สำนักงานการบินพลเรือนแห่งประเทศไทย
The Civil Aviation Authority of Thailand

Guidance Material for Approval of Individual Flight Time Specification Scheme (IFTSS)

CAAT-GM-OPS-IFTSS

Issue: 01

Revision: 00

Date: 26 June 2026

Approved by

Air Chief Marshal

Manat Chavanaprayoon

Director General of the Civil Aviation Authority of Thailand

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Foreword

The Civil Aviation Authority of Thailand (CAAT) has developed this Guidance Material to support the approval and implementation of the Individual Flight Time Specification Scheme (IFTSS), providing the Thai aviation industry with a comprehensive and harmonized reference for fatigue management requirements under the Thailand Civil Aviation Regulation - Air Operations (TCAR-OPS). In recognition of the increasing complexity of aviation operations, the systematic management of fatigue is essential to maintaining the highest levels of safety in air transport operations.

This Guidance Material provides guidance to Commercial Air Transport (CAT) operators on the regulatory requirements, framework, approval processes, and assessment considerations applicable to IFTSS established within prescriptive fatigue management regulations, Variations to prescriptive regulations under exceptional circumstances, and IFTSS established outside the applicable prescriptive fatigue management regulations. It is intended to support a structured, proportionate, and standardized approach to the implementation and oversight of fatigue management requirements under TCAR OPS Part ORO Subpart FTL and Subpart FTLS.

In addition, this document has been developed in alignment with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organization (ICAO). It is intended to support operators in developing Fatigue Risk Management System (FRMS) frameworks that are robust, data-driven, and proportionate to the size, nature, and complexity of their operations. The Guidance Material outlines the regulatory expectations, methodological framework, key principles, processes, and recommended practices necessary for the development, implementation, and continued oversight of approved FRMS, including the integration of FRMS within existing Safety Management System (SMS) structures.

Through the issuance of this Guidance Material, CAAT reaffirms its commitment to promoting a proactive safety culture and ensuring that fatigue risk management practices within the Thai aviation industry remain aligned with international best practices and continue to contribute to the sustainable enhancement of aviation safety in Thailand.

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Record of Amendments

Issue	Revision	Date	Amendment Summary
01	00	26-Jun-2026	First Issue to provide guidance and support for the application and effective implementation of an operator's IFTSS in accordance with TCAR-OPS

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Table of Contents

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0. Administration

0.1 Control of Documentation

This Guidance Material provides the guidelines for approval of IFTSS. It is issued by the Flight Operations Standards Department, Civil Aviation Authority of Thailand (CAAT).

The Operations Management Inspection Division is responsible for the development, issuance, amendment, and distribution of its contents.

0.2 Amendment and Revision

Whenever there is a significant change, a new procedure issuance is required. Minor amendments shall be issued as revisions, with effective pages reviewed no later than the effective date. A vertical black line is required on the left-hand side of the page to identify the change of this revision.

Significant changes are extensive revisions necessitating a complete re-issuance when involving significant changes in organization, responsibility, guidelines, policy, or procedures including substantial format change.

Minor changes affected some contents in the provision, the revision can be made to the corresponding page.

Manual custodian shall record the details of revision and indicate their name with the initial last name in the Records of Revision.

0.3 Users feedback

The Guidance Material is subject to a continuous improvement program involving periodic reviews. Your valuable recommendations for improvement should be submitted to the Operations Management Inspection Division (OM), Flight Operations Standards Department (OPS) at ops_om@caat.or.th

1. General Introduction

1.1 Background

An Individual Flight Time Specification Scheme (IFTSS) serves as a critical safety barrier that bridges high-level state regulations with an air operator's unique operational profiles. It provides operators with necessary scheduling flexibility while legally binding them to data-backed thresholds regarding maximum duty periods, cumulative limits, and mandatory rest requirements. By integrating with an operator's Safety Management System (SMS), the IFTSS ensures that any proposed variations to prescriptive regulations under exceptional circumstances, and IFTSS established outside the applicable prescriptive fatigue management regulations are justified by a robust safety case involving systematic hazard identification and data-driven risk mitigations. Ultimately, the scheme establishes clear regulatory accountability across the organization, serving as the primary benchmark to verify that operational efficiency is never prioritized over-flight safety performance.

Any implementation of an IFTSS outside the applicable prescriptive regulations that alter daily or cumulative flight time limitations, flight duty period limitations, duty period limitations, or rest period requirements may require approval of a Fatigue Risk Management System (FRMS) by the Civil Aviation Authority of Thailand (CAAT). Such approval shall only be granted upon satisfactory completion of the defined trial implementation period, where applicable, and fulfilment of all applicable regulatory approval requirements.

The operator's FRMS shall be maintained to proactively identify and manage fatigue-related safety risks through a systematic and data-driven approach based on scientific principles, knowledge, and operational experience, in order to ensure that a level of safety equivalent to, or better than, that achieved through compliance with the applicable prescriptive fatigue management limitations.

1.2 Purpose

This CAAT Guidance Material for an Approval of IFTSS:

- provide the fundamental elements for the development of an Individual Flight Time Specification Scheme (IFTSS), together with the associated assessment considerations,
- assist operators in demonstrating compliance with the applicable fatigue management regulatory requirements, including the development and implementation of IFTSS established within prescriptive fatigue management regulations, variations to prescriptive regulations under exceptional circumstances, and IFTSS established outside the applicable prescriptive regulations,
- provide guidance on the regulatory approval processes applicable to variations, deviations, derogations, and Fatigue Risk Management System (FRMS) approvals, including the associated safety assessment, implementation, monitoring, and oversight requirements,
- provide applicants with detailed guidance to support preparation for FRMS approval, including the development of required documentation, the establishment of Fatigue Risk Assessment (FRA) and Safety Assurance (SA) processes, data collection and analysis, the development of crew Fatigue Risk Management System operational procedures, and the step-by-step processes required for CAAT evaluation and validation of the proposed FRMS application,

- provide guidance on the enforcement actions related to IFTSS, and
- ensure that nothing in this Guidance Material exempts an operator from compliance with the applicable regulatory requirements or from the responsibility to ensure the continued safe conduct of operations.

1.3 Applicability

a) TCAR OPS Part ORO, Subpart FTL, is applicable to the Commercial Air Transport operations by aeroplanes.

b) TCAR OPS Part ORO, Subpart FTLS, is applicable to the Commercial Air Transport operations by:

i. Helicopter,
ii. Air Taxi, and
iii. Emergency Medical Service (EMS).

c) According to the cover regulations to TCAR OPS Article 6a, the CAT operator, who intends to operate outside the prescribed limits and FRMS is required, may apply for FRMS approval only when the operators have gained at least 24 months of operational experience with TCAR OPS.

1.4 Reference

a) Thailand Civil Aviation Regulation – Air Operations (TCAR OPS), Part Organization Requirements for Air Operations (Part ORO) Subpart FTL and Subpart FTLS,

b) Acceptable Means of Compliance and Guidance Material to TCAR OPS - Part Organization Requirements for Air Operations (AMC/GM to TCAR OPS Part ORO) Subpart FTL and Subpart FTLS,

c) ICAO Annex 6, Part I Chapter 4 Paragraph 4.10 & Part III Chapter 2 Paragraph 2.8 Fatigue Management and Appendix 7 Fatigue Risk Management System Requirement,

d) ICAO Doc 9966 Manual for the Oversight of Fatigue Management Approaches,

e) Fatigue Risk Management System Guide for Airline Operators (ICAO/IATA/IFALPA),

f) Fatigue Risk Management System Guide for Helicopter Operators (ICAO/FSF/ICAO/ IFALPA/IFHA),

g) Australian Government CASA – Bio-mathematical Fatigue Models Guidance Document

1.5 Guidance Material Instruction

This Guidance Material (GM) provides applicants with information on the process for obtaining approval of Individual Flight Time Specification Scheme (IFTSS), variations to prescriptive regulations under exceptional circumstances, Fatigue Risk Management System (FRMS), and provides structured guidance for CAAT inspectors in the evaluation of applications.

It should be noted that the responsibility for the development, implementation, and continued compliance of such arrangements rests entirely with the applicant.

1.5.1 Definitions, Abbreviations and Terms

The "Definitions" contained in TCAR OPS Part DEF, Part ORO Subpart FTL.105, and Subpart FTLS.105 establish the applicable terminology. All terms used in this Guidance Material (GM) and in an applicant's proposed IFTSS documentation shall be interpreted in accordance with those definitions.

For clarity and simplicity, applicants should include in their documentation only the definitions that are relevant to their existing or proposed operations.

Please note the following regarding definitions and terms in this GM:

- Fatigue Risk Management (FRM) under TCAR OPS is equivalent to the Fatigue Risk Management System (FRMS) as referenced in ICAO Annex 6 and Doc 9966. The following figure is provided for reference.

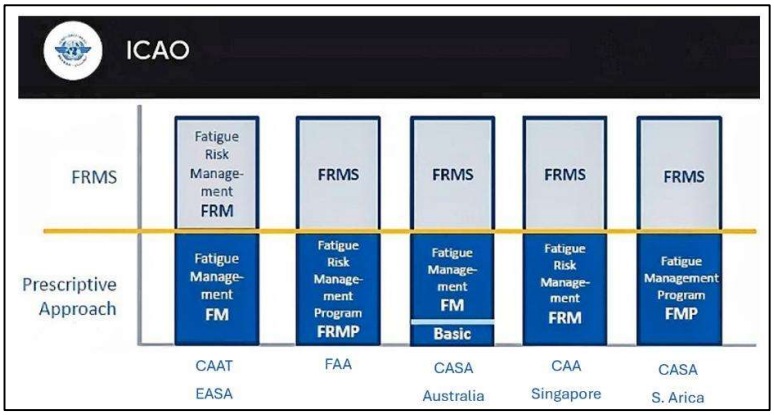


Figure 01 - Prescriptive approach and FRMS

- The term Guidance Material has occasionally been abbreviated as GM.
- The terms "Operator" and "Applicant" used in this document refer to a commercial air transport (CAT) operator.
- Any reference to ORO.FTL or ORO.FTLS in this document refers to TCAR OPS Part ORO, Subpart FTL and Subpart FTLS, including any subsequent amendments.
- Variation means a variation to prescriptive regulations in exceptional circumstances.
- Deviation means a deviation from Certification Specification issued by CAAT.
- Derogation means a derogation from Implementing rules issued by CAAT.

1.6 Roles and Responsibilities

As fatigue may accumulate as a result of all waking activities, and not solely from work-related demands, fatigue management is a shared responsibility among the CAAT, the applicant, and crew members.

This paragraph outlines the general roles and responsibilities of the three principal stakeholders involved in the application for approval of an IFTSS. These roles and responsibilities should be regarded as a baseline and do not constitute an exhaustive description of the actions to be undertaken by each stakeholder during the development and implementation process. The specific roles, responsibilities, and actions required will depend on the nature, size, and operational characteristics of the applicant.

1.6.1 CAAT

CAAT is responsible for establishing a regulatory framework that enables effective fatigue management and ensures that operators manage fatigue-related risks to achieve an acceptable level of safety performance, including where operations are conducted outside the applicable prescriptive fatigue management regulations.

The Flight Operations Standards Department (OPS) of CAAT is responsible for leading discussions with applicants regarding the approval of an operator's IFTSS, applications for variations under exceptional circumstances, and FRMS applications, as well as for assigning inspectors to manage the approval processes.

Where necessary, OPS may seek technical expertise to provide advice on specialised technical matters and to support inspectors throughout the approval process.

Assigned inspectors shall evaluate applications in accordance with the applicable requirements of ORO.FTL and ORO.FTLS, together with the guidance provided in this Guidance Material, and shall record the results of their assessments within the CAAT system.

CAAT OPS shall maintain effective oversight to ensure that the operator's IFTSS remains responsive to feedback and supports continuous improvement.

1.6.2 Applicant

The applicant is responsible for the development, implementation, and continued monitoring of its approved IFTSS, including all associated processes, procedures, and practices.

The applicant shall also provide all supporting documentation, analyses, and any other information relevant to the proposed IFTSS approval, as required by CAAT.

1.6.3 Crew members

Crew members are responsible for managing their personal fatigue by obtaining sufficient sleep, planning rest in advance, and reporting fatigue when unfit for duty.

Adequate sleep is the primary mitigation against fatigue, and crew members shall make effective use of available opportunities for rest, sleep, and meals, recognising that individual sleep requirements may vary. Crew members shall plan their sleep in consideration of upcoming duty periods, including adjusting sleep schedules for early starts or obtaining appropriate naps before evening duties in order to minimise extended periods of wakefulness.

Where sufficient rest has not been obtained, crew members shall report their fatigue to the operator and shall not undertake duty if they are unfit to safely perform their assigned task.

