Fatigue Risk Management System* (TP 14575E) for more detailed discussion). At Level 1, organizations must provide sufficient sleep opportunity to all employees. This can be achieved either through prescriptive hours of service rules or computer-based fatigue modelling (see Section 3.3). At Level 2, organizations should encourage employees so that, when provided with sufficient sleep opportunity, they

strive to obtain sufficient sleep. This can be done in a number of different ways, as outlined in Section 3.4. At Level 3, organizations should monitor the frequency that employees exhibit fatigue-related symptoms, regardless of sleep opportunity and actual sleep obtained. If employees appear to be exhibiting fatigue-related symptoms, their ability to perform high-risk tasks should be examined by an appropriate manager. This process is outlined in more detail in Section 3.5. Level 4 deals with fatigue proofing situations that may involve higher levels of fatigue-related risk, such as emergency overtime or extreme weather. See Section 3.6. The final level in the error trajectory is concerned with reporting errors and incidents that may be fatigue-related. Details of this process are given in Section 3.7.

The information presented under each of the following sections is not intended as a *prescriptive* formula for the development of a Fatigue Risk Management System. You should use this material to tailor an FRMS to suit the size and nature of your operation. This will ensure a level of ownership by both management and operational personnel.

As with any Safety Management System, commitment from management and clear consultation with employees ensures a positive safety culture that is the foundation for success.

An FRMS should be part of your wider SMS as an integrated set of work practices and procedures for monitoring and improving the safety of all aspects of your organization. It recognizes the potential for fatigue-related errors and establishes robust defences to minimize the likelihood of incidents or accidents.

As with all safety management systems, fatigue risk management involves goal setting, planning, documentation, and measuring performance against goals. An FRMS should be a comprehensive, integrated tool for managing fatigue in operational settings.

This section should include general information about the FRMS and provide a framework for the remainder of the manual. It should say why the FRMS has been implemented and list the basic components that it covers.

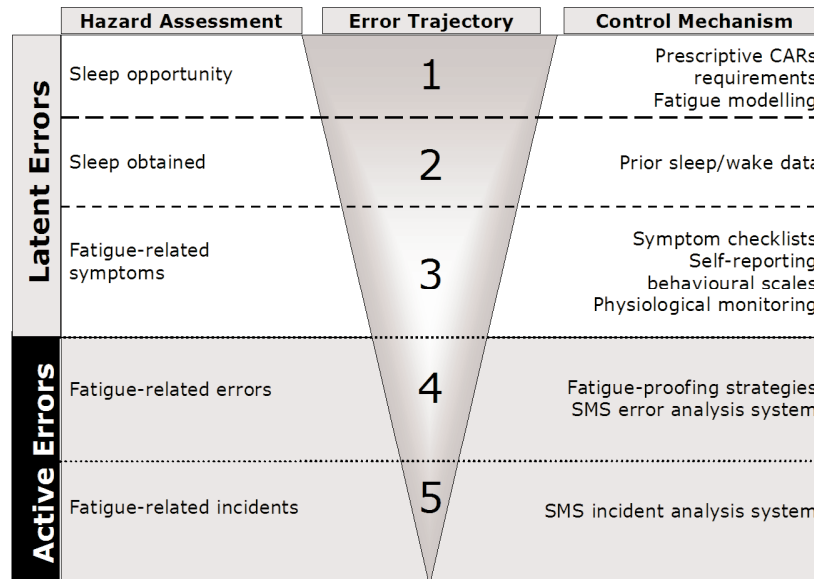**Points to Consider**

- What is the basic structure of the FRMS?

Section 3.1   **Preface** (Mandatory)

The FRMS incorporates fatigue hazard control mechanisms to ensure:

- sufficient sleep opportunity is given to employees (see Section 3.3)
- actual sleep obtained is verified (see Section 3.4)
- procedures for monitoring and dealing with fatigue-related symptoms (see Section 3.5)
- fatigue-proofing strategies are implemented to reduce fatigue-related risk (see Section 3.6)
- fatigue-related accident/incident investigation procedures are in place (see Section 3.7)

The FRMS is based on the five-level error trajectory shown below.

Hazard Assessment	Error Trajectory	Control Mechanism
Latent Errors — Sleep opportunity	1	Prescriptive CARs requirements Fatigue modelling
Sleep obtained	2	Prior sleep/wake data
Fatigue-related symptoms	3	Symptom checklists Self-reporting behavioural scales Physiological monitoring
Active Errors — Fatigue-related errors	4	Fatigue-proofing strategies SMS error analysis system
Fatigue-related incidents	5	SMS incident analysis system

Fatigue Hazard Control Model

3.2 FRMS Policy

3.2.1 Senior Management Commitment to Managing Fatigue (Mandatory)

Every organization is unique in terms of the size of its operation, layout of its facilities, frequency of aircraft movements, and maintenance and flight operations. The FRMS you develop needs to be tailored to meet the needs of your specific operation.

This section must contain a clear commitment to the FRMS from the organization's

senior management. This is an overall statement about the management of fatigue hazard (see *Developing and Implementing a Fatigue Risk Management System* (TP 14575E) for an example of such a mission statement). The statement outlines the corporate philosophy of fatigue risk management and clearly identifies the person(s) responsible for oversight of the FRMS within the company. FRMS policies and procedures must be communicated to all employees with a clear endorsement by senior management.

Your policy statement should clearly state:

- commitment of senior management to the FRMS
- responsibilities and accountability of the accountable executive, managers, committees, and employees

- how the organization will achieve its safety objectives
- resources allocated
- fatigue-related safety outcomes expected of managers, employees, and contractors

You should also include a statement explaining how the FRMS interacts with your SMS.

Points to Consider

- Has senior management given support and commitment to FRMS implementation?
- What is the overall purpose of the FRMS?
- What resources are allocated for the FRMS?

SAMPLE TEXT

Section 3.2.1   Senior Management Commitment to Managing Fatigue (Mandatory)

1. [Insert Company Name]'s Fatigue Risk Management System policy represents the strongest commitment at the highest level — signed by the accountable executive.

   [insert Company Name] is committed to protecting all employees, contractors, service providers, clients, visitors, and the general public from fatigue-related risk. There will be no compromise in an employee's well-being in anything we do. Implementing measures to minimize fatigue-related risk and create a safe, healthy, and injury-free environment is a leadership responsibility. Continuing support of this effort is the responsibility of everyone.

2. The purpose of the FRMS is to reduce, as far as practicably reasonable, workplace fatigue and its risks, to ensure a safe and error-free work environment for employees, contractors, and clients. The objectives of this policy are to ensure:

- Employees are fit for work
- The company enjoys a safe working environment by minimizing hazards associated with fatigue
- The fatigue hazards associated with long work hours and shift work are minimized
- Employees have access to assistance through a range of preventative initiatives, including training
- Informed decisions are made about work design
- On-going risk assessment and hazard monitoring takes place
- Employees unfit for duty as a result of fatigue will be dealt with consistently and fairly in accordance with this policy

Resources for maintenance, development and implementation, updating and reporting of fatigue in the workplace in relation to the FRMS policy and personnel responsible for it will be through the Human Resources Department (or similar).

3.2.2 Fatigue-related Safety Objectives (Mandatory)

Fatigue-related safety objectives form the basis for measuring the success of the FRMS components. Safety objectives need to be specific, measurable, realistic, and have the backing of those who have to deliver them. Both short- and long-term objectives should be set and prioritized, and balanced with business requirements.