2. Fundamental Elements for the Development of an IFTSS

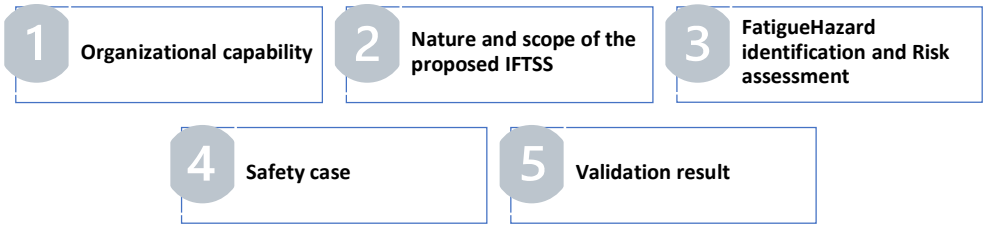
Where an IFTSS is established by an operator, the following fundamental elements, in addition to the required documentation, shall be evaluated during the approval process, as applicable to the proposed IFTSS, including an IFTSS established within prescriptive fatigue management regulations and outside the applicable prescriptive fatigue management regulations.

2.1 IFTSS within Prescriptive Regulations

The following fundamental elements, in addition to the required documentation, shall be evaluated during the approval process:

2.2 IFTSS Outside Prescriptive Regulations

The following fundamental elements, in addition to the required documentation, shall be evaluated during the approval process:



2.3 Evaluation elements

CAAT shall review and evaluate the following elements, as applicable, to determine its suitability to the operator's operational context. The operator shall ensure that the submitted processes and procedures are sufficiently robust to identify, assess, and manage any direct or indirect impacts on fatigue levels through the effective application of mitigation measures.

2.3.1 The organizational capability

At the beginning, it is assumed that the operator has established a Safety Management System (SMS) capable of managing a regular IFTSS. Where an operator seeks to conduct operations outside the applicable prescriptive regulations, CAAT shall assess whether the maturity and performance of the SMS are sufficient to support such IFTSS Outside Prescriptive Regulations, taking into account previous oversight results and current system performance.

Newly established organisations with no operational experience, or operators with unresolved findings related to deficiencies in safety risk management, shall not be authorised to implement IFTSS Outside Prescriptive Regulations. Where these prerequisite conditions are not met, the application shall be returned to the operator for further improvement.

2.3.2 The nature and scope of the proposed IFTSS

The operator shall provide a description of the nature, scope, and operational environment of the proposed IFTSS. CAAT shall assess whether the nature, scope, and operational environment of the proposed IFTSS are adequately and comprehensively described.

2.3.3 Fatigue Hazard identification and Risk assessment

The operator shall establish and document an appropriate methodology for fatigue hazard identification and risk assessment. Suitable tools and methods shall be established and utilized for hazard identification and for the assessment of the likelihood and severity of consequences identified through Fatigue Risk Management System processes. The identified fatigue hazards and associated risk mitigations shall be consistent with the proposed IFTSS and shall address foreseeable worst-case operational scenarios.

For any implementation of an IFTSS outside prescriptive regulations, the operator shall ensure that the proposed IFTSS is developed and implemented as an integral part of its management system. The operator shall establish processes to systematically identify fatigue hazards arising from its operations, assess and mitigate the associated risks, and implement controls to manage their potential consequences. Further details are provided in Chapter 5 - IFTSS Outside Prescriptive Regulations of this Guidance Material.

2.3.4 Safety case supported by Safety risk assessment

The operator shall develop a robust safety case demonstrating that the proposed IFTSS Outside Prescriptive Regulations does not increase fatigue levels or reduce alertness. The safety case shall be supported by scientific methods and/or validated operational data and shall enable CAAT to assess the following:

- the expected impact of the proposed deviation or derogation against an established performance baseline.
- The tools used to collect data (e.g. FDM events, crew reporting, actigraphy, sleep diaries, PVT, subjective fatigue and sleepiness ratings, independent scientific team, focus groups, etc.), and
- proposed metrics to assess data (operational SPIs or crew fatigue SPIs, threshold values on bio-mathematical model predictions).

The operator shall ensure that the submitted documentation clearly identifies the baseline fatigue and alertness levels of aircrew affected by the proposed IFTSS. For example, a deviation from CS-FTL the minimum rest requirement of 10 hours is proposed, the operator shall first monitor and measure fatigue and alertness levels using a representative sample of flights operated in accordance with the minimum rest requirement of 10 hours (baseline performance) prior to applying for reduced rest periods.

The operator shall ensure that data collected or to be collected and used in the safety case are derived from a representative sample of affected crew members. The safety case shall include a justification of the sample size required to obtain statistically meaningful results, taking into account the size and scope of the operation subject to the deviation or derogation, such as a specific rotation or aircraft type.

The safety case shall include a clearly formulated hypothesis and defined outcome measures demonstrating that an acceptable level of safety performance can be maintained where the

proposed IFTSS deviates from CS-FTL or derogates from the Implementing Rules. The hypothesis and outcome measures shall be supported by the results of the safety risk assessment.

The operator shall identify and implement mitigation measures to reduce all identified risks to an acceptable level, taking into account all applicable legal requirements (e.g. national, international, safety, or social provisions).

The safety case shall include clear conclusions and shall support approval of IFTSS Outside Prescriptive Regulations and its subsequent validation. For example, during the approval of an IFTSS requiring FRMS, greater emphasis should be placed on predictive bio-mathematical methods, for subsequent validation, well-validated operational data derived from a combination of scientific methods, including statistical methods, shall be provided.

The operator may also use data or results from other operators, provided that the flights concerned meet, at a minimum, the following conditions:

- similar in duration and operating environment,
- operated in the same time zone or across the same number of time zones in the same direction,
- operated with aircraft of the same type and configuration (including rest facilities, if applicable),
- operated with the same number of crew members,
- operated at the same time of day,
- operated with the same level of cabin service.

CAAT shall be satisfied that, prior to using data from other operators, the operator has assessed the comparability of all operational conditions that may have an impact on fatigue.

2.3.5 Validation result

CAAT shall assess the operator's safety assurance processes to ensure continuous monitoring of IFTSS safety performance. This assessment shall verify that the assumptions of the safety case remain valid and that the implemented mitigation measures are in place and effective. The validation results demonstrate a fatigue safety performance level comparable to the established baseline performance, and the duration of any approval of IFTSS Outside Prescriptive Regulations (Trial period) shall be sufficient to enable comprehensive data collection and analysis.

3. IFTSS within Prescriptive Regulations

ICAO Annex 6, Part I and Part III, and TCAR OPS require operators to manage fatigue through the establishment of limitations for flight time, flight duty period, duty period, and rest period in accordance with the limits prescribed in their approved Individual Flight Time Specification Scheme (IFTSS).

Compliance with prescriptive fatigue management regulations does not relieve the operator of the responsibility to manage its safety risks, including fatigue-related risks, through the implementation of its Safety Management System (SMS) in accordance with the provisions of ICAO Annex 19.

For the approval of a proposed IFTSS established within prescriptive regulations, the associated documentation, together with the systematic processes and procedures, shall be evaluated and assessed.

3.1 Documentation evaluation

An operator intending to operate within the prescribed limitations shall establish IFTSS documentation, including, but not limited to, flight time limitations, flight duty period limitations, duty period limitations, rest period requirements, and associated documentation required within the applicable prescriptive fatigue management regulations in TCAR OPS, and shall submit such documentation for approval.

The IFTSS shall be included in the Operations Manual (OM) and consist of a set of instructions for crew members, with additional detailed documentation provided for other operational personnel, where applicable. The fatigue management content contained in the OM and its associated documentation for managing fatigue-related safety risks shall be evaluated and approved upon satisfactory determination that the submitted documentation contains sufficient detail and all required information to enable crew members to perform their duties at an adequate level of alertness. Upon completion of the document evaluation, the CAAT will grant provisional approval for IFTSS documentation authorizing the operator to conduct the training and system configuration activities, where applicable.

The Checklist OPS - Approval of Individual Flight Time Specification Scheme (IFTSS), as applicable to the scope of operations, shall be used to evaluate the documentation submitted for an IFTSS established within the Prescriptive Regulations.

3.2 Initial Approval of IFTSS

Upon approval of the IFTSS documentation, the operator shall commence activities, including, but not limited to, the following:

- assigning personnel to the roles and responsibilities established under the approved IFTSS documentation,
- configuring the manual or automated systems to be used for the preparation, implementation, and recording of the IFTSS implementation,
- ensuring that a fatigue reporting system is established and functional;
- arranging the facilities required in accordance with the approved IFTSS; and
- providing fatigue management training to all relevant personnel, as required by the applicable regulations.

Upon completion of the required activities, the operator shall notify the Civil Aviation Authority of Thailand (CAAT) that it is ready to undergo an assessment for IFTSS approval.

The Checklist OPS - Initial Approval of Individual Flight Time Specification Scheme (IFTSS), as applicable to the scope of operations, shall be used to assess the operator's preparation and implementation of the IFTSS against the approved documentation for the purpose of approval.

Any changes to the approved IFTSS shall be managed in accordance with the change management procedures required under ORO.GEN.130 and shall therefore be subject to prior approval by CAAT. The proposed change shall be assessed to determine its impact on the approved IFTSS. Following such assessment, the CAAT may raise objections that shall be addressed prior to implementation or specify a period within which the application will be examined.

3.3 Oversight and continuous monitoring

The oversight of IFTSS implementation will be included in the surveillance plan to ensure compliance with the approved IFTSS and effectiveness of the operator's fatigue management.

3.3.1 Main base inspection

During a main base inspection, both an implementation check and a documentation check shall be conducted against the operator's approved IFTSS, including, but not limited to, the following:

- assessing the operator's IFTSS management system, including the assignment of personnel involved in the implementation and oversight of the IFTSS, and the manner in which fatigue is managed as a safety hazard through the operator's existing Safety Management System (SMS) processes,
- verifying that crew members fulfil their roles and responsibilities in accordance with the approved IFTSS, including the application of relevant SMS processes where applicable,
- verifying compliance with rostering processes, including roster preparation prior to publication and day-to-day operational practices following roster publication. The roster should provide duty information together with associated codes, definitions, and correspondences with applicable regulatory requirements where different terminology is adopted. The operator's rostering practices should demonstrate that crew member fatigue is managed through measures which include, but are not limited to:
    i) providing adequate opportunity for sleep recovery,
    ii) limiting periods of extended wakefulness,
    iii) accommodating circadian influences on sleep and performance,
    iv) recognizing the effects of workload on fatigued individuals,
    v) monitoring compliance with applicable prescriptive limitation regulations, and
    vi) recognizing fatigue as a safety hazard to be managed through existing SMS processes.
- verifying the record-keeping system for individual crew members against the published roster. The original roster and any subsequent revisions shall be traceable. Records related to the IFTSS shall be retained for a minimum period of 24 months,
- assessing the systematic process established for the exercise of commander's discretion to exceed the allowable FDP limits due to unforeseen operational circumstances, and
- verifying training records to ensure compliance with applicable fatigue management training requirements.

The Checklist OPS - Individual Flight Time Specification Scheme (IFTSS) Implementation, as applicable to the scope of operations, shall be used to assess the implementation of the operator's IFTSSat the main base.

3.3.2 Station inspection

The rostering patterns of crew members operating duties away from base may involve time zone differences, eastward-westward or westward-eastward transitions, and other operational factors that may affect circadian influences on sleep and performance while performing duties. Accordingly, the implementation of fatigue management under the IFTSS at stations away from base shall also be assessed and monitored to ensure that the operator maintains compliance with the approved IFTSS in its entirety.

In addition, rest facilities and/or accommodation provided in accordance with applicable rest requirements, including those associated with extended FDP, split duty, or other fatigue mitigation measures, shall be assessed during station inspection activities to determine whether they are suitable and compatible with the planned operational activities.

The check items for verifying the operator's fatigue management implementation are included in the Station Audit Checklist, which shall be used by the CAAT when conducting station audit (LG).

3.3.3 Operator continuous assessment of Fatigue

The operator shall monitor the fatigue of its crew members and ensure that the approved IFTSS remains effective. A mechanism for the assessment of fatigue-related safety risk as an ongoing and continuous process shall be established. Such a mechanism may be incorporated into an existing system or established separately for the purpose of continuous fatigue assessment.

The fatigue assessment analysis report shall be submitted to CAAT quarterly, or at intervals agreed with CAAT.

The continuous assessment process should include, but not be limited to, monitoring of the following:

- fatigue reports and the associated assessment results;
- the use of FDP extensions due to unforeseen operational circumstances;
- the use of controlled rest in-flight;
- roster stability and disruption; and
- the introduction of new routes, fleet types, or automated systems.

4. Variations to Prescriptive Regulations under Exceptional Circumstances

Exceptional circumstances are situations which can be anticipated in advance, occur infrequently, outside normal day-to-day operations, and cannot reasonably be managed through routine rostering or scheduling practices.

Where the operator adopts prescriptive fatigue management regulation for part or all of its operations, the CAAT may approve, in exceptional circumstance, variations to these regulations on the basis of a risk assessment provided by the operator. Approved variations shall provide a level of safety equivalent to, or better than, that achieved through the prescriptive fatigue management regulations.