Fatigue risk management objectives are outcome-based to meet the organization's safety policies. They should be transparent to employees and customers and clearly outline expectations and intent to ensure a safe work environment for everyone.

It is essential that employees know how these objectives affect their job functions and roles. Simply informing employees that they need to manage fatigue-related risk is not sufficient. They should be given operational roles or responsibilities that ensure fatigue-related risk is managed appropriately.

Points to Consider

- What does the organization aim to achieve with FRMS implementation? (This may extend beyond the reduction of fatigue-related risk to aspects such as increased employee morale or increased performance capacity)
- How does the organization plan to achieve that?

Section 3.2.2   Fatigue-related Safety Objectives (Mandatory)

All levels of management are committed to managing the risk of work-place fatigue. This company has clear employee safety standards with clear accountability, as outlined in Section 2.3.

We involve everyone in the process, as described in Section 3.2.

We provide the necessary training to build and maintain meaningful fatigue-risk management safety leadership skills, as stated in Section 4.

3.2.3 Communication and Consultation (Mandatory)

As with the wider SMS, information on FRMS policies, objectives, and responsibilities must be clearly communicated to staff, consultants, customers, and other appropriate individuals.

Where possible, the communication process should be recorded and filed for future reference by management and/or a Transport Canada audit team. Methods of communication could include memos, e-mail, or posters. Employees may be invited to submit agenda items to the FRMS Committee.

Whatever the method, communication needs to be clear and unambiguous, specific, and easily transferred and recorded by some means. An important step in this communication process is feedback.

Feedback can be formal and informal. Formal communication may take the form of minutes from the FRMS committee meetings or newsletters. Informal communication may be verbal. For example, a supervisor may update employees on the outcome of a fatigue-related issue during a lunch break.

In this section, you need to describe how you will distribute FRMS-related information, throughout the organization. What method will you use? How is the information to be distributed? Who is responsible? What is the time frame?

You also need to describe the methods of communication between the person/committee responsible for the FRMS and senior management. For example, regular, scheduled meetings with a set agenda or e-mail updates following each FRMS committee meeting.

This section should also detail the level of consultation with levels of management and employees during the FRMS design and review process. All employees should have the opportunity to participate in the FRMS design and review. There are many ways of achieving this. For example, focus

groups, one-on-one interviews, question-naires, or employees may be asked to e-mail feedback.

Finally, you need to describe how you will distribute non-critical information related to fatigue. This might include educational information related to personal fatigue-risk management strategies. Examples might include memos, website, company newsletter, and safety notice boards.

Points to Consider

- How will information related to the FRMS be distributed and recorded?
- Who needs to receive FRMS related information?
- What level of consultation will be conducted among employees during the FRMS design and review process?
- Who will be involved in the FRMS consultation process?
- How will the FRMS consultation process be conducted?

SAMPLE TEXT

Section 3.2.3   Communication and Consultation (Mandatory)

1. The person/committee responsible for the FRMS will distribute information about the FRMS and informing all employees of their individual responsibili-ties. The preferred method of delivery for critical safety-related information at this organization is through safety meetings, followed up by e-mailed meeting minutes.

   All employees will be consulted during the FRMS design and review process-es. Employees will be given a training session on fatigue-risk management and FRMS components (see Section 4). Each training session will be followed by a focus group, during which employees will be able to provide feedback on the framework of the FRMS. Feedback provided through the focus groups will form the basis of any changes to the FRMS during the review process.

2. Whenever there is an urgent need to distribute fatigue-related safety informa-tion or to take safety-related action, employees will be notified directly by their supervisors. An update on FRMS activities will be published and e-mailed to all staff twice a year.

   Employees will be consulted during any review of the FRMS. Employees will receive a copy of the FRMS along with a questionnaire to be returned to the person responsible for the FRMS. Feedback provided through the question-naire will be considered during the annual FRMS review process.

3.3 Hours of Service and Scheduling (Mandatory)

The degree of work-related fatigue associated with a given task on a given schedule is linked to the degree a schedule precludes sleep of sufficient quality and duration to ensure employees are fit for work. A schedule produces higher levels of work-related fatigue if it requires an employee to work more often at times when one is socially and biologically predisposed to sleeping.

It is important that schedules provide employees with sufficient sleep opportunity to ensure they are fit for work. The factors that affect sleep opportunity are the length and timing of shifts, time away from work, long blocks of shifts, and biological limits on recovery.

There are a number of ways to ensure employees have been provided with sufficient sleep opportunity within a schedule:

- operate within federal or provincial hours-of-work rules
- use a computer-based fatigue modelling package
- use a fatigue likelihood scoring matrix

Biomathematical modelling

Many models predict fatigue based on planned or actual hours of work. They consider a number of factors including the timing and duration of all shifts in the previous days (with more weight given to more recent shifts). Most models also allow comparison of various schedules and the fatigue "scores" that each may produce in an employee population.

Using a "fatigue score" as an index of average sleep opportunity, organizations can determine whether sleep opportunity is adequate by comparing the estimated fatigue score to a threshold value established by the organization in advance. Schedules that produce a score over this threshold value may be considered to provide inadequate sleep opportunity. Any organization that chooses to use a biomathematical model should set threshold values for fatigue scores based on a risk assessment of the tasks found in the workplace. The risk assessment process may identify different task categories that require different threshold values based on their susceptibility to fatigue impairment. These threshold values are used to establish compliance tables for the schedules of various workgroups. To keep compliance tables convenient to manage, task categorization should be broad and based on criticality and susceptibility to fatigue risks.

The most effective way to use biomathematical models for scheduling is to set risk-based limits and restrict how much of the schedule exceeds them. Using this approach, the company defines *acceptable*, *questionable*, and *unacceptable* zones. Fatigue (sleep opportunity) scores (based on a task-defined risk assessment) are assigned to the acceptable/questionable and questionable/unacceptable thresholds.

Organizations should not intentionally schedule work with scores in the *unacceptable* zone and 95% of actual work hours must fall within the *acceptable* zone. A small percentage of total hours are permitted for scheduled work in the

questionable zone. Circumstances may sometimes dictate that actual hours worked fall in the *unacceptable* zone. All work in zones other than *acceptable* must be investigated and appropriate corrective action taken. An example of a compliance table that shows threshold values, percentages of planned and actual hours of work, and corrective actions is shown below.

Create a compliance table or a list of threshold values as needed for each task category defined in the risk assessment process. The FRMS manual could also contain a list of corrective actions to be taken when necessary.

Example of a compliance table used with biomathematical modelling

	Threshold values	Planned hours of work	Actual hours of work	Corrective Action
Acceptable	< X	97.5%	95%	None unless one or more controls indicate levels are wrong
Questionable	[X-Y]	2.5%	3.75%	Correct if there is moderate chance of recurrence
Unacceptable	> Y	0%	1.25%	Act immediately Rest until fit for duty Report to regulator

Fatigue Likelihood Scoring Matrix for Work Schedules

An alternative assessment tool to the biomathematical model is a fatigue likelihood scoring matrix. There are five key elements that make up this matrix:

1. *The total number of hours worked in a seven-day period*. As total hours worked increases, sleep opportunity decreases.

2. *The maximum length of an individual shift*. As the length of a given shift increases, the subsequent sleep opportunity decreases.

3. *The minimum length of a short break*. A short break is defined as a single sleep opportunity between work periods. It is typically a period shorter than 32 hours. As the break between shifts decreases, so does the sleep opportunity.