CAAT may permit variations to the prescriptive fatigue management requirements under exceptional circumstances to address specific operational needs and associated risks, without requiring the operator to implement a full FRMS. Examples of such circumstances include maintaining essential services during a short-term event addressing a specific operational need.

These circumstances are not intended to accommodate commercial convenience, inadequate operational planning, or recurrent scheduling practices. Operators shall ensure that normal operational demands and foreseeable operational conditions are managed within the approved prescriptive limitations and established fatigue management processes.

4.1 Application

CAAT may approve variations to prescriptive regulations under exceptional circumstances in accordance with the granting for exemption process described in the CAAT Exemption Policy and Procedure Manual.

To apply for a variation to prescriptive regulations under exceptional circumstances, the applicant shall submit an application package which includes, but not be limited to:

- Forms in accordance with Appendices of CAAT Exemption Policy and Procedure Manual.
- Form for Assessment of Safety Cases to support Variations,
- Supporting documents, as applicable

The operator shall submit an application for a variation at least 90 working days prior to the proposed commencement date. The initial validity period of a variation shall not exceed 3 months and may be extended once for a period not exceeding the initial validity period. During the approval period, the applicant shall establish reporting intervals, as agreed with CAAT, to enable continuous monitoring of the effectiveness of the variation and its associated safety impacts. All approved exemption related to variations shall be officially published by CAAT.

Where an operator seeks to apply the same variation repeatedly or on a seasonal basis, such intermittent application under the same provision shall be categorized by CAAT as a prolonged variation. As such operations are recurring rather than one-off temporary events and require a higher level of safety assurance, the operator shall transition from the short-term variation process to the approval of IFTSS outside prescriptive regulations if continued application is intended.

The form for Assessment of a Safety Case to support a Variation is provided in Appendix J of this Guidance Material.

4.2 Evaluation step of Safety cases to support variation

Any variation to prescriptive requirements under exceptional circumstances shall be subject to prior approval. To ensure safety, CAAT requires the operator to demonstrate active management of fatigue risks while the variation is in effect. This involves the submission of a Safety case (risk assessment) that demonstrates a level of safety equivalent to, or better than, the existing prescriptive fatigue management regulations. The assessment shall consider, as applicable, the anticipated fatigue impact on crew members, cumulative fatigue exposure, operational complexity, workload, circadian factors, recovery opportunities, and any additional mitigations necessary to manage fatigue-related risks.

The operator shall establish documented procedures for the planning, assessment, implementation, monitoring, and review of operations conducted under approved variations. An operator seeking such approval shall demonstrate that the proposed variation is operationally necessary, appropriately justified, limited in scope and duration, and supported by an appropriate safety risk assessment. The operator shall also demonstrate that effective fatigue mitigations, monitoring measures, and recovery provisions have been established to maintain an acceptable level of safety.

Depending on the nature, complexity, and duration of the proposed variation, CAAT may require the submission of supporting operational data, evidence of fatigue risk assessments, or additional oversight activities as part of the approval process.

Although the level of detail and preparation may vary depending on the complexity of the safety case, all safety cases may be assessed using the following interrelated steps:

1) assessing the nature, scope and impact of the proposed variation,
2) assessing the applied risk assessment methodology,
3) evaluating how the risk assessment is used and how the decision to accept risk has been made,
4) assessing the appropriateness of the risk mitigation measures,
5) assessing whether the claims, arguments and evidence made in the risk assessment are valid, and
6) assessing plans for continued monitoring of the safety impact of the changes.

The guidelines for assessing safety cases at each step are as follows:

1) Assessing the nature, scope and impact of the proposed variations

Objective:
Assured that the applicant understands the change it is proposing including the direct or indirect impact of the change on the fatigue levels of those who will work to the new limits.

Methods:

- Submitted documentation clearly identifies which element(s) of the prescriptive regulations that it is seeking to vary, the proposed changes, and the operations to which they are intended to apply.
- Other areas of regulation that are affected by the proposal are identified.
- Submitted documentation demonstrates that the operator has considered any direct or indirect impacts the proposed variations will have on those operations and other services.

2) Assessing Hazard and consequence identification

Objective:
Assured that a hazard identification process has been carried out with regard to the proposed variation and that the consequences of the hazards have been documented.

Methods:

- Review the method used to identify and assess the fatigue hazards and their consequences for the proposed variation.
- Review any other direct or indirect hazards identified in relation to the variation and their consequences.
- Transitional risks to the operation associated with the variation are considered.

3) Evaluating the Fatigue risk assessment methodology and how the risk has been accepted

Objective:
Assured that the level of risk associated with the proposed variation is acceptable.

Methods:

- Examine the record of the risk assessment.
- Assess if the risk assessment appears reasonable both before and after mitigations have been applied using personal experience and judgement.
- Evidence is provided that existing fatigue controls and mitigations are effective.
- Confirm that an appropriately authorized person has accepted the remaining risk level and that this has been recorded.

4) Assessing the Risk mitigation measures

Objective:
Assured that the mitigations identified are sufficient to manage the fatigue risk expected when operating up to the fullest extent of the variation to the fatigue management limitations being proposed.

Methods:

- Determine who was involved in the process of identifying and establishing the mitigations to ensure that this was conducted at the correct level within the organizational structure of the operator and with the involvement of the relevant people.
- Carefully examine the proposed fatigue mitigations using knowledge of the operator proposing the variations and of other operator in similar situations to establish if the mitigations are appropriate and likely to be effective.
- Review the operator's processes and procedures to evaluate the appropriateness of their plan for risk management and training.
- Consider other aspects of human performance that may be affected by the mitigations.
- Ensure that the operator is not relying only on training to mitigate fatigue risks.

5) Assessing the claims, arguments and evidence made in the risk assessment are valid

Objective:
Assured that the claims and arguments are robust and supporting evidence is accurate and correctly interpreted.

Methods:

- Review the safety arguments to confirm that a justification for the continuation of an acceptable level of safety performance has been demonstrated.
- Safety arguments are supported by well-validated research or best practices.
- Transitional risks are mitigated.
- Clear conclusions are included in the risk assessment
- Proposed mitigations have considered all the legal requirements applicable to the worker (national, international, safety, social). Ensure they have been captured and addressed.

6) Assessing plans for continued monitoring of the safety impact of the variations

Objective:
Assured that the hazards associated with the variations have been correctly identified and the mitigations are performing as expected.

Methods:

- The service provider has processes in place and demonstrated the capability to allow continued monitoring through existing SMS activities.
- Specific safety performance indicators related to the variation are established.
- A review process is identified to assess the impact of organizational changes to the operating environment.

4.3 Continuous monitoring of approved variations

Where variations have been approved to address expected operational circumstances, the operator shall ensure, and report to CAAT, that compliance with the associated mitigations, processes, and procedures is continuously monitored throughout the period of the approved variation. Such monitoring shall include, as applicable:

- assessment of the implementation and use of the approved variation,
- review of the safety performance indicators established as part of the approved variation, and
- review and analysis of any mandatory or voluntary safety reports associated with the approved variation.

5. IFTSS Outside Prescriptive Regulations

5.1 IFTSS Outside Prescriptive Regulations for which FRMS is not required

Where an Individual Flight Time Specification Scheme (IFTSS) deviates from prescriptive requirements but does not alter the prescriptive limitations for daily or cumulative flight time, flight duty periods, duty periods, or rest period requirements, such a scheme shall be subject to CAAT approval. A formal Fatigue Risk Management System (FRMS) approval is not required in this case.

The 5 fundamental elements, in addition to the required documentation, in accordance with Chapter 2 item 2.2 IFTSS outside Prescriptive Regulations shall be evaluated during an approval process.

The OPS-TCOMI-309: OPS – Evaluation of IFTSS outside prescriptive regulations shall be used to evaluate the proposed IFTSS outside prescriptive regulations for which FRMS is not required.

To apply for an IFTSS established outside the prescriptive fatigue management regulations for which FRMS is not required, the applicant shall submit an application package that includes, but is not limited to:

5.1.1 Application form

Where an operator intends to apply for approval of IFTSS Outside Prescriptive Regulations for which FRMS is not required, the operator shall complete and submit an application form identifying the intended scope of operations, together with all required documentation as applicable, to the CAAT.

The application form for Approval of an Individual Flight Time Specification Scheme (IFTSS) is provided in Appendix F of this Guidance Material.

5.1.2 Gap analysis Tool

The Gap Analysis Tool provides a detailed checklist to assist applicants in assessing existing policies and procedures and in identifying areas requiring further development. The review and completion of this tool support the applicant's understanding of the applicable requirements and facilitate effective preparation for the approval process.

Through the conduct of a comprehensive Gap Analysis tool, the applicant shall identify:

- elements of the proposed FRMS that are already available in existing systems and processes,
- existing systems and processes that could be modified to meet the needs of proposed deviation or derogation (to minimize "reinventing the wheel"),
- where new systems and processes need to be developed for the proposed deviation or derogation.

The gap analysis tool for operators whose scope of operations does not require a Fatigue Risk Management System (FRMS) is provided in Appendix G: G1 - IFTSS Gap Analysis Tool (FRMS Not Required) of this Guidance Material.

5.2 IFTSS Outside Prescriptive Regulations for which FRMS is required

An Individual Flight Time Specification Scheme (IFTSS) that incorporates deviations outside the prescriptive requirements for daily or cumulative flight time, flight duty periods, duty periods, or rest period requirements, shall be subject to a Fatigue Risk Management System (FRMS) approval.

The operator's FRMS shall be approved by CAAT before it may take the place of any or all of the prescriptive limitations and requirements.

The proposed FRMS submitted for approval shall be designed to proactively identify and manage fatigue-related safety risks through a systematic and data-driven approach based on scientific principles, knowledge, and operational experience, in order to ensure a level of safety equivalent to, or better than, that achieved through compliance with the prescribed limitations.

CAAT shall grant FRMS approval only upon satisfactory completion of the defined trial implementation period, where applicable, and upon demonstration of compliance with all applicable regulatory approval requirements.

Guidance on the implementation and application of an FRMS is provided in Chapter 6 - Introduction to FRMS, and guidance on the approval of an FRMS is provided in Chapter 7 - FRMS Approval Process of this Guidance Material.

6. Introduction to FRMS

Fatigue Risk Management System (FRMS) is a performance-based approach that enables an operator to establish a management system to mitigate the effects of fatigue within its specific operations.

FRMS is a data-driven approach for continuously monitoring and managing fatigue-related safety risks, based upon scientific principles, operational knowledge and operational experience that aim to ensure relevant personnel maintain adequate levels of alertness. FRMS shall include, but not limited to the following:

- a description of the philosophy and principles of the operator with regard to FRMS, referred to as the FRMS policy,
- documentation of the FRMS processes, including a process for making personnel aware of their responsibilities and the procedure for amending this documentation,
- scientific principles and knowledge,
- a hazard identification and risk assessment process that allows managing the operational risk(s) of the operator arising from crew member fatigue on a continuous basis,
- a risk mitigation process that provides for remedial actions to be implemented promptly, which are necessary to effectively mitigate the operator's risk(s) arising from crew member fatigue and for continuous monitoring and regular assessment of the mitigation of fatigue risks achieved by such actions,
- FRMS safety assurance processes,
- FRMS promotion process

An FRMS should not be considered as a "right" of all operators. It is considered as a privilege for those who have demonstrated capability to apply mature SMS processes to manage fatigue, collect and analyze fatigue-related data, and commit to further proactive measures.

In summary, the FRMS has four components, two of which are operationally focused and two which are organizationally focused. A fully functioning FRMS requires these four components to interact seamlessly and continuously.

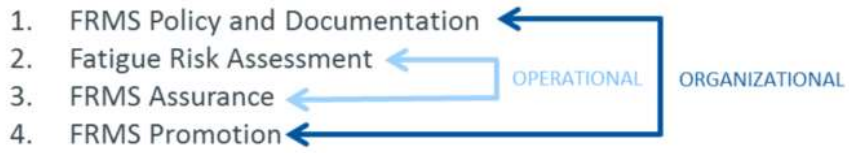


Figure 02 – FRMS components

Components 2 and 3 are operational FRMS activities, defined, documented, and supported by Components 1 and 4, which are organizational FRMS activities.

6.1 Component 1 - FRMS Policy and Documentation

The FRMS documentation shall describe all elements of the FRMS and provide a record of FRMS activities, including any changes made to the system. Such documentation is essential to support both internal and external audits of the FRMS. The documentation may be maintained in a dedicated FRMS manual or integrated within the applicant's SMS manual, as appropriate. In all cases, it shall be readily accessible to personnel who require it for operational or management purposes, and to CAAT for oversight and audit.