4. *The total number of hours worked between 9 p.m. and 9 a.m. in a seven-day period*. This element captures late finishes, early starts, and night work. All of these will reduce the night sleep opportunity and result in a significant reduction in total sleep opportunity.

5. *The frequency of long breaks*. A long break is defined as a period of two night sleeps with a non-working day in between. Long breaks typically provide a significant opportunity to recover from sleep loss accumulated over a sequence of work periods.

A schedule can then be scored on each of the five elements using the following table.

Fatigue Likelihood Scoring Matrix for Work Schedules

	Score				
	0	**1**	**2**	**4**	**8**
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

The points for each element can then be added to provide a score between 0 and 40 that indicates the degree of sleep opportunity afforded by the schedule. Schedules with a lower score provide greater sleep opportunity (and are less likely to be associated with work-related fatigue) than those with a higher score. Organizations must define what they deem to be acceptable or unacceptable. The cut-off point for an acceptable schedule is determined by the specific characteristics of the organization. For example, an organization could choose to assign a lower cut-off score for highly complex or safety-critical work, or a high physical stress work environment (e.g. high humidity), than less complex or

safety-critical work in an air-conditioned environment.

Organizations should consider consulting with employees, the regulator, researchers, and others in the industry to establish some initial standards for how sleep opportunity can be assessed using each of these approaches and appropriate threshold values for adequate sleep opportunity for various categories of employees in the Canadian aviation industry.

Points to Consider

- How likely are employees to be fatigued due to lack of sleep opportunity in their work schedule (night work, early morning starts, extended shifts, overtime, long blocks of shifts, amount of time away from work, commute time, etc.)?
- How will the work schedules be assessed for fatigue-related risk?
- What is the level of fatigue-related risk associated with work tasks within the organization?
- What benchmark is the organization using to define fatigue-related risk as acceptable, questionable, or unacceptable?
- What procedures are in place for when work schedules fall within the questionable zone?

SAMPLE TEXT

Section 3.3   Hours of Service and Scheduling (Mandatory)

Work schedules will be assessed for adequate sleep opportunity and considered appropriate according to the following compliance table. *Planned* work hours will be assessed in advance, whereas *actual* work hours shall be assessed retrospectively.

Through the planning phase, work schedules will be assessed using a Fatigue Audit InterDyne (FAID) software assessment tool to determine whether employees have been provided with adequate average sleep opportunity. Fatigue-related risk will be managed using a risk control process. Management will undertake a fatigue-related risk assessment for specific work groups and tasks. These will be assigned a nominal upper limit consistent with a safe system of work.

The compliance table below for [*insert task category designator*] shows the FAID threshold values for providing sufficient sleep opportunity. The upper threshold sets the limit for an acceptable degree of sleep opportunity provided by a work schedule for the designated group of employees. FAID scores above [*insert upper threshold value*] are considered to be in the unacceptable zone. The lower threshold is set at [*insert lower threshold value — for FAID this is typically 10-20 points below upper threshold*]. FAID scores falling between the upper and lower thresholds are in the questionable zone, and scores below the lower threshold are in the acceptable zone. Compliance is determined by calculating the percentage of total hours worked above the two designated thresholds.

Compliance table for [*insert task category designator*]

	FAID threshold values	Planned hours of work	Actual hours of work	Corrective Action
Acceptable	< X	No less than 97.5% of scheduled hours	No less than 95% of hours worked	None unless evidence of Level 2 hazards or higher are present
Questionable	[X-Y]	No greater than 2.5% of scheduled hours	No greater than 3.75% of hours worked	Where there is reasonable likelihood of recurrence (more than twice in a row), investigate and undertake corrective action before next audit
Unacceptable	> Y	0% of scheduled hours	No greater than 1.25% of hours worked	Investigate and undertake immediate corrective action

> Work schedules will be analysed monthly during normal operations and weekly during contingency situations. [*Insert company name*] will not intentionally plan work beyond the upper threshold value (i.e., operate in the unacceptable zone) and will be required to achieve compliance for 95% of actual hours of work (i.e., in the acceptable zone). Percentages in the remaining boxes shall be limited to the percentages specified in the compliance table. Thus, up to 1.25% of total hours may occur in the unacceptable zone due to unforeseeable circumstances, up to 2.5% of hours may be planned occasionally in the questionable zone and up to 3.75% permitted in practice. 97.5% of hours shall be planned within the acceptable zone.

3.4 Verification of Actual Sleep (Mandatory)

The primary physiological determinants of fatigue for a given employee carrying out a given task are the timing and duration of prior sleep and time awake. These factors are the most appropriate criteria for judging whether an employee is likely to be fit for work. The hours of service and scheduling rules outlined in the preceding section are effective in predicting how much sleep an employee is *likely* to obtain in a given break from work. Level 2 control, however, aims to ensure that individual employees actually obtained sufficient sleep.

The focus of this level of control is setting minimum and maximum thresholds for sleep and time awake for employees to ensure that they are fit for duty. These minimum and maximum thresholds may vary for a specific task category or work group, according to the risk profile, but they can provide a simple, practical, and easily measurable yardstick to determine whether an employee has obtained sufficient sleep and is, by inference, fit for work.

These thresholds are equivalent to the simple formula used by people to determine whether they are alcohol impaired. For example, in counting number of drinks they have had over a period of time. While counting sleep and time awake is not a perfect indicator of the level of fatigue for all individuals on all occasions, it can provide employees with a simple measure for determining the relative likelihood that they are fatigued.

Calculating an Individual Fatigue Likelihood Score (IFLS)

Most evidence suggests that to maintain optimum performance, health, and well-being, individuals should get between seven and nine hours sleep per 24-hour period.

Many studies have investigated how decreasing levels of sleep and increasing

time awake affects performance (see references in Section 7). In general, research has found that performance begins to become impaired after less than five hours sleep over a 24-hour period. Performance also becomes impaired if sleep consistently falls below six hours per night on an ongoing basis (over the period of a week).

A measure of fitness-for-duty related to fatigue can be calculated using the following table.

As prior sleep decreases and time awake increases, the likelihood of fatigue-related symptoms, errors, and incidents also increases. In general, X should be greater than 5, Y should be greater than 12 and Z should be less than Y. Each of the factors (X, Y, and Z) are added to provide an overall score of individual fatigue likelihood. Employees who obtain an elevated score should inform the appropriate supervisor or manager, and appropriate action should be taken. It is useful to establish a decision tree for employees and managers that provides clear information about appropriate action at various levels of fatigue. The table below shows an example.

How to calculate the Individual Fatigue Likelihood Score

Prior sleep/wake factor	Threshold value	Scoring*
X (sleep in prior 24 hours)	5 hours	Add 4 points for every 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

* *Partial hours should be pro-rated or scored proportionally. For example, if the scoring calls for 4 points for every hour below the threshold, give 2 points for a half-hour, or 1 point for 15 minutes.*

Decision tree based on Individual Fatigue Likelihood Score

Individual Fatigue Score	Risk Level	Approved Controls
Zero	Acceptable	No additional controls necessary except in the presence of higher level indicators of fatigue (i.e., symptoms, errors, or incidents).
[Zero-A]	Minor	Report fatigue to local supervisor. Implement approved individual controls including, but not limited to: symptom monitoring, strategic use of caffeine, task rotation, increased personal and co-worker monitoring.
[A-B]	Moderate	Report fatigue to local manager. Implement additional approved individual controls, including but not limited to: task reallocation, napping, increased level of supervisory monitoring.
> B	Significant	File formal fatigue report. Do not engage in safety-critical tasks. Do not recommence work until sufficiently rested as per prior sleep/wake rules.