The FRMS documentation shall describe and record:

- FRMS policy and objectives
- FRMS processes and procedures – including details of Fatigue Risk Assessment (FRA) and FRMS assurance methods
- accountabilities, responsibilities and authorities for these processes and procedures
- mechanisms for ongoing involvement of management, flight and cabin crew members, and all other personnel involved
- FRMS training programme, training requirements and attendance records
- scheduled and actual flight times, duty periods and rest periods with deviations and reasons for deviations noted
- FRMS outputs including findings from collected data, recommendations, and actions taken; and
- FSAG Terms of Reference.

The applicant may provide a standalone FRMS Manual, an Operations Manual in which the FRMS is described and documented, or a Safety Management System (SMS) Manual incorporating the FRMS documentation. Regardless of the chosen method of documentation, the FRMS Manual (however titled) shall include all elements prescribed in ORO.FTL.120 and its associated AMCs and GMs, or in ORO.FTLS.120, as applicable.

6.1.1 FRMS Policy

The Fatigue Risk Management System (FRMS) policy shall clearly articulate the applicant's commitment and approach to managing fatigue-related safety risks. It shall define all elements of the applicant's FRMS, reflecting the unique organizational structure, operational context, and specific operational requirements of the operator.

An FRMS shall be integrated within the applicant's SMS. However, the existence of an SMS does not, in itself, constitute an FRMS. The FRMS policy shall be clearly identifiable, distinct from general safety policy statements, and available for review in its entirety.

The applicant's FRM policy should identify all the elements of FRMS and should define to which operations FRM applies.

In summary, FRMS Policy shall:

a) identify all elements of FRMS, including the objectives, documentation, practical operating procedures, procedures for hazard identification, risk assessment and mitigation, safety assurance, safety promotion procedures and change management.

b) define the scope of FRMS operations to which the FRMS applies,

c) clearly define that, while primary responsibility for the FRMS lies with the applicant, its effective implementation requires shared responsibility by management, flight and cabin crew members, and other involved personnel

d) state the safety objectives of FRMS

e) be signed by the Accountable Manager/Chief Executive Officer

f) be communicated, with visible endorsement, to all the relevant areas and levels of the organisation;

g) declare management commitment to effective safety reporting

h) declare management commitment to the provision of adequate resources for FRMS

i) declare management commitment to continuous improvement of FRMS

j) require that clear lines of accountability for management, flight and cabin crew, and all

k) other involved personnel are identified; and

l) require periodic reviews to ensure it remains relevant and appropriate.

The FRMS policy shall include a clear statement of management commitment to effective safety reporting. This may be demonstrated through a commitment to maintaining an operational environment that fosters a positive safety culture, including open and fair reporting of fatigue-related issues. The policy should specifically emphasize the importance of reporting fatigue, supported by a just culture in which personnel are encouraged to report all safety-related occurrences, errors, and near misses without fear of reprisal.

As the applicant shall not assign a flight duty to a flight crew member if it reasonably believes that the crew member is unfit to perform the duty due to fatigue, this obligation shall be documented in the FRMS Manual and reflected in the FRMS policy. Likewise, the FRMS policy shall affirm the organization’s commitment to accept, without prejudice, the removal or displacement of crew from duty when, considering the circumstances of the planned operation, the crew member reasonably believes that they are, or may become, unfit to perform the assigned duty due to fatigue.

6.1.2 Safety objectives of FRMS

The safety objectives shall be clearly specified in the FRMS policy, identifying the intended outcomes the operator seeks to achieve through the implementation of the FRMS. The objectives shall explicitly emphasize that safety is the highest priority.

To support the effective achievement of the FRMS objectives established in the FRMS policy, research indicates that the application of SMART principles should be adopted.

- Specific
- Measurable
- Achievable
- Realistic
- Time-bound, have a set time frame for the objectives to be achieved.

FRMS objectives may include:

- proactive management of operational risk of reduced alertness to maintain a safe operation
- adequate crew member resourcing
- adequate crew member training to avoid, detect and mitigate fatigue impairment
- reporting and acting upon fatigue hazards and incidents within a specified timeframe to minimise the chance of recurrence
- maintaining active awareness of, and applying, contemporary fatigue research as part of the continuous improvement reviews of the FRMS
- promoting participation by all relevant areas of the organisation to ensure representation in the processes and decision-making that occurs in the FRMS.

To determine whether the FRMS is achieving its stated objectives, the system's performance shall be continuously monitored. CAAT shall verify that the operator has established specific Safety Performance Indicators (SPIs) and associated safety targets that effectively measure progress toward achieving the FRMS objectives. Examples of SPIs and safety targets that may be used to assess the effectiveness of the FRMS in meeting its safety objectives are provided in subsequent sections of this chapter.

6.1.3 Management commitment

Management holds primary responsibility for the management and mitigation of fatigue-related safety risks, as it determines personnel work schedules and allocates organizational resources. The FRMS provides a structured framework that enables management to fulfil this responsibility effectively. By signing the FRMS policy, the accountable executive accepts overall accountability for the FRMS, either directly or through the supervision and management of others to whom specific responsibilities may be delegated.

The Chief Executive Officer (CEO), as the AOC holder, is accountable for:

- the approval of the FRMS policy
- the provision of adequate resources and authority to support the implementation and maintenance of the FRMS, and
- the appointment of the FRMS Manager.

While the CEO is not expected to possess detailed technical knowledge of all aspects of the FRMS, their visible commitment to the safety principles underpinning the system is fundamental to its successful implementation and continual effectiveness.

Additionally, the FRMS shall include clearly defined decision-making processes that address the following areas:

- roles and responsibilities, including assigned levels of decision-making authority,
- closed-loop escalation procedures, and
- defined timeframes within which responses or decisions are to be taken by each responsible party.

6.1.4 Appointment of Key Personnel

The organization shall appoint a manager who is responsible for, and serves as the focal point in, the implementation and maintenance of an effective FRMS. Effectiveness is achieved when the FRMS is actively facilitated by the responsible individual and supported by a structured team of key personnel representing the various operational areas of the organization. Accordingly, FRMS responsibilities, accountabilities, and authorities shall be clearly defined, documented, and communicated throughout the organization.

The FRMS Manual shall define the personnel accountabilities, responsibilities, and authorities necessary for the effective implementation and maintenance of the FRMS. It shall also describe the organization's structure, position descriptions, and training programmes to ensure that adequate personnel are appropriately qualified, trained, and experienced to effectively implement and administer the FRMS.

The FRMS Manual shall further describe the mechanisms for the ongoing involvement of all personnel through a functional group and a designated individual responsible for coordinating FRMS activities. The processes supporting these activities shall be clearly defined and documented.

6.1.4.1 FRMS Manager

The FRMS Manager (however titled) shall be appointed by the Chief Executive Officer (CEO) as a focal point and is responsible for the day-to-day implementation, management, and continual effectiveness of the FRMS. The appointment of a suitably qualified FRMS Manager is critical to the success of the organization's FRMS.

If the operator has an SMS in place, the FRMS Manager shall report to the Safety Manager. The FRMS Manager shall be granted sufficient authority to ensure that they are appropriately informed of, and consulted on, all operational decisions that may have implications for crew fatigue and alertness.

FRMS Manager shall ensure:

- processes for the FRMS are established, implemented and maintained
- FRMS documents and records are maintained
- FRMS hazard identification and risk management processes are coordinated
- performance of the FRMS is monitored
- FRMS is continuously improved
- reports are provided to the Safety Manager/CEO on the performance of the FRMS
- appropriate FRMS training is developed and delivered
- promotion of the FRMS is carried out.

FRMS Manager should have a sound understanding of FRMS principles and practices, acquired through formal training and relevant experience. This may include participation in training courses and meetings addressing current developments in fatigue science.

Depending on the size and complexity of the organization, the FRMS Manager's overall knowledge, skills, and experience should include:

- sound knowledge of FRMS principles and practices
- sound knowledge of fatigue science
- experience in fatigue management or safety management system within an aviation organization
- proficiency in data collection and analysis techniques
- competence in hazard identification and risk management
- knowledge and understanding of bio-mathematical fatigue modelling
- experience in investigation, auditing, and analytical processes
- effective interpersonal and communication skills
- demonstrated leadership ability

The knowledge and skill requirements shall be proportionate to the type of AOC, the nature of operations, and the scope of the FRMS.

To avoid potential disruption to the FRMS in the absence of the FRMS Manager or other key FRMS personnel, the organization shall establish procedures for the delegation of duties to address both short-term and extended absences, to ensure the continuity and fulfilment of the FRMS duties and responsibilities.

6.1.4.2 Fatigue Safety Action Group (FSAG)

To meet the requirement for providing mechanisms for the ongoing involvement of relevant personnel, the operator should establish a functional group responsible for coordinating FRMS activities. In larger organizations, this group or committee may be referred to as the Fatigue Safety Action Group (FSAG).

a) FSAG Composition

The fatigue safety group, committee, or FSAG should be chaired by the FRMS Manager and ensure effective representation of all relevant stakeholders.

The FRMS would generally include a representative (or representatives) from:

- Crew members
- staff responsible for crew scheduling
- management of the relevant work groups
- any other work group included within the FRMS (such as Aircraft rotation, engineering)
- appropriate subject matter experts (e.g. Aviation Medical Officers, Human Factors or fatigue specialists)
- other relevant representatives (e.g. SMS personnel)

All members of the fatigue safety group, committee, or FSAG should complete fatigue management training programmes to maintain competency levels commensurate with their roles and responsibilities within the FSAG.

b) FSAG Term of Reference

The following aspects of the FSAG constitute its core FRMS accountabilities:

- develop and maintain FRMS documentation
- oversee the development of the FRMS
- assist in FRMS implementation
- oversee the ongoing operation of the fatigue risk assessment processes
- contribute as appropriate to the FRMS assurance processes
- be responsible for ongoing FRMS training and promotion
- provide necessary input on all aspects of fatigue risk to the SMS.

The FSAG should operate in accordance with the following Terms of Reference (TOR), which should be included in the FRMS documentation. The TOR should define the parameters within which the FSAG operates and specify the group's accountabilities, as set out below:

- the stated objectives and recognition of the FSAG within the company structure
- the lines of communication for decision-making processes
- the frequency of meetings
- the expectations of the FSAGs scope and deliverables
- the delineation of FSAGs members roles and responsibilities.

An example of FSAG Term of Reference is provided in Appendix A of this Guidance Material.

6.1.5 FRMS Documentation and Records

Prior to approval for either a trial FRMS or FRMS, CAAT shall verify that the FRMS Manual complies with all FRMS requirements.

In addition to the FRMS Manual, other documents that constitute the FRMS documentation may include, but are not limited to, the following:

- Duty rosters, both as scheduled and as flown
- Flight duty period records
- Duty periods and rest periods
- Fatigue and incident reports, including documents associated with the investigation of fatigue-related incidents
- Agendas and minutes of FSAG meetings and associated bodies
- Fatigue surveys, submissions, or other crew member inputs
- Training and competency-related records, such as syllabi, instructor feedback, and course evaluations
- Hazard identification and risk assessment records
- Operations notices, bulletins, newsletters, or similar publications referencing fatigue-related matters
- Reports of extensions, diversions, and similar occurrences
- Audit reports and records of the FRMS
- Details and records of BMM activities, including thresholds, assumptions, operational procedures, and outputs
- Fatigue- or safety-related data collection and analysis

All documents and records related to the FRMS shall be retained by the operator for a minimum period of five years from the date of the record and shall be made available to CAAT.

The amendment and distribution of FRMS documentation, such as the FRMS Manual, shall be documented and managed under the applicant's FSDS.

6.1.6 Practical Operating Procedure

The FRMS shall establish documented operating procedures to identify fatigue-related safety hazards, assess associated risks, and ensure that appropriate remedial actions are implemented and monitored for effectiveness. These procedures shall define responsibilities and processes for the identification, mitigation, recording, assessment, and ongoing monitoring of fatigue hazards, and shall include a feedback mechanism to support continuous improvement of the FRMS. Where an SMS is already established, existing hazard identification and risk assessment processes may be adapted for Fatigue Risk Management System, provided they deliver outcomes commensurate with CAAT requirements. The FRMS manual shall be sufficiently detailed to ensure the recording of all relevant actions, including the implementation of remedial measures and the evaluation of their effectiveness in mitigating fatigue risk.

6.1.6.1 FRMS limits

The FRMS manual shall document the operational limits based on scientific principles and knowledge and subject to safety assurance processes. The limits shall include the maximum values for flight times, flight duty periods and duty periods, the minimum values for rest periods and all other relevant limits.

For this purpose, the AOC shall establish operating procedures within the applicable prescriptive limits where an FRMS is not applied. Gap between the prescriptive limits and the proposed FRMS limits shall be identified as an area of increased risk and shall be subject to risk assessment and mitigation.

When establishing maximum and minimum limits, the operator shall determine and specify the applicable limits relevant to its operations, taking into account the following matters, as applicable:

- flight times, FDPs and duty periods,
- Rest periods (at home base and away from base),
- sleep opportunities,
- duty periods which encroach a window of circadian low,
- acclimatization,
- number of sectors,
- augmented/unaugmented crew numbers (and complement),
- the class(es) of crew rest facility,
- inflight rest opportunities,
- delayed reporting time,
- reassignment and extensions,
- standby and positioning,
- split duties,
- cumulative flight time and cumulative duty time,
- training (in aircraft and in simulators),

The applicant shall provide CAAT inspectors with a documented FRMS Safety case demonstrating the application of FRMS processes in establishing all limits and justifying each proposed divergence.