Scores that constitute A and B should be worked out on an industry, sector, or organizational basis. They should be based on overall job risk and consultation with employees.

Potential Applications of the Individual Fatigue Likelihood Score (IFLS)

One way to use the IFLS as a Level 2 control is to apply the minimum sleep and maximum time awake rules as a simple self-assessment tool embedded in the training program. Employees would determine their own risk of fatigue and be required to manage their own fatigue with countermeasures such as sleep planning, strategic napping, caffeine, breaks, task rotation, etc.

Or employees might be required to report actual sleep obtained on a daily basis to the employer and to engage in clearly defined and documented risk mitigation strategies. In this case, the organization should design specific decision trees for designated tasks or work groups indicating what should be done at specified IFLSs. Levels of risk mitigation should increase with higher IFLSs. Examples of fatigue control measures for the various levels of risk are presented below.

Minor increase in risk: At this level, individual fatigue controls implemented by the employee are most common. Employees should report the level of fatigue-related risk to the appropriate supervisor according to the organizational reporting structure. The use of symptom checklists prior to starting work would be appropriate as would an increased level of supervision by the employee and/or by co-workers. Appropriate use of caffeine may be recommended, particularly during hours when an employee would typically be asleep. It would also be reasonable for the employee and/or co-workers to restructure work tasks and/or breaks to minimize any additional risk.

Moderate increase in risk: No employee should begin work with an IFLS in this range without completing a symptom checklist and indicating in writing that they consider themselves fit to work. Supervisors should discuss the work assignment with the employee and ensure that the number of safety-critical tasks are minimized and that all reasonable efforts are made to reallocate the workload safely. Employees with an IFLS in this range would receive priority for napping, where possible. The use of caffeine or other strategies to stay awake (bright lights, exercise, cool air, noise or upbeat music, etc.) would be common.

Significant increase in risk: An employee with an IFLS in this range would typically be considered unfit for work. This level of impairment is broadly comparable to drug or alcohol intoxication. It is unlikely that an employee would be permitted to undertake any safety-critical task and

would probably not be allowed to drive to or from the workplace. Activities should not require employees to be responsible for the safety of themselves or others and should be limited to simple tasks in a relatively hazard-free environment. Before returning to work, all employees should be given adequate opportunity to obtain sufficient sleep. In general, employees should not be required to return until their fatigue likelihood score is zero.

When an employee notifies a supervisor or line manager of an elevated fatigue score, the reasons for the score need not to be discussed unless the employee reports such a score more than three times in 90 days. Discussions about the cause of multiple reports should typically involve the employee assistance program in the first instance (where applicable) and can subsequently involve line managers and supervisors where appropriate.

Using the Individual Fatigue Likelihood Score (IFLS) to Improve Work Scheduling Practices

Level 2 controls are designed to ensure adequate sleep at the individual level. They use relatively objective measures that are intuitively meaningful, observable, and easily recorded at the individual and group levels.

If an organization emphasizes Level 2 controls and they are reliably reported and documented, they can also be used to collect valuable data on fatigue in the organization. The data could be aggregated across an entire organization or even industry to provide the basis of a statistically sound approach to evaluating the

amount of sleep and time awake provided by a schedule and form the basis for evaluating the effectiveness of scheduling factors set out in Section 3.3.

Points to Consider

- What is the minimum amount of sleep required to be considered fit for work:
  - on a one-time basis?
  - on a continual basis?
  - for high-risk work?
  - for low-risk work?

- What are the measures or procedures to follow when an employee has not obtained sufficient sleep?
- What should be done when this happens repeatedly?
- What policies or procedures are in place for contractors working on site?

SAMPLE TEXT

Section 3.4   Verification of Actual Sleep (Mandatory)

Prior to starting work, employees who have undergone fatigue management awareness training will be required to assess their fitness-for-work risk by calculating their individual fatigue likelihood score for the previous 48 hours. The result helps employees determine the likelihood of fatigue-related impairment and the degree of safety associated with scheduled work activities.

An individual fatigue likelihood score (IFLS) can be calculated using the following table.

How to calculate the Individual Fatigue Likelihood Score

Prior sleep/wake factor	Threshold value	Scoring*
X (sleep in prior 24 hours)	5 hours	Add 4 points for every 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

*   Partial hours should be pro-rated or scored proportionally. For example, if the scoring calls for 4 points for every hour below the threshold, give 2 points for a half hour and 1 point for 15 minutes.

If the assessment finds an elevated level of fatigue-related risk, the employee should inform the appropriate line manager or supervisor as soon as practical. Together, the employee and manager should discuss and implement appropriate controls. Employees who report a non-zero score more than 3 times in 90 days will be referred to the employee assistance program to discuss potential reasons and solutions for the lack of sleep.

The following decision tree indicates proper course of action to follow, based on IFLS scores.

Decision tree based on Individual Fatigue Likelihood Score

Individual Fatigue Score	Risk Level	Approved Controls
Zero	Acceptable	No additional controls necessary except in the presence of higher level indicators of fatigue (i.e. symptoms, errors, or incidents).
1-4	Minor	Inform line supervisor and document in daily log-book. Self-monitor for fatigue-related symptoms, and apply individual controls such as strategic use of caffeine, task rotation, working in pairs, additional rest breaks.
5-8	Moderate	Inform local manager and document in a fatigue report. Implement additional fatigue controls such as task reallocation, napping, and increased level of peer and supervisory monitoring.
9+	Significant	Call manager before driving to work. Document in a fatigue report on next work shift. Do not engage in safety-critical tasks (including driving to work), and do not return to work until sufficiently rested as per sleep/time awake rules.

Each employee will be provided with a pocket card for easy reference.

Individual Fatigue Likelihood

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

Individual Fatigue Likelihood

Step 4. Sleep in prior 24 hours
Add all points together to determine your score

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

Refer to FRMS policy for detailed explanation of controls

Untrained Employee/Contractor Assessment

Employees and contractors who have not taken fatigue management training are asked to confirm that they have had a minimum of six hours sleep in the 24 hours prior to starting work.

Where employees have not had six hours of sleep, they are required to report this to an appropriate individual. A risk assessment must be conducted to determine the appropriate action. As a general rule, obtaining only five to six hours of sleep should be considered a minor hazard, obtaining four to five should be considered a moderate hazard, and obtaining less than four should be considered a significant hazard.

In general, managers and supervisors should use controls similar to those outlined in the decision tree. This may include but is not limited to: task rotation, napping, workload reallocation, sending the employee home, provision of transport off site, and/or requiring the employee get adequate sleep prior to returning to work.

3.5   Fatigue-related Symptoms (Mandatory)

Level 3 controls are concerned with reducing the likelihood that employees exhibit fatigue-related symptoms – and reducing the consequences. There are many reasons that an employee may appear to be or act fatigued. If the FRMS is operating effectively, the main cause – insufficient sleep – should be screened out by Level 1 or 2 controls.

The type of work performed may be particularly physically or mentally demanding, which can exacerbate fatigue and lead to fatigue-related symptoms. External factors such as weather can also affect fatigue. These factors should all be considered in the risk assessment of work tasks so that scheduling parameters can be set for different work groups or work tasks where warranted. The appearance of fatigue-related symptoms during certain work periods or tasks can be an indication that risk profiles need to be re-assessed.

There may be situations where fatigue-related symptoms are not directly linked to work tasks or environmental conditions, and where the employee has been provided sufficient opportunity and actually obtained sufficient sleep. Non-work factors are likely the cause. For example, the employee may be experiencing personal stress (e.g., sickness, newborn baby, financial issues, divorce) that is disturbing sleep.

Employees who say they get enough sleep and cannot explain their fatigue-related symptoms should undergo screening for a sleep disorder. Some of the more common sleep disorders are discussed in *Developing and Implementing a Fatigue Risk Management System* (TP 14575E). Employee Suspected of having a sleep disorder should be referred to a doctor or sleep specialist as soon as possible, particularly if they are performing high-risk tasks.

Level 3 controls – observing and reporting fatigue-related symptoms – are important in an effective FRMS to determine whether:

- minimum sleep requirements are appropriate
- task-scheduling processes are appropriate
- non-work activities are affecting the risk of workplace fatigue
- employees have a sleep disorder

The following table lists typical symptoms of fatigue. If employees have experienced more than three of the specified symptoms in a 15-minute-period, they are likely to be fatigued and should be considered at an elevated level of fatigue-related risk.

Symptoms of fatigue

Physical Symptoms	Mental Symptoms	Emotional Symptoms
• Yawning • Heavy eyelids • Eye-rubbing • Head drooping • Inappropriate or unintentional dozing	• Difficulty concentrating on the current work task • Lapses in attention • Difficulty remembering what you are meant to be doing • Failure to communicate important information to a colleague • Failure to anticipate events or actions • Unintentionally doing the wrong thing (errors of commission) • Unintentionally failing to do the right thing (errors of omission)	• More quiet or withdrawn than normal • Lethargic or lacking in energy • Lacking in motivation to do the task well • Irritable or bad tempered with colleagues, family, or friends

In addition to general symptoms of fatigue, most employees are also aware of task-specific indicators of fatigue. These should be identified during the task assessment and included in the table of reportable symptoms. Actions to be taken when fatigue-related symptoms are observed and reported should be determined in a similar fashion to Level 1 and 2 controls.

When employees notice symptoms of fatigue in a co-worker, they should point it out to the co-worker. If the situation arises again, employees should encourage the co-worker to report the fatigue and take the precautions outlined in the FRMS manual.

Employees repeatedly exhibiting fatigue-related symptoms should be encouraged to consult medical specialist to determine whether they suffer from a sleep disorder. This is particularly important for employees with a body mass index greater than $30 \ \text{kg/m}^2$ and a neck size greater than 16 inches (40 cm) since they are at a greater risk for sleep apnea.

Some organizations are exploring performance testing technologies that could theoretically provide a more objective indication of fatigue-related impairment. Some of the main technologies currently available include the Occupational Safety Performance Assessment Test (OSPAT), psychomotor vigilance tests (PVT), Digit-Symbol Substitution Tests (DSST), pupillometry and blink tests. While some of these technologies are promising, they have not yet been shown to be sufficiently scientifically reliable to serve as a sole means to detect fatigue-related impairment.

Using Symptom Data to Assess Level 1 and 2 Controls

Documenting Level 3 controls can help double-check that Level 1 and 2 controls are appropriate. For example, if there is a high incidence of fatigue-related symptoms, and employees say they are complying with the organization's minimum sleep requirements, the scoring system for sufficient sleep may need to be reviewed.

Fatigue-related symptoms can also flag employees who breach their responsibility of obtaining appropriate sleep in the time provided. For example, it is unlikely that employees who choose to engage in social activities rather than sleep will report their inadequate sleep to management. If employees regularly demonstrate fatigue-related symptoms, they may need to be reminded of their responsibility under the FRMS to arrive at work fit for duty.

Level 3 controls can also flag employees who experience disturbed sleep quality or quantity beyond their or their employer's control, and who may be impaired by fatigue.

Points to Consider

- What are the main fatigue-related symptoms experienced by employees in the work environment?
- What symptoms are particularly indicative of being unfit for duty due to fatigue?
- How should fatigue-related symptoms be reported/used within the overall FRMS?

SAMPLE TEXT

Section 3.5   **Fatigue-related Symptoms** (Mandatory)

[*Insert company name*] recognizes that a result of zero on the IFLS is not a guarantee that an employee is fit for work with respect to fatigue. Personal (stress, medical condition, etc.) and work-related factors (weather, time pressures, etc.) may contribute to the level of fatigue. Employees and supervisors are expected to be proactive in observing and acting on fatigue-related symptoms in one another. Typical symptoms of fatigue are listed in the table below. If a symptom of fatigue is observed in another person, it should be brought to that person's attention. As a guideline, if an employee experiences more than three of the specified symptoms in a 15-minute period they are likely to be fatigued and should be considered to be at an elevated level of fatigue-related risk. Appropriate fatigue control measures need to be applied. Employees that repeatedly exhibit fatigue-related symptoms over a number of shifts will be referred to the employee assistance program, screened for sleep disorders, and may be provided further consultation with a doctor and/or sleep specialist. Reporting protocols are outlined later in this document.

Symptoms of Fatigue

Physical Symptoms	Mental Symptoms	Emotional Symptoms
• Yawning • Heavy eyelids • Eye-rubbing • Head drooping • Inappropriate or unintentional dozing	• Difficulty concentrating on the current work task • Lapses in attention • Difficulty remembering what you are meant to be doing • Failure to communicate important information to a colleague • Failure to anticipate events or actions • Unintentionally doing the wrong thing (errors of commission) • Unintentionally failing to do the right thing (errors of omission)	• More quiet or withdrawn than normal • Lethargic or lacking in energy • Lacking in motivation to do the task well • Irritable or bad tempered with colleagues, family, or friends

3.6 Fatigue-Proofing Strategies
(Recommended)

The main benefit of an FRMS is to provide organizations and employees with an increased level of safety management. The scheduling guidelines set out in Section 3.3 should be used for the majority of the company's operations. However, there will be occasions when operational demands require extended hours of work. This may result in employees working through higher levels of fatigue than normal.

In these situations, there are a number of strategies that can be used to reduce the consequences of increased fatigue. For example, management may rely more heavily on Level 2 and 3 controls. This can help to determine which employees are most appropriate to complete the additional duties. To prevent fatigue-related errors, management should use Level 4 strategies, such as:

- napping
- supervisor and co-worker monitoring
- double-check systems
- task rotation and reallocation
- additional breaks and strategic use of caffeine

The organization should provide guidelines on how each of these can be used.

Napping: As a general rule, those with the highest risk should have the highest priority for napping. In general, the longer the nap the greater the recovery value. Naps should last at least 20 minutes and no more than two hours to be of maximum benefit. Shorter naps do not produce appreciable or lasting improvements in alertness. Sleeping more than two hours brings little additional benefit, particularly when that time could be used to provide another employee with a napping opportunity. Where controlled napping is allowed, the company should detail the circumstances under which it is permitted.

It is important to keep in mind that longer naps are associated with a longer period of sleepiness immediately following waking. This effect is known as sleep inertia. Employees should be given sufficient time to overcome the effects of sleep inertia before returning to work. Typically, this is at least 10 minutes during the day, and up to 20 minutes in the early hours of the morning.