CAAT shall be satisfied that proposed limits do not introduce fatigue risks that are not adequately mitigated. The greater the extent of divergence from the prescriptive limits, the more substantive and compelling supporting evidence.

Where FRMS data indicate that established maximum or minimum limits are too high and too low (respectively), the applicant shall adjust mitigation measures, including amendment of FRMS limits as necessary, to ensure that the established limits are within an acceptable level of safety.

The FRMS manual shall describe the operating procedures for this process, including examples of thresholds, alerts, or indicators that trigger review of limit suitability. The establishment of appropriate SPIs shall support the ongoing assessment of the suitability of the limits.

6.2 Component 2 - Fatigue Risk Assessment (FRA)

Fatigue Risk Management System processes are specifically designed to manage risks associated with crew member fatigue and constitute an integral part of the day-to-day operations of the FRMS. They enable the applicant to achieve the safety objectives established in its FRMS policy and are managed by the FSAG.

The FRMS Manual shall include Fatigue Risk Management System processes, which involve the following:

1) Identifying situations or conditions where fatigue may constitute a hazard,
2) Evaluating the level of fatigue risk,
3) Implementing risk mitigations when necessary, and
4) Establishing metrics to measure the effectiveness of the risk mitigations and the overall FRMS.

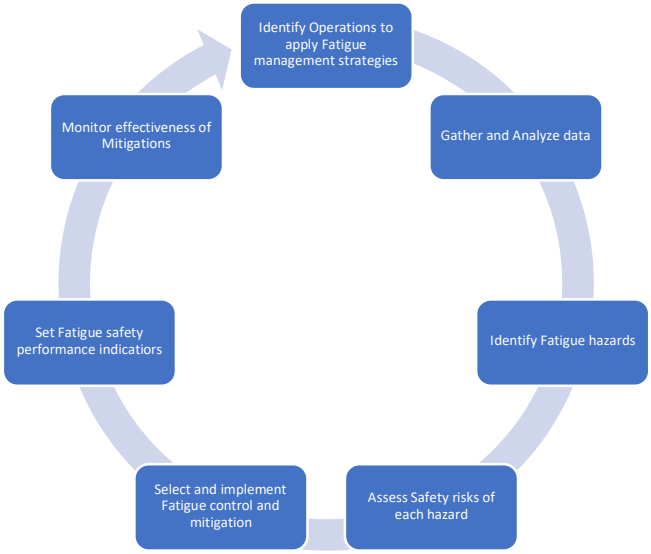


Figure 03 - Fatigue Risk Assessment processes

While the Fatigue Risk Management System processes are described in more detail below, the applicant shall establish the processes to ensure that the following outcomes are achieved:

- All fatigue hazards are identified.
- The risks associated with each hazard are identified and classified.
- Appropriate remedial actions or mitigation strategies are implemented to reduce the level of risk to an acceptable level.
- All levels of residual risk that fall within the tolerable range are formally accepted by the designated level of management.
- Any residual risk that remains after mitigation is subject to further mitigation as part of ongoing risk management and continuous improvement processes.
- Formal records of all hazard identification and risk management processes are maintained.
- Risk management processes involve relevant subject-matter experts (SMEs) and stakeholders.
- All personnel involved in any risk management processes have successfully completed the relevant training to enable these activities to be appropriately conducted.

6.2.1 Fatigue Hazard Identification

FRA processes are data-driven. The fatigue monitoring data required as part of the FRA process are more comprehensive than those required for managing fatigue in operations conducted in compliance with prescriptive limits and are managed under the operator's SMS.

In accordance with ICAO SARPs, an FRMS necessarily involves the following three methods of hazard identification:

a) Predictive
b) Proactive
c) Reactive

The applicant should identify fatigue hazards using all of these methods to ensure the availability of the various types of information and data required by an FRMS to continuously monitor fatigue risk levels.

These methods enable data-driven decisions based on scientifically valid principles and measurements.

ICAO SARPs identify the types of data and information that can be monitored.

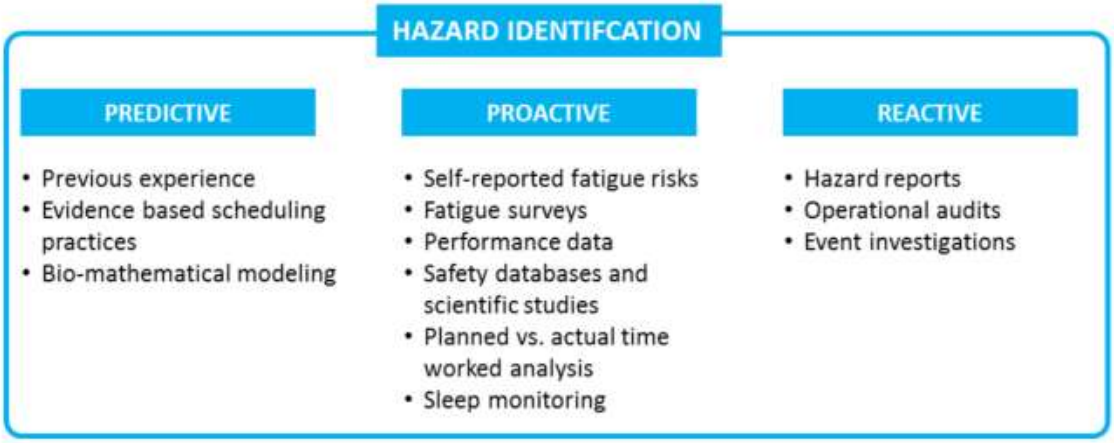


Figure 04 - Fatigue hazard identification

6.2.1.1 Predictive Hazard Identification

Predictive processes are designed to identify likely fatigue hazards before they occur, in a manner similar to trend analysis within an applicant's SMS, which evaluates an organisation's existing safety data to predict potential hazards. The three methods of data and information collection and analysis that may inform the development of predictive fatigue hazard identification processes are outlined below:

a) Previous experience

The collective experience of managers, schedulers, and crew members constitutes an important source of information for identifying fatigue hazards related to scheduling. Examples include:

- Input from crew members based on their experience with particular types of operations,
- Review of safety reports indicating fatigue in existing operations,
- Review of reports and crew fatigue reports from similar routes.

In summary, organisational experience in safety or fatigue management may support the development of safety cases, trend identification, and the assessment of "hypothetical" or "what-if" scenarios to predict potential fatigue hazards associated with proposed FRMS operations.

b) Evidence-based scheduling practices

Fatigue hazards relating to scheduling can also be predicted when fatigue science is applied during schedule development. Examples and considerations include:

- Appropriate consideration of the impact of time awake, circadian rhythms, sleep loss, and recovery on crew members performance during planned FDPs,
- Appropriate consideration of the impact of environmental stressors and workload on crew members performance during planned FDPs,
- Appropriate consideration of accommodation choices to facilitate the achievement of adequate sleep quality and duration.

Using known scientific facts, schedulers can assume the fatigue risk of operations that contain similar factors (such as length of FDP, WOCL encroachment) within their scheduling pattern and consider appropriate counter measures (such as limiting consecutive WOCL FDPs, increasing rest periods).

c) Bio-mathematical modelling

Bio-mathematical models (BMM), made available mostly as computer software, predict the level of fatigue associated with specific schedules. While not mandatory, fatigue BMMs can incorporate principles of fatigue science into rostering practices by providing predictions of potential fatigue risk levels, performance levels, and/or optimal sleep opportunities.

The benefits and limitations of fatigue BMMs are discussed in Appendix B – Bio-Mathematical Models (BMMs) of this Guidance Material.

For reference, the Australian Civil Aviation Safety Authority (CASA) has published valuable guidance on the use of bio-mathematical models in FRMS.

However, CAAT does not endorse any specific fatigue modeling tool, and an applicant shall ensure that any selected BMM is appropriate for the potential fatigue risks associated with their operations.

Note: The output of the bio-mathematical modelling tool shall not be used as a sole basis for operational 'go/no go' decision making. Any score derived from a BMM does not 'mean' a schedule is free from fatigue or that fatigue mitigations would not benefit crew members performance. The model outputs shall be used only as supporting information within the broader FRMS risk assessment and decision-making processes.

6.2.1.2 Proactive Hazard Identification

Proactive processes are designed to identify fatigue hazards by measuring fatigue levels in current operations, recognizing that fatigue levels are influenced by both duty and off-duty activities, including sleep history and waking behaviours. As no single measure provides a complete assessment of fatigue-related impairment, multiple data sources shall be used, including subjective and objective measures of alertness, performance, and sleep.

The success of proactive processes and the FRMS depends on the willingness of individuals crew members to participate in the data collection. Data collection activities shall be conducted on a voluntary basis. Crew members shall not be forced or incentivized to participate. The operator shall ensure that participants are informed of the purpose of data collection and retain confidence that their information is used solely for safety improvement.

All data shall be collected, stored, and managed in accordance with applicable data protection and confidentiality requirements. Where third parties or electronic recording devices are used, the operator shall ensure that equivalent data protection controls are effectively applied.

Methods of proactive fatigue hazard identification may include but are not limited to:

a) Self-reporting of fatigue risks,

Operators shall establish and maintain a fatigue reporting process under their SMS. An existing safety reporting form (e.g. Air Safety Report) may be adapted for fatigue reporting, or a dedicated fatigue report form shall be developed where necessary.

Fatigue report forms shall, as a minimum, capture the following information:

- Self-assessed severity level of fatigue,
- Recent sleep history, including timing and duration of sleep for at least the preceding three (3) days,
- Time of day of the safety event, where the report relates to an occurrence or hazard event,
- Description of the causes and consequences of fatigue, and
- Any relevant operational or personal contextual factors contributing to the reported fatigue.

Note: In addition to providing operational personnel with a form to report fatigue, there are other forms such as mandatory incident/accident reporting forms that need to be adjusted to collect the necessary information to identify fatigue as a contributing factor.

Operators shall ensure that all personnel are informed of, and trained in, the procedures for submitting fatigue reports, in accordance with the FRMS requirements.

Fatigue reports shall be reviewed and analysed by the FSAG at regular intervals, appropriate feedback shall be provided to individuals and relevant personnel regarding actions taken as a result of the reports or the reasons for no action taken. FSAG shall document its assessment and determine whether investigation and/or mitigation actions are required.

An example of Fatigue report form is provided in Appendix C of this Guidance Material.

b) Crew members fatigue surveys,

Fatigue surveys are an effective method for collecting a large quantity of information regarding operational fatigue risk. Surveys should be designed to identify the duties and patterns perceived by the crew members as the most fatiguing, specific scheduling elements associated with increased fatigue, or other operational factors or variables that may be contributing to fatigue. Where practicable, surveys should also collect information regarding general health, wellbeing, recent sleep and duty history.

Surveys can be administered as a paper-based questionnaire, a web-based survey, or mobile devices. Data collection may be conducted either retrospectively or prospectively, as determined by the operator's data gathering objectives and operational requirements.

- Retrospective fatigue surveys require crew members to recall and report their perceived fatigue levels and contributing factors over a specific time. (e.g. over the last three months, their fatigue levels, the factors which contributed to their fatigue levels, and the amount of sleep they obtained).
- Such surveys are typically administered through web-based platforms and may include detailed data collection elements. Depending on their scope and complexity, retrospective surveys should normally be conducted on an annual or biannual basis, as determined appropriately by the operator's fatigue risk monitoring programme.
- Prospective fatigue surveys require crew members to actively monitor and record their current levels of alertness and fatigue, as well as duration of sleep. These surveys shall be designed as brief assessment tools and shall be completed at multiple intervals across a duty period or throughout a roster cycle, as specified within the operator's fatigue risk monitoring programme.

c) Crew members performance data,

Performance measurements provide objective data to supplement the subjective data collected through fatigue reports and survey activities. Such measurements shall support the ongoing monitoring and assessment of fatigue-related performance risk within the FRMS. Currently, there are three main approaches to monitoring performance which include:

i. Tests of cognitive performance and alertness

There are several alertness tools that could be used to measure a range of performance metrics, for example: reaction time, vigilance and short-term memory. Things to consider when choosing a performance test for measuring an individual's fatigue include:

- the length of the test and whether it can be easily performed during an FDP
- whether the test has been shown to be sensitive to the effects of sleep loss under laboratory conditions
- whether the test is predictive of more complex tasks e.g. performance in a simulator
- whether it has been used in other similar aviation operations, and whether the data is available to compare fatigue levels between operations.

This approach may interrupt the normal flow of work. However, this is currently the most practical approach available.

ii. Automated data collection

There is now considerable interest in finding ways to link individual fatigue levels to data collected systematically through an automated system, such as flight data analysis (FDA). Such data has the advantages that it is routinely collected, it does not interrupt the normal flow of work, and it is relevant to operational safety. The difficulty is that a multitude of factors contribute to deviations from defined parameters. Therefore, linking consequences of the deviations to fatigue is difficult and requires further research.

iii. Observational reports

Trained observers can be used to rate the performance of operational personnel undertaking their duties (e.g. Line-Oriented Safety Audit - LOSA). However, this can be labour-intensive and expensive. Having the observer present may also have an alerting effect and place additional demands on the individual. These factors currently limit the usefulness of this approach for proactive fatigue hazard identification in an FRMS.

d) Safety databases and scientific studies,

Additional information about fatigue hazards may be available from external safety databases, such as Aviation Safety Reports (ASRs) and Mandatory Occurrence Reports (MORs) maintained by safety authorities and/or operator internal database and/or research institutions.

Analyses of safety event databases complement direct measurement of fatigue levels in the operations covered by the FRMS. Operationally based fatigue research is expanding. These types of studies may have value to an FRMS due to their applied scientific approach. Operators should ensure they have processes to systematically review and evaluate information from these sources.

e) analysis of planned versus actual time worked, and

The unforeseen circumstances may result in deviation from planned schedule, for example weather conditions, unexpected automation or mechanical failures, or staffing unavailability due to illness.

Fatigue risk assessments shall be based on actual duty performed, rather than only on planned schedule. Accordingly, operators shall collect and analyse data on actual duty periods to identify instances where fatigue risk levels may be higher than planning.

Data on both planned and actual duty periods shall be maintained in compliance with prescriptive flight and duty time limitation regulations and FRMS requirements. For the purposes of proactive fatigue hazard identification, FSAG shall monitor and trend, at least on a monthly basis, the frequency of occurrences where:

- duty periods beyond the planned schedule,
- the maximum scheduled duty day specified in the FRMS policy is exceeded, and
- shift/trip swapping occurs.

f) crew members sleep monitoring.

The simplest method of monitoring sleep is to have crew members complete a daily sleep diary before, during, and after the duty pattern or roster period under assessment. Sleep diaries may be completed using either paper-based formats or approved electronic platforms.

Where a higher level of objectivity is required, operators may utilise actigraphy devices to measure sleep and wake behaviour. Actigraphy devices shall be worn continuously on the wrist

and shall estimate sleep timing and quality based on body movement and/or physiological measures. The accuracy of the sleep prediction can vary depending on the device type and software platform.

6.2.1.3 Reactive Hazard Identification

FRMS reactive processes are designed to identify the contribution of crew members fatigue to safety reports and events that have occurred. The objective is to determine how fatigue could have been mitigated and to reduce the likelihood of similar occurrences in the future.

The potential triggers for the reactive processes include:

- Fatigue report,
- Safety report,
- Operational audit report,
- Incident and accident report,
- Flight data monitoring (FDM) events.

When analysing whether a crew member was in a fatigued state, the operator shall consider the following as part of the fatigue report:

- how much sleep crew members need to feel fully rested,
- how much sleep the crew member achieved in the previous 24 hours,
- how much sleep the crew member achieved in the previous 72 hours,
- how long the crew member had been awake at the time of the event,
- the position in the circadian cycle of the crew member at the time of the event,
- the crew member's workload at the time of the event,
- the crew member's physical and mental health, medication, nutrition, physical exertion, and environmental stress.

The reactive hazard identification processes are closely aligned with the fatigue investigation processes. Depending on the severity of the event, a fatigue analysis may be conducted by FSAG, the operator's safety department, or an external fatigue expert or accident investigation agency. The findings of any fatigue investigation shall be recorded as part of the FRMS documentation.

6.2.1.4 Fatigue investigation

Operators should develop a fatigue investigation process to identify causal and contributing factors to fatigue related incidents. The outcomes of this process may contribute to the reactive hazard identification processes. An appropriate investigation process should ensure:

- All fatigue events/incident reports and any other reports in which fatigue may be identified are formally reviewed, based on predetermined thresholds. The thresholds should be determined through the risk assessment process to enable identification of fatigue events/incidents for investigation along with the level of the investigation.
- The fatigue incident reporting and investigation process is clearly documented, and the investigation is conducted with appropriately trained individuals. The reporting and investigation process should include:
    - provided in Appendix C. Any report and subsequent investigation should consider the factors noted on this form, and as identified in the section outlining Reactive Hazard Identification,

- specialist assistance when required, e.g. a subject matter expert in flight data analysis, may be required to assist with an investigation which involves consideration of traces depicting a Flight Data Monitoring (FDM) event,
- a timeframe for the completion of the investigation and the provision of the report to the FSAG (if present),
- formal review of the investigation report and recording of all action items and decisions made in relation to the investigation report,
- staff awareness of their responsibilities for assisting with the investigation and providing any records, documents or information,
- reinforcing the principles of open and fair culture in evaluating any findings or recommendations,
- a focus that is directed to understanding the contributing factors that led to the reported fatigue and whether the reported fatigue is indicative of a unique set of circumstances or a systemic issue.

- All contributing factors, findings and recommendations are presented in a format which facilitates formal analysis.

6.2.1.5 FRMS audits

The FRMS shall be managed as a continuous improvement system and shall not be treated as static. The FRMS Manual shall be maintained as a living document, subject to regular review and amendment in response to identified hazards, technological developments, evolving knowledge, and improved fatigue measurement and mitigation methods.

Operators shall conduct a formal annual audit of all essential FRMS components to identify system deficiencies and unacceptable fatigue risks and to determine required corrective actions.

FRMS performance shall be evaluated using a combination of subjective and objective data, crew member feedback, and industry practices to support ongoing improvement of the operator's FRMS.

6.2.2 Fatigue risk assessment

Once a fatigue hazard has been identified, the level of risk it presents shall be evaluated within the relevant operational context. The FRMS risk assessment procedures shall enable the operator to review identified hazards and link them to:

- operational processes,
- Their probability,
- Possible consequences, and
- The effectiveness of existing safety barriers and controls

Fatigue risk is typically defined as the combination of the predicted fatigue likelihood and the severity of the consequences arising from an identified fatigue hazard or operational situation. The operator shall establish the fatigue risk matrix or other equivalent risk-ranking tools to support the determination of whether the assessed risk level is tolerable and whether additional resources or mitigation measures are required to control the risk to an acceptable level. The level of Fatigue risk is established by plotting the hazard against the defined likelihood and severity criteria within the matrix.

When applying a risk matrix for fatigue risk assessments, the operator shall define and customize the severity and likelihood categories to ensure they are appropriate to the nature and

complexity of their operations. The severity classifications shall not be relied upon as the sole basis for assessing fatigue-related risks, as the worst foreseeable consequence of fatigue-affected performance during the execution of safety-critical tasks is catastrophic. Accordingly, the operator shall ensure that fatigue risk assessments are supported by additional analytical methods and operational data to enable meaningful differentiation of risk levels.

With regards to fatigue risk:

- Severity determination shall be based not solely on the level of fatigue experienced by an individual, but on the resulting degradation of performance and the way that degraded performance may affect operational outcomes.
- The severity of potential consequences shall be determined primarily by the nature of the task being performed while fatigued. Tasks classified as safety-critical present a significantly higher consequence severity in the event of fatigue-related performance impairment. For example, loss of alertness during routine administrative duties may have no immediate safety impact; however, the same condition occurring on the flight deck or at an operational workstation while performing safety-critical tasks may lead to serious incidents or accidents.

6.2.2.1 Severity classification

As outlined above, the operator shall apply severity classifications that appropriately reflect the range of potential consequences arising from fatigue-affected performance. Examples of methods for establishing severity classification include the following:

i. Severity classifications may be determined by assessing or reporting of “perceived fatigue levels”, on the basis that increasing fatigue is associated with a progressive degradation of operational performance. The operator may apply the Samn–Perelli, or other equivalent measures. Examples of Measurement tools are provided in Appendix D of this Guidance Material or in the applicable ICAO Implementation Manuals.

   Where subjective measures are used, the operator shall document the selected tools and associated criteria within their FRMS and ensure their consistent application in fatigue risk assessments.

ii. Bio-mathematical models may be used to estimate the predicted fatigue levels of the average individual at various points throughout planned rosters. Where an operator has established the relevance and validity of the model outputs for its specific operational context, severity classifications may be determined by reference to the defined bio-mathematical model thresholds.

   The selected thresholds and their application shall be documented within the FRMS and used consistently as part of the fatigue risk assessment process.

iii. Severity classifications may be determined by reference to the number and combination of relevant fatigue-related factors associated with a specific duty or work pattern.

Where this method is applied, the operator shall define, document, and apply the identified fatigue factors and associated criteria consistently within the FRMS risk assessment process.

6.2.2.2 Likelihood classification

Fatigue likelihood shall be evaluated by determining the probability that a specific fatigue-related performance consequence may occur within the operational context. As likelihood assessments are inherently influenced by operational variables, the operator shall ensure that evaluations are appropriate to the specific operational environment and duty characteristics.

Where fatigue assessments relate to the defined fatigue risk factors associated with particular duty types or work schedules (for example, less than seven hours between duties or duty commencement prior to 07:00), the operator shall, where practicable, determine likelihood classifications using measurable exposure or occurrence frequencies to support objective and consistent risk evaluation.

When using a risk matrix, operators shall recognize that such tools do not inherently account for the effectiveness of existing controls and mitigations. Accordingly, the risk assessment process shall include a systematic review of implemented and proposed mitigations to ensure that the assessed risk level accurately reflects the residual safety risk.

The assessment of risks associated with fatigue hazards shall recognize the inherent variability and uncertainty of the factors that influence the level of crew member impairment. The operator shall take into account that the application of risk assessment and mitigation measures may vary depending on the nature of the duty and the specific operational context in which the fatigue hazard is encountered. Accordingly, fatigue risk assessment shall be conducted using a structured and documented process that consider operational factors, duty criticality, environmental conditions, and available safety data to ensure consistent and defensible risk management.

6.2.3 Fatigue risk mitigation

The applicant shall develop and implement fatigue risk mitigation procedures to:

- select the most appropriate mitigation strategies,
- implement the selected mitigation strategies, and
- continuously monitor the effectiveness of the implemented mitigation strategies for each identified fatigue hazard.

Decisions on mitigations shall be made by the FSAG or designated safety committee, which possesses the necessary expertise. Where a risk is determined to an acceptable level, no further mitigation is required, and the rationale shall be documented within the FRMS records.

The FSAG shall continuously monitor operations against predefined safety performance indicators to ensure fatigue risks remain tolerable. If risks exceed acceptable levels, FRMS processes shall be revisited, including data collection, hazard re-evaluation, and implementation of additional mitigations, as part of a cyclical process of continuous assessment and improvement.

6.2.4 Fatigue risk metric

Fatigue metrics shall be established using available data sources to provide measurable indicators of fatigue levels and the effectiveness of mitigations strategies. Metrics shall reflect key fatigue factors relevant to the operational context, with predefined acceptable values or targets indicating tolerable or acceptable levels of fatigue. These metrics, together with their targets, shall form Safety Performance Indicators (SPIs). Multiple metrics should be used where appropriate to ensure reliable monitoring of fatigue risk and FRMS performance, with consideration given to the specific characteristics of different operations.

6.3 Component 3 - FRMS Assurance

FRMS assurance is the systematic process used to monitor and evaluate how effectively the Fatigue Risk Management System is functioning in achieving its intended safety objectives. It involves the continuous assessment of fatigue risks using established fatigue metrics, data from the Fatigue Risk Assessment (FRA) process, and information from other relevant sources.

The applicant shall develop and maintain the FRMS assurance process to:

1) monitor and analyse that the FRMS continues to deliver an acceptable level of fatigue risk consistent with the safety objectives defined in the FRMS policy and applicable regulatory requirements,
2) monitor changes within the operational and organizational environment that may influence fatigue risk in the operations covered by the FRMS, and to identify measures to maintain or enhance FRMS performance prior to the implementation of such changes under management of change process, and
3) provide ongoing feedback to ensure the continued effectiveness of the FRMS and to support its continuous improvement where necessary.

The assurance function shall provide ongoing feedback to maintain and enhance FRMS performance and shall serve as a key mechanism for demonstrating compliance with regulatory requirements. It also enables both the applicant and CAAT to verify that the FRMS continues to deliver an acceptable level of fatigue-related safety performance and to take corrective or preventive action when required.

6.3.1 FRMS Performance monitoring

The FRMS Manual shall include safety assurance procedures to ensure continuous monitoring of FRMS performance, analysis of fatigue-related trends, and evaluation of the effectiveness of mitigation strategies.

The applicant should note that approval is not required to commence the monitoring, analysis, and measurement of fatigue within current operations. The collection and analysis of information from existing operations may provide an overview of the effectiveness of current fatigue risk levels and the controls already in place. This information can subsequently support the operator in the development and continuous improvement of the FRMS.