Monitoring and double-check systems: Where an employee is at an elevated risk of fatigue-related error, increased monitoring by peers or supervisors for fatigue-related symptoms and/or impaired task performance can be an effective strategy. However, this can be a sensitive issue and it is important that the criteria for increased monitoring are clear in advance to minimize misunderstanding.

Increased monitoring can be achieved in a number of ways. It can be as simple and informal as more frequent or regular conversations with the employee over the course of the shift. Or it can involve more formal policies or procedures that call for additional, verified supervisory checks on safety-critical work by the fatigued impaired employee, co-workers, or a supervisor/line manager.

Task rotation and reallocation: Monotonous tasks with little variety are particularly susceptible to the effects of fatigue. In many cases, the workload can be made more engaging by varying the tasks during a shift. It is important to understand that the benefits of task rotation do not increase linearly. In general, the number of different tasks undertaken in a given shift should not exceed three or four, or the risk of error due to unfamiliarity with the job at hand may rise. Where task rotation forms part of the control system for fatigue-related risk, the number and types of tasks allocated should be determined in consultation with employees.

When an employee shows signs of fatigue, or when a self-assessment tool indicates impairment from fatigue is likely, the employer should make sure that the employee is not given certain tasks that may be high-risk to the employee, colleagues, the work flow, and/or the general public. Acceptable activities might include simple procedural tasks, word or data processing, quality checks, and basic communication. This reduces the risk of an incident, but does not mitigate the employee's fatigue.

Additional breaks and strategic use of caffeine: When operational requirements call for longer hours of work, additional breaks should be provided to employees when fatigue may impair their performance. A break of 10 to 20 minutes may permit improvements in performance on a short-term basis. Employees assigned to tasks that require sustained attention over prolonged periods of time should take a break at least every two hours. Research shows that performance starts deteriorating after two hours on high-demand tasks. The breaks should be used to engage in strategies to improve alertness, e.g., walk outside to get some fresh air, exercise, have a coffee, etc.

Caffeine can provide a short-term improvement in alertness when it is used strategically. A typical dose of caffeine (75 to 150 mg) will provide an increase in alertness approximately 20 minutes after ingestion. The stimulating effects will vary in intensity and duration (up to four hours) depending on how often and how much caffeine the body is used to. However, the body can develop a tolerance, meaning the more caffeine the body gets on a daily basis, the less noticeable are the stimulating effects.

The best way to think about caffeine is that it has the capacity to "shift" fatigue and alertness to more appropriate times. However, there are significant disadvantages to prolonged regular caffeine use. Individuals differ enormously in their sensitivity to both the positive and negative effects of caffeine.

Points to Consider

- What strategies will be employed to avoid fatigue-related errors when employees need to work through high levels of fatigue?

SAMPLE TEXT

Section 3.6 Fatigue-Proofing Strategies (Recommended)

There may be occasions when operational demands require employees to work longer hours than normal. A number of control factors will be put in place. First, employees required to work additional work hours will be asked whether they have obtained six hours sleep in the last 24 hours. If they have not, fitness for duty will be considered using the protocol outlined in Section 3.4. In addition, employees will be required to complete a symptom checklist (see Section 3.5) every two hours. If an employee reports more than three symptoms, their fitness for duty should be examined by a supervisor. If at any stage an employee feels unfit for work, they will be relieved of duty and sent home or given an opportunity to rest.

A number of controls or strategies can be used to minimize the likelihood of errors when employees experience low or moderate levels of fatigue. These include:

- napping
- supervisor and co-worker monitoring
- task rotation and re-allocation
- additional breaks and strategic use of caffeine

Napping
Where appropriate, employees may be allowed to take a nap or controlled rest. [Insert company name] has provided a limited number of short-term sleeping facilities for employees during working hours.

Highest priority for napping will be given to those with the highest fatigue-related risk. Naps shall be at least 20 minutes and no more than 2 hours, depending on operational constraints and fatigue risk involved. Before returning to work after a nap, employees will be given sufficient time to overcome the effects of sleep inertia. Typically, this is at least 10 minutes during the day, and up to 20 minutes in the early hours of the morning.

Supervisory and co-worker monitoring
In instances where operational demands require extended hours of work that may result in employees working through higher levels of fatigue than normal, employees and supervisors will be proactive in observing and acting on fatigue-related symptoms in one another. In cases where fatigue symptoms are repeatedly observed in an employee, the supervisor shall be informed and measures will be taken to allow the employee to take a break or a nap, or use other strategies to improve alertness (such as exercise, caffeine). Additional supervisory checks for safety-critical work will also take place.

Task rotation and task re-allocation
Rotation of tasks will be arranged during periods when operational demands may increase fatigue-related risks. Monotonous tasks with little variety will be targeted in particular. Supervisors will rotate work in consultation with concerned employees to ensure that all are assigned to familiar tasks. No employee shall be assigned to more than three different tasks during a given period.

In situations of increased fatigue-related risk, such as when an employee repeatedly exhibits symptoms of fatigue, it may be necessary to re-schedule or re-assign some tasks. Any task sensitive to the effects of fatigue should be re-scheduled or re-assigned. The list of risk factors below should be used as a guideline to identify activities that need to be rescheduled or re-assigned:

[List risk factors specific to the company.]

Additional breaks and strategic use of caffeine
When operational requirements call for longer hours of work, additional breaks of 10 to 20 minutes will be provided to employees on request. Employees are responsible for monitoring themselves and for requesting a break when they feel it necessary to restore their performance levels. Employees should also suggest breaks to co-workers if they observe fatigue symptoms. During these breaks, employees will take necessary actions to counter fatigue effects (exercise, drink caffeine, etc.).

It should be noted that since habitual use diminishes the stimulating effects of caffeine, [insert company name] does not promote regular use of caffeine. However, it can be useful in contingency situations to help increase alertness when required.

3.7 Reporting Protocols
(Mandatory)

Reporting protocols within the FRMS should be defined on two levels:

1. Reporting fatigue-related risk (insufficient sleep or sleep opportunity, fatigue-related symptoms)
2. Reporting errors and incidents that are fatigue related

Reporting fatigue-related risk (recommended)

Reporting risk is important for FRMS review and evaluation. Collect data on the frequency that employees are at risk of fatigue-related error or incident. How often did the work schedule provide insufficient sleep opportunity? How often did employees report getting insufficient sleep? How often did they report experiencing fatigue-related symptoms?

Employees may be reluctant to report this level of fatigue-related impairment on formal incident reporting forms, particularly in the early stages of FRMS implementation. The company should ensure that employees are aware of the fatigue reporting policy and that reports submitted to the system remain confidential. A special reporting form may be appropriate. The company could set up a reporting system and fatigue occurrence database on the company intranet to collect information such as:

- What schedule have you been working for the last week?
- How much sleep did you obtain in the last 24 hours?
- How much sleep did you obtain in the last 48 hours?
- What fatigue-related symptoms have you been experiencing?
- Have you notified a supervisor that you are at risk of making a fatigue-related error?
- Who have you notified that you are at risk of making a fatigue-related error?
- What countermeasures have you used?

Reporting fatigue-related errors and incidents (mandatory)

Most organizations have formal requirements to report errors and incidents as a part of their SMS. Few, however, systematically examine whether fatigue was a contributing factor. Industries that rely on shift work should develop standard reporting criteria that accurately reflect the occurrence of fatigue and sleepiness-related errors and incidents.