6.3.1.1 Safety Performance Indicators (SPIs)

The organization shall develop and maintain the means to verify the safety performance of the FRMS and to validate the effectiveness of FRMS risk controls. The safety performance of the FRMS shall be verified in reference to the safety performance indicators and targets of the FRMS.

Effectiveness is achieved when the FRMS has developed a series of safety performance indicators that are appropriate to the type of operation. There is a means to measure and monitor trends and take appropriate action when necessary.

Safety Performance Indicators (SPIs) shall be established by the Fatigue Safety Action Group (FSAG) as part of the operator's Fatigue Risk Assessment (FRA) processes and agreed upon with CAAT. Fatigue SPIs are used to monitor the effectiveness of fatigue controls and mitigations, and their selection should reflect the scope, nature, and complexity of the operator's activities. Typical categories of fatigue SPIs include:

- Operational SPIs that monitor duty- and roster-related contributors to fatigue,
- Fatigue-related SPIs derived from proactive reporting or monitoring of actual crew fatigue levels, and
- Bio-mathematical model thresholds that provide predictive indicators of elevated fatigue risk.

Acceptable values or targets shall be established for fatigue SPIs and must remain within the tolerable limits defined in the operator's risk assessment. As the FRMS matures, the operator shall review and refine SPIs and targets to enhance system monitoring and support continuous improvement.

Examples of Fatigue Safety Performance Indicators (SPIs) are provided in Appendix I of this Guidance Material.

However, it is not feasible for CAAT to prescribe a single set of SPIs applicable to all types of operations. Indicators appropriate for simple operations may not be valid or meaningful for more complex operations. Accordingly, each operator is required to identify SPIs that are relevant to its specific operational context.

6.3.1.2 Source of data

Source of data for FRMS Performance monitoring may include, but are not limited to:

i. Hazard reporting and investigations

Trends in fatigue reporting rates shall be monitored to assess the effectiveness of mitigation measures. Fatigue Safety Action Group (FSAG) shall analyze and follow up on contextual information provided by individuals in fatigue reports. All fatigue hazards identified through the FRA processes, along with the actions taken to mitigate them, shall be documented in the FRMS records.

The documentation of fatigue hazards shall be regularly reviewed to ensure it reflects current and valid hazards, as well as appropriate mitigation measures, in accordance with FRMS safety assurance processes.

Trends in voluntary fatigue reports may also be used as indicators of FRMS effectiveness.

ii. Audit and survey reports

Audits and surveys provide a means of assessing FRMS effectiveness without relying solely on fatigue reports or fatigue-related safety events, which may be infrequent. Audits shall be conducted periodically to evaluate FRMS performance, with an annual audit recommended.

Audits should address questions such as:

- Are all relevant departments implementing recommendations of the FSAG?
- Are all targeted operational personnel using mitigation strategies as recommended by the FSAG?
- Is the FRMS training programme effective?

The quality audit of the FRMS shall cover all processes and outcomes impacting crew member's fatigue. The audit programme should include formal checklists applicable to the areas under review. The audit shall be conducted by personnel or organisations independent of the FSAG.

The quality audit of FRMS shall comprehensively assess:

- all FRMS documentation and elements of its activities,
- The monitoring of fatigue SPIs is being actively managed by FSAG in accordance with documented processes,
- Procedures to manage audit findings.

Fatigue surveys are an effective method for collecting extensive information on operational fatigue risk, subject to the safety assurance processes of the FRMS, and may be conducted retrospectively or prospectively.

Data and analysis results from these surveys shall be communicated through the FSAG to support monitoring FRMS performance and identifying areas for improvement.

iii. Fatigue studies

In FRMS assurance, fatigue studies provide broader information from external sources on common FRMS issues, whereas in FRA processes they focus on evaluating specific fatigue hazards. Fatigue studies are conducted when an operator faces a broad fatigue-related concern or is introducing a new operation with limited internal data. Sources may include the experience of other operators, industry-wide or State-wide studies, or scientific research. Such information is particularly valuable when building a safety case in areas with limited operational experience.

This process should include, where possible:

- the participation of relevant stakeholders (e.g., the FRMS Manager) in forums, workshops, or other educational activities to stay current with developments in applied fatigue science,
- review by relevant stakeholders (e.g., the FRMS Manager) of publications related to fatigue science.
- The proposed FRMS should also have provisions to commission an independent review of the FRMS to ensure that decisions and actions are consistent with current processes and practices informed by fatigue science.

Trend analysis of safety performance indicators provides insight into emerging fatigue hazards that may not have been identified through routine FRA processes. For example, operational or organisational changes in one area may lead to increased workload and elevated fatigue risk elsewhere in the organisation. The FRMS safety performance processes therefore serve as an important system-level mechanism for detecting such emerging risks.

Where newly identified fatigue risks, or combinations of existing risks, are ineffective or found to be inadequately controlled, they should be referred to the Fatigue Safety Action Group for evaluation. The FSAG should apply the established FRA processes to assess the risk, and to develop, implement, and monitor appropriate controls and mitigations.

6.3.2 Management of Change

The FRMS shall include a formal process for the management of change in the operational environment and in the organization that may affect the performance of the FRMS which includes, but is not limited to:

1) identification of changes in the operational environment that may affect fatigue risks,
2) identification of changes within the organisation that may affect fatigue risks, and
3) consideration of available tools which could be used to maintain or improve FRMS performance prior to implementing changes.

Operational and organizational factors may change over time and could affect the performance of the FRMS. Examples of such changes include, but are not limited to:

- bringing new operations under the scope of the FRMS System
- adjusting the FRMS training programmes
- a significant alteration to the workforce profile
- a change in the FRMS Manager
- the introduction of a new route, aircraft or BMM.

When a planned change is identified, the applicant shall:

- apply the fatigue risk assessment processes to identify fatigue hazards, assess the associated risks, and propose appropriate controls and mitigations,
- ensure that consideration is given to the available tools that may be used to maintain or improve FRMS performance prior to the implementation of the change,
- obtain approval from the CAAT prior to implementing the proposed change, to ensure that the application of the proposed controls and mitigations will result in an acceptable level of residual fatigue risk, and
- document the strategy for managing any fatigue risks associated with the change.

During the implementation of the change, the FRMS shall ensure that the safety assurance processes address the introduction of the change and verify that the FRMS is functioning as intended under the new operating conditions.

6.3.3 Continuous improvement of FRMS

Ongoing evaluation by FRMS assurance processes not only enable the monitoring of overall FRMS performance, ensuring that fatigue is effectively managed across operations, but also support the continuous improvement of the FRMS. Continuous improvement is achieved through systematic evaluation, trend analysis of safety performance indicators, and the implementation of corrective and preventive measures to enhance FRMS effectiveness. This shall include, but is not limited to:

1) the elimination and/or modification of risk controls have had unintended consequences or that are no longer needed due to changes in the operational or organizational environment,
2) routine evaluations of facilities, equipment, documentation and procedures; and
3) the determination of the need to introduce new processes and procedures to mitigate
4) emerging fatigue-related risks.
5) Optional use of bio-mathematical modeling of duty schedules, both retrospective and prospective, to assess potential schedule-related fatigue risks.

All changes to the FRMS shall be documented and retained to ensure they are available for internal review and regulatory audit.

6.4 Component 4 - FRMS Promotion

FRMS promotion processes, together with the FRMS policy and documentation, support the operational activities of the FRMS, including Fatigue Risk Assessment (FRA) and Safety Assurance (SA) processes. Promotion processes are an essential component of an FRMS, similar to an SMS. The effectiveness of an FRMS relies on effective communication throughout the organization. This shall include, but is not limited to:

- FRMS training programmes, and
- FRMS communication plan

Information regarding FRMS activities and safety performance shall be regularly communicated to all stakeholders. Depending on the organizational structure, this may be achieved through the Fatigue Safety Action Group (FSAG), the SMS, or an accountable executive responsible for the FRMS communication plan. Conversely, operational personnel and other stakeholders shall promptly report any fatigue-related concerns to the FSAG or relevant management. All stakeholders shall have an appropriate understanding of fatigue and their roles within the FRMS to ensure effective Fatigue Risk Management System and system performance.

6.4.1 FRMS Training programmes

To ensure effective implementation of the FRMS, an applicant shall establish and provide appropriate training to all personnel whose duties have a direct or indirect influence on fatigue-related operational outcomes. The training should be designed to ensure that personnel understand their roles and responsibilities and are competent to perform their assignments under the FRMS. The targeted personnel should include, but are not limited to:

- Operational personnel: Personnel who are subject to the FRMS and whose performance may be affected by fatigue, i.e. crew members,
- Personnel involved in crew scheduling or bio-mathematical modelling: Personnel who are responsible for developing, modifying, or overseeing duty schedules, rosters, and work periods of crew members
- Executive decision-maker and operational risk manager: Personnel who make on-the-day decisions or strategic operational decisions that may affect planned or actual duty and rest periods,
- Fatigue Safety Action Group (FSAG) members,
- Risk assessment and resource management personnel: Personnel involved in overall operational FRA and resource allocation.
- Senior management: Including the accountable executive for the FRMS and senior management within departments that manage operational activities under the FRMS.

The initial training shall be provided at commencement, with crew members trained prior to undertaking any operational duties, and non-crew personnel trained prior to performing any FRMS-related decision-making or activities.

6.4.1.1 FRMS Training syllabus

The content of FRMS training programmes should be commensurated with the competencies and tasks required of each group, through a formal training needs analysis or an equivalent process, to enable them to fulfil their responsibilities within the FRMS effectively. All groups require basic training on the scientific principles of fatigue which are the dynamics of sleep loss and recovery, the effects of the circadian body clock, the influence of workload, and the ways in which these factors interact with operational demands to contribute to fatigue.

Recommended FRMS training topics are provided in Appendix E of this Guidance Material.

6.4.1.2 Training instructor

To ensure effective delivery competence assessment, FRMS instructor should:

- Possess appropriate knowledge of fatigue science, including sleep principles, circadian rhythms, fatigue risk factors, and recovery, relevant to the scope of operations.
- Demonstrate comprehensive understanding of the operator's FRMS, including Fatigue Risk Assessment (FRA), safety assurance (SA) processes, and fatigue mitigation strategies.
- Hold a formal training qualification that demonstrates the ability to develop and deliver training programmes.
- Be capable of designing and conducting competent assessments to verify that trainees have achieved the learning objectives.
- Maintain up-to-date knowledge of fatigue science, FRMS practices, and regulatory requirements.

6.4.1.3 Training delivery

FRMS training can be delivered in various ways, each with advantages and limitations. Live training with a qualified instructor allows crewmembers to ask questions, share experiences, and engage with different FRMS stakeholders to support safety culture. However, it requires coordination of time and location, as well as travel and session time.

Alternative training methodology, such as virtual class or computer-based training (CBT) provide flexibility in timing and location and can be delivered to large groups simultaneously. However, these methods offer limited opportunities for questions, discussion, or clarification. Applicants shall select training methods that ensure effective knowledge transfer, achievement of training objectives, and assessment of competence.

6.4.1.4 Training frequency

The FRMS training programme shall include both initial and recurrent training. Recurrent training may be conducted as a standalone course or integrated into SMS, Human Factors, Crew Resource Management, or non-technical skills training, where appropriate.

6.4.1.5 Training evaluation

The competence of all personnnel with responsibilities under the FRMS must be assessed to ensure they are capable of appropriately performing their roles and responsibilities.

Assessments shall be conducted against a designated standard consistent with the level of training provided. The primary purpose of assessment is to determine the extent to which trainees have acquired the required knowledge, skills, and awareness.

Different phases of training, such as awareness, knowledge, and skills may require different forms of assessment. Operators should develop assessments across multiple domains, such as multiple-choice questions, free-text responses, and verbal responses. Where appropriate, behavioural assessments should be included to verify that knowledge has been effectively integrated into professional fatigue management practices.

In addition, training survey results and feedback from participants may be used to support the continuous improvement of training content and instructor delivery methods.

6.4.1.6 Training program assurance and improvement

The training program shall be subject to an assurance process, including at least audit of training program, tracking of relevant SPIs, and formal annual review to ensure the training achieved the required outcomes and remains relevant to FRMS operational needs.

6.4.1.7 Training documentation

All FRMS documentation shall be recorded and maintained, including but not limited to FRMS training programmes, training attendance records, training materials, and training evaluation.

6.4.2 Communication plan

The applicant shall develop FRMS communication plan that:

- explains FRMS policies, procedures and responsibilities to all stakeholders, and
- describes communication channels used to gather and disseminate FRMS-related information.

The FRMS training programs are clearly an important part of the communication plan. Since training intervals are annual, ongoing communication with stakeholders is required. Appropriate communication channels should be used to report FRMS activities and safety performance of FRMS, sustain attention to fatigue-related issues, and encourage the continuing commitment of all stakeholders to the FRMS processes, which may include electronic media (Websites, online forums, email), newsletters, bulletins, seminars, periodic campaigns in strategic channels, etc.