For an error or incident to be defined as fatigue related, it must have:

1. occurred in the presence of fatigue
    and
2. been consistent with fatigue-related error (e.g., caused by employee falling asleep, inattention, delayed reaction time, complacency, etc.)

In order to define an event as fatigue related, the first three levels of control (see the figure in Section 3.1) must be reviewed:

1. Did the work schedule provide sufficient sleep opportunity for the employee?

2. Did the employee actually obtain sufficient sleep?
3. Was the event preceded by the presence of fatigue-related symptoms?

Examining planned and actual hours of work not only reveals whether changes led to insufficient sleep opportunity but can help the company better understand whether additional work hours were foreseeable and how to better allocate them in the future. Questions about the schedule could also include examining the commute to and from work for employees involved since this can also influence the sleep opportunity.

The second question allows the company to collect information on actual sleep obtained by the specific employee. How many hours of sleep did the employee obtain in the 24 and 48 hours before the event? How long was it since the employee had woken up from a sleep or a nap? If the employee had not obtained sufficient sleep, why not? Why was it not reported on arrival at work?

Since the reporting process relies heavily on the honesty of employees, it should be non-punitive. Incidents of insufficient sleep should be considered a learning experience for the organization and other employees, rather than as an incident that can affect an employee's employment status.

The organization should also investigate whether the employee had been observed falling asleep or struggling to remain alert in the week before the event. This information could be collected either directly from the employee, or from co-workers or supervisors. Similarly, was the employee exhibiting any other fatigue-related symptoms directly before the event?

Additional questions that could be asked include:

- Did the employee take medications or drugs in the week prior to the event?
- Has the employee been diagnosed with or show symptoms of a medical problem or sleep disorder that may affect fatigue or alertness?
- Did the employee work at another job or have additional responsibilities during the two weeks before the event?

Assessing the information collected with these questions can provide organizations with a clearer understanding of when fatigue is a contributing factor to an error or incident.

Reporting non-critical errors also offers an opportunity to analyse the effectiveness of the FRMS. In any organization, there is a greater frequency of errors than incidents. An organization can determine the root causes of any fatigue-related risk and implement appropriate control strategies before an error becomes an incident.

Points to Consider

- What reporting structures are already in place within the organization?
- What is the process for reporting potential risk from fatigue (as opposed to an actual event)?
- What factors are to be investigated to

determine whether fatigue was a contributing factor to an incident?

- How can fatigue be better reported within the organization?

SAMPLE TEXT

Section 3.7   Reporting Protocols (Mandatory)

[Insert company name] is committed to continually reducing the risk of fatigue. To achieve this, a structured data collection process records when:

- An employee is at risk of making a fatigue-related error (i.e., provided with insufficient sleep opportunity within the schedule, actually obtained insufficient sleep, and/or exhibits fatigue-related symptoms)
- Fatigue has been a contributing factor to a safety-related error and/or incident

Employees are required to report all cases of fatigue-related risk, errors, and incidents to their immediate supervisor. The supervisor will act accordingly, depending on the severity of the case. This may include (but is not limited to) advising the employee to self-monitor performance, allocating peer/management supervision to the employee, task reassignment, scheduling naps, or sending the employee home.

A confidential reporting database (Fatigue Occurrences) has been made available to all employees on the company intranet. The purpose of this database is to collect information on the frequency that employees: are provided with insufficient sleep opportunity (due to overtime or contingency situations); obtain insufficient sleep; exhibit fatigue-related symptoms; or make a non-consequence error that may have been fatigue-related. Although employees are required to provide their name, this will only be used by the safety manager if more information is required. The intent is purely data collection, and the information will not be used for disciplinary purposes.

All reports of errors and incidents will be made using the existing SMS reporting framework (refer to SMS policy document). During the error/incident investigation process, the investigator will ask any employees involved to provide an accurate account of hours worked during the two weeks prior to the event, how much sleep was obtained during the preceding 24 and 48 hours, and whether they were experiencing any fatigue-related symptoms. Colleagues and supervisors will also be asked whether they observed any fatigue-related symptoms in the employees involved.

In consultation with management and safety officials, the investigator will recommend short term corrective actions for preventing similar events, and factors to consider in the FMRS review process.

CHAPTER 4

Training and Education (Mandatory)

All staff should be trained to understand the purpose of the FRMS and their responsibilities within the system. The person responsible for the FRMS or the FRMS Committee should arrange fatigue-related safety training for all employees. The training program should highlight the risk of fatigue, how it will be managed within the organization's operations, and how it fits within existing organizational policies and procedures. It is essential that records be kept that include dates, names, subjects covered, and course presenters. The company may seek the assistance of fatigue specialists in the development of a training program.

Training tools developed by Transport Canada include:

- an introductory booklet (TP 14572E)
- a workbook for employees on applied fatigue management strategies (TP 14573E)
- an employee competency assessment workbook (TP 14574E)
- a guide aimed at assisting the person/ committee responsible for the FRMS design and implement the FRMS (TP 14575E)
- a trainer's handbook (TP 14578E)

Use of these tools is not mandatory. They provide foundations and guidance material for the implementation of an FRMS. Organizations choosing to use the toolbox should tailor the contents to meet the requirements of their organization based on their own unique operating environment.

All employees should be provided with the introductory booklet when the company decides to implement an FRMS. This booklet can also be provided to new employees in advance of scheduled training.

All employees should also complete a formal training course that includes face-to-face training and a competency-based workbook. Face-to-face training allows employees to ask questions about their responsibilities within the FRMS and how it affects the work environment. The competency-based workbook ensures that employees have understood the information and can apply the knowledge and skills to their own work environment. The training is also available online at www.shiftwork.com.au which features an automatic assessment tool.

Employees involved in the design, implementation, and/or evaluation of the FRMS (such as senior management staff, the person responsible for the FRMS or FRMS committee members) should follow a more advanced level of training. This should outline what an FRMS is, the specific elements that need to be included in an FRMS, and how to tailor the FRMS to suit operational needs. This is detailed in *Developing and Implementing a Fatigue Risk Management System* (TP 14575E).

A trainer's handbook has been developed to help organizations who wish to maintain the in-house capacity to deliver face-to-face training on fatigue management for employees. It provides background information for delivery of the employee training workshop, including learning outcomes, questions frequently asked by participants, as well as additional reference material.

Points to Consider

- What level of fatigue-related training already exists within the organization?
- What are the major topics that should be covered in fatigue-related training?
- Do different work groups require different levels of fatigue-related training?
- How will fatigue-related training be delivered (e.g., posters, video, face-to-face, readings, workbook, website)?
- How often should fatigue-related training be conducted?
- How will fatigue-related training be recorded and maintained?
- How will the training be given (i.e., process, people)?

SAMPLE TEXT

[Insert company name] is committed to creating an informed safety culture. This is particularly important for consultations with employees regarding fatigue risk management. To this end, training programs will be provided to employees.

All employees will receive a two-hour face-to-face training session with a qualified trainer. This session will include:

- basic information about fatigue and fatigue management strategies
- information on the impact of fatigue on specific operational tasks
- organizational responsibilities within the FRMS
- individual responsibilities within the FRMS
- control mechanisms for fatigue
- fatigue-proofing strategies

In addition to the face-to-face training, employees will be required to complete a workbook on Fatigue Management Strategies for Employees to ensure that they understand the issue of fatigue at [insert company name] and their responsibilities.

All employees will be required to sign and date a training form, and will be provided with a certificate on completion of the competency-based exercises. These records will be maintained by the person responsible for the FRMS.

Refresher training will be given to employees every two years. This will also provide employees with the opportunity to comment on the effectiveness of the FRMS and to suggest potential changes to the system.

Senior management, the person/committee responsible for the FRMS will be required to complete training based on *Developing and Implementing a Fatigue Risk Management System* (TP 14575E).

CHAPTER 5

Review & Improvement Process (Mandatory)

Fatigue-related impairment is likely to change with operational demands, organizational culture, and employee turnover. It is important that the FRMS be continually reviewed and improved to ensure that it is operating effectively. All the major components of the FRMS and levels of control should be reviewed, including:

- Policy
- FRMS Committee
- Communication and consultation
- Implementation process
- Schedule and actual hours of work
- Assessment of actual sleep obtained
- Training and education
- Delivery of training and education
- Incident and accident investigation
- Internal audits

Among other aspects, the review process should consider the following:

- Is the FRMS manual clear and up to date?
- Has everyone been provided with fatigue-related information and received the appropriate training?

- Is the FRMS able to identify and deal with fatigue-related hazards before they result in an error or incident?
- Is the FRMS able to adapt to changing operational demands, scheduling changes, and contingency situations?
- Is the reporting system adequate for identifying fatigue-related hazards?
- Is there an internal investigation and auditing system in place, and is it working?
- What feedback has been obtained from safety audits and from error and incident reports?
- What feedback has been provided by employees, contractors, and clients about the system?

As part of the FRMS review, it is also useful to look at annual expenditures on the FRMS. In calculating the cost of FRMS, include factors such as person-hours devoted to implementing and maintaining the FRMS and absenteeism due to fatigue.

Major design and implementation expenses normally occur in the first year. It is possible that absenteeism due to

fatigue will increase slightly at the beginning as employees become more aware of fatigue as a potential hazard. However, it is likely that employees who feel impaired by fatigue already call in sick under normal sick leave conditions – the FRMS will probably help highlight existing causes of absenteeism.

The review may find that employees need to be encourage to participate more actively in the FRMS. Employees who hold key leadership roles within the organization could be approached to promote the FRMS. Similarly, employees who have been proactive throughout the review period in FRMS (e.g., reporting events, involvement in the FRMS committee, promoting fatigue countermeasures) could be formally acknowledged in corporate newsletters.

Points to Consider

- How often will the FRMS be reviewed?
- Who will be responsible for collecting data and overseeing the review process?
- How will the FRMS be reviewed?
- What will be done with information obtained through the review process?
- How will results of the review be communicated to employees?

SAMPLE TEXT

The FRMS will be reviewed and updated after the first year of implementation. Following the post implementation review, the FRMS will be reviewed and updated every two years.

The Accountable Executive will appoint an independent person to be responsible for providing oversight for the FRMS review process. The review should include all aspects of the fatigue risk management system including (where applicable) the following components and operational responsibilities:

- Schedulers are required to maintain accurate records of planned and actual work hours for assessment with the FAID program.
- Payroll personnel are required to record reasons for absenteeism to assess any trends due to fatigue.
- Employees are required to complete a two-week sleep diary twice a year (which will be kept confidential from company management) to assess current sleep habits (see form in Section 7). This will be coordinated by the person responsible for the FRMS.
- Supervisors are required to report any instances where employees may be at risk of making a fatigue-related error due to insufficient sleep opportunity, insufficient sleep, or fatigue-related symptoms using the fatigue occurrence database (see Section 3.7). This data will be analysed for any trends and used for further improvement of the FRMS.

- Employees and supervisors are required to report any errors or incidents that may have been fatigue related using the reporting system outlined in the SMS policy. This data will be analysed for any trends and used for further improvement of the FRMS.
- Employees and supervisors are required to participate in incident investigation procedures, and provide data to investigators regarding work schedules, sleep obtained, and symptoms prior to the event. This data will be analysed for any trends and used for further improvement of the FRMS.
- The person responsible for the FRMS will conduct focus groups with a representative sample of employees to obtain feedback about the effectiveness of the FRMS.
- The person responsible for the FRMS will keep a record of all costs and benefits that result from the FRMS. This may include but is not limited to financial gains/losses, employee morale, and frequency of errors, lost time injuries, and fatalities.

After the review process, the Accountable Executive will review the findings and the FRMS Committee will meet to discuss the results and any potential changes to be made to the FRMS. The results of all FRMS reviews, together with any actions taken to improve the FRMS, will be kept on file for Transport Canada to review in the auditing process. Any changes made to the FMRS policies and procedures document will be recorded using the manual amendment process, outlined in Section 1.2.

CHAPTER 6

Appendices

Attach any supporting documents here. This may include:

- Relevant safety manuals
- Relevant CARs or guidance notes from Transport Canada
- Sleep diary form for collecting data
- Symptom checklist
- Description of the fatigue occurrence reporting form or database
- Additional reading material that may be of particular interest to employees

Points to Consider

- Is there any information that users of the FRMS manual will require easy access to?

Sleep Diary

Sleep Diary – FRMS Study

Month & Year: ....   Name:..

	Start Date/ Time ddhhmm	Pre-sleep Fatigue Level	End Time hhmm	Post-sleep Fatigue Level	Sleep Quality	Remarks
eg	27 1400	1 2 3 4 5 6 **7**	2130	**1** 2 3 4 5 6 7	1 2 3 **4** 5 6	Broken sleep due to sick child
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Fatigue Level

1. Fully alert, wide awake
2. Very lively, responsive,
   but not at peak
3. Okay, somewhat fresh
4. A little tired, less than fresh
5. Moderately tired, let down
6. Extremely tired, difficulty
   concentrating
7. Completely exhausted,
   unable to function effectively

Sleep Quality

1. Very good
2. Good
3. Average
4. Poor
5. Very poor
6. Did not sleep

Instructions

1. Please complete a single line of the sleep diary for each attempted or actual sleep period (i.e., major sleeps and naps) even if you do not actually fall asleep.

2. Record start date/time and pre-sleep fatigue level immediately prior to "lights out." Start time is the time that you start attempting to sleep (i.e., "lights out") not the time that you fall asleep.

   Note: start/end times should not include time spent reading, watching TV, etc.

3. Record end time and post-sleep fatigue level approximately 20 minutes after the sleep period ends. End time is the time that you get up or start reading, watching TV, etc., in bed. It may differ from wake up time.

4. Rate the quality of your sleep compared to a "normal" sleep period.

5. Make any relevant comments (e.g., regarding the sleep environment, interruptions, ambient noise, etc.).

Symptom Checklist

Name: ....   Date: ....   Circle: Pre/Post Shift

Fatigue-related Symptoms

☐ **Physical**	☐ **Mental**	☐ **Emotional**
☐ Yawning	☐ Difficulty concentrating	☐ More quiet or withdrawn than normal
☐ Heavy eyelids	☐ Lapses in attention	☐ Lacking in energy
☐ Eye-rubbing	☐ Difficulty remembering what you are doing	☐ Lacking in motivation to do the task well
☐ Head drooping	☐ Failure to communicate important information	☐ Irritable or grumpy behaviour
☐ Micro-sleeps	☐ Failure to anticipate events or actions	☐ Other
☐ Other	☐ Accidentally doing the wrong thing (error)	
	☐ Accidentally not doing the right thing (omission)	
	☐ Other	

CHAPTER 7

Further Reading

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