Communication content of FRMS activities and safety performance, provided by the FSAG or other designated management, shall be clear, timely, and credible (i.e., consistent with facts and previous statements). Information should be tailored to the needs and roles of each stakeholder group to ensure it is relevant, practical, and concise.

To achieve this outcome, the FRMS communication should address the following:

- The confidentiality of crew communications (e.g. reports, surveys) and of the data derived from such activities,
- A policy outlining the ethical use of information and data obtained from crew communications,
- Confirmation of receipt for all fatigue reports submitted by personnel,
- Feedback to reporters upon completion of any enquiry or investigation related to a fatigue report, summarizing the findings and any associated actions,
- Availability of FSAG minutes (or equivalent committee minutes) to all stakeholders via appropriate distribution channels, de-identification should be applied where necessary to protect confidentiality,
- Accurate, concise, and timely FRMS publications (for example, printed materials, electronic publications, SMS messaging, social media) regarding fatigue and FRMS safety performance that are:
    - developed and disseminated to all stakeholders,
    - endorsed by the CEO,
    - produced regularly to ensure fatigue issues are brought to the attention of stakeholders, updates are expected following FSAG meetings,
    - appropriately focused to ensure fatigue messages are not obscured by other information,

- relevant with information about recent fatigue events, hazards and/or investigations to demonstrate the need for vigilance,
- supported by method for assessing the uptake/readership/effectiveness of the messages and messaging system
- designed to reinforce the concept of shared responsibility and support an open and fair reporting culture.

The communication plan needs to be described in the FRMS documentation and assessed periodically as part of FRMS assurance processes.

7. FRMS Approval process

7.1 Application package for an FRMS approval

To apply for approval of an FRMS approval, the applicant shall submit an application package for approval. This package shall include, but not be limited to, the following elements:

- Application form for an approval of FRMS,
- Gap analysis Tool,
- Safety case,
- FRMS implementation plan,
- FRMS documentation

7.1.1 Application form

Where an operator intends to apply for approval of an FRMS, the operator shall complete and submit an application form identifying the intended scope of operations, together with all required documentation, to the CAAT.

The application form for approval of an Individual Flight Time Specification Scheme (IFTSS) is provided in Appendix F of this Guidance Material.

7.1.2 Gap analysis Tool

The Gap Analysis Tool for IFTSS Outside Prescriptive Regulations for which FRMS is required provides a detail for assessing existing processes and for identifying areas requiring further development. The review and completion of this analysis shall assist the applicant in understanding the applicable requirements for FRMS and, as such, constitute a critical element of preparation for FRMS implementation where applicable.

Through the conduct of a comprehensive Gap Analysis tool, the applicant shall identify:

- elements of the proposed FRMS that are already available in existing systems and processes,
- existing systems and processes that could be modified to meet the needs of proposed FRMS (to minimize “reinventing the wheel”),
- where new systems and processes need to be developed for the proposed FRMS.

The Gap Analysis Tool for operators whose scope of operations requires a Fatigue Risk Management System (FRMS) is provided in Appendix G: G2 - IFTSS Gap Analysis Tool (FRMS Required) of this Guidance Material.

7.1.3 Safety case

A safety case is a key component of an application for FRMS approval. It is a structured and documented submission in which the applicant demonstrates that the proposed FRMS can be implemented without adversely affecting safety, that fatigue-related risks are identified, assessed, and controlled to an acceptable level, and based on scientific principles to maintain crew member alertness at a level that ensures operational safety.

The safety case shall be proportionate to the nature, scope, and complexity of the proposed FRMS and shall be based on scientific principles, operational experience, and relevant safety data, supporting the determination the proposed FRMS achieves a level of safety equivalent to, or better than, that provided by prescriptive requirements.

In preparing the Safety Case for FRMS, the applicant shall include appropriate information on existing and proposed processes, as well as planned activities. This demonstrates that the applicant understands and intends to mitigate any fatigue-related risks inherent in operating outside the relevant prescriptive limits.

A comprehensive Safety Case should include, at a minimum:

- Description of the proposed FRMS operation and its supporting processes, including operational scope and applicability,
- Proposed limits under the proposed FRMS identifying each prescriptive limit that the applicant seeks to exceed, including the extent of the exceedance and the circumstances under which it applies,
- Processes to identify fatigue hazards of each planned exceedance,
- Risk assessments for all identified fatigue hazards associated with each exceedance,
- Scientific principles supporting the proposed mitigations for each fatigue risk,
- Mitigation deployment and safety assurance processes,
- Resolution of fatigue risk issues,
- The system for collecting data and relevant evidence to support the implementation of the proposed processes.

CAAT shall consider the applicant's capability to develop and demonstrate a safety case for FRMS as indicative of its ability to establish and maintain effective fatigue management for the proposed FRMS. The proposed safety case shall be assessed, as applicable to FRMS, using the following steps:

1) assessing the nature, scope and impact of the proposed FRMS,
2) assessing hazard and consequence identification,
3) evaluating the fatigue-risk assessment methodology and how the decision to accept risk has been made,
4) assessing the appropriateness of the risk mitigation measures,
5) assessing whether the claims, arguments and evidence made in the safety case are valid,
6) assessing plans for continued monitoring of the safety impact of the proposed limits, work schedules and mitigations, and
7) assessing the previous safety behaviours demonstrated throughout the organization (including safety reporting policies and practices).

The details of the Evaluation steps for a proposed FRMS Safety Case are provided in Appendix H of this Guidance Material.

7.1.4 FRMS implementation plan

The FRMS implementation plan shall be developed based on the results of the gap analysis and the safety case for the proposed FRMS. It shall provide a structured approach for the applicant to:

- address and resource gaps identified in existing processes and procedures,
- define implementation processes to manage these gaps within operations and across the organization,
- assign responsibility to appropriate functions for the actions to be taken, and
- proceed with implementation in a safe manner using realistic timelines.

The plan shall reflect the applicable requirements and demonstrate that all necessary processes and procedures are in place and capable of managing fatigue-related risks prior to the trial. It shall also specify the anticipated timelines for the implementation of the FRMS application processes and for the submission of associated documentation and supporting evidence, thereby enabling CAAT to allocate resources for timely review and response.

7.1.5 FRMS documentation

The operator shall submit documentation containing the required information, processes, and procedures applicable to the scope of operations to enable CAAT to conduct an assessment in accordance with the applicable requirements.

The applicant may submit a standalone Fatigue Risk Management System (FRMS) manual, an Operations Manual incorporating the associated processes, or a Safety Management System (SMS) Manual incorporating the associated processes applicable to FRMS. Regardless of the format selected, any deviation and derogation for which an FRMS is required shall be supported by an FRMS manual (however titled) that contains all required FRMS elements, including, but not limited to, the following:

- FRMS policy and objectives,
- FRMS processes and procedures,
- Accountabilities, responsibilities and authorities for these processes and procedures,
- Mechanisms for ongoing involvement of management, crew members, and all other involved personnel,
- FRMS training programs, training requirements, and attendance records,
- Scheduled and actual flight times, duty periods, and rest periods with deviations and reasons noted, and
- FRMS outputs including findings from collected data, recommendations, and actions taken.
- FSAG terms of reference.

Guidelines to support the development of the FRMS Manual are provided in Chapter 6 - Introduction to FRMS of this Guidance Material.

7.2 FRMS Approval process

The approval process for FRMS is a systematic and progressive approach for obtaining approval. This process enables the applicant to demonstrate that the proposed deviation or derogation is supported by an adequate safety case for the management and mitigation of fatigue, including provisions for continuous monitoring.

The approval process comprises five phases, which shall be completed in sequence. Each phase includes specific tasks that shall be satisfactorily completed before the applicant may proceed to the subsequent phase. The five phases are as follows:

- Phase 1: Pre-application and Planning
- Phase 2: Formal Application
- Phase 3: Documentation and Data Collection Plan evaluation
- Phase 4: Demonstration and Validation
- Phase 5: Approval, Implementation, and Monitoring

7.2.1 Phase 1: Pre-application and Planning

Prior to developing an application package for FRMS approval, the applicant shall contact the Flight Operations Standards Department (OPS) of the Civil Aviation Authority of Thailand (CAAT) to arrange a meeting to discuss its intention to operate under the proposed FRMS. The meeting may be conducted in person or by teleconference. During the meeting, the applicant shall present its intended scope of operations and relevant documentation associated with the FRMS approval process. The meeting shall also provide the applicant with an opportunity to seek clarification on any aspect of the approval process.

The proposed FRMS implementation plan shall be developed and made available for discussion at the pre-application meeting. The plan should be based on fatigue modelling data or other scientific data or research that supports the proposed FRMS. The applicant shall establish fatigue risk assessment (FRA) and safety assurance (SA) processes to identify and document fatigue-related risks and to implement appropriate mitigations to reduce their likelihood and severity. These FRA and SA processes shall be applied in the development of operational procedures associated with the proposed FRMS throughout the approval process and shall be supported by data and appropriate fatigue analysis methods.

In this phase, the applicant shall:

- conduct a needs analysis to define the specific operational conditions for which the proposed FRMS is sought, including justification for operating outside prescriptive flight, duty, and rest requirements,
- identify the operational procedures requiring FRMS and the associated application of an approved FRMS, with reference to the relevant regulatory provisions and supporting justification,
- demonstrate how the proposed operational procedures provide adequate fatigue mitigations for the deviation from prescriptive requirements,
- develop a draft FRMS implementation plan for discussion,
- complete the applicable gap analysis tool, and
- prepare the application form for FRMS.

7.2.2 Phase 2: Formal application

The applicant shall develop a formal application package for FRMS for preliminary review by CAAT. Once the application package is complete, it shall be submitted electronically through the CAAT system.

The formal application package shall include, but not limited to:

- application form,
- Completed Gap analysis tool,
- Safety case,
- FRMS implementation plan,
- FRMS documentation, as applicable

In this phase, CAAT shall review the submitted application package to verify the completeness and availability of all documentation required for the formal application. A detailed evaluation of the content shall be conducted in Phase 3.

During this phase, the operator's capability to address safety risk management deficiencies shall be verified to confirm that the Safety Management System (SMS) is sufficiently mature and effective to manage fatigue risk and support FRMS. Where this prerequisite is not met, the application shall be returned to the operator for further improvement.

Upon satisfactory verification, CAAT shall issue an acceptance letter of formal application package for FRMS and proceed to Phase 3.

The applicant shall also develop a data package to serve as a repository for all collected and analysed data. In addition, the applicant shall maintain records of all amendments to draft operational procedures in order to demonstrate policy and procedural changes during the FRMS approval process.

7.2.3 Phase 3: Documentation and Data Collection Plan evaluation

7.2.3.1 Documentation evaluation

Upon satisfactory completion of Phase 2, the applicant may proceed to Phase 3. During this phase, CAAT shall conduct a comprehensive review and evaluation of the applicant's data collection plan and all documentation submitted as part of the formal application for FRMS approval, including the policies, processes, and procedures supporting FRMS operations during data collection and analysis.

In this phase, CAAT shall, as applicable:

- interview the FRMS manager and verify the composition of the FRMS team and relevant functions, including the Fatigue Safety Action Group (FSAG), where required,
- evaluate the applicant's FRMS documentation describing the policies, processes, and procedures supporting FRMS flight operations during data collection,
- assess the proposed data collection flight plans to determine anticipated fatigue levels,
- determine whether the proposed FRMS demonstrates effective fatigue management to ensure that relevant personnel maintain adequate levels of alertness,
- review safety case and any fatigue modelling analysis used to support the proposed FRMS, including the justification for the modelling approach and all underlying assumptions, parameters, initial conditions, and the safety standard used as the baseline for evaluating fatigue or performance estimates under FRMS,
- validate and approve the data collection plan and confirm that the proposed data collection and analysis methods are sufficient to demonstrate an effective FRMS, and
- monitor readiness and confirm completion of all approval processes for temporary approval (trial implementation).

The applicant shall amend the documentation related to FRMS to ensure that crew members, including all relevant functions, comply with the approved FRMS operational procedures whenever the FRMS is applied to a flight or series of flights. The amended documentation shall be submitted to CAAT for approval prior to implementation.

7.2.3.2 Assessment checklist

The checklist OPS-TCOMI-310: OPS - FRMS Documentation Evaluation shall be used to evaluate the proposed FRMS.

The checklist OPS-TCOMI-311: OPS - FRMS Key Personnel Assessment shall be used to interview FRMS Key personnel.

Upon satisfactory completion of Phase 3, the applicant shall be granted provisional approval authorizing the applicant to conduct a trial implementation in accordance with the approved data collection and analysis plan for the proposed FRMS.

The duration of the trial implementation shall be specified and agreed upon for a period of up to 24 months, depending on the nature of the proposed FRMS. Reporting intervals shall be established, documented, and agreed between the applicant and CAAT to ensure effective monitoring of the approved trial implementation.

7.2.4 Phase 4: Demonstration and Validation

Once provisional approval for trial implementation has been granted, the applicant shall collect and analyse data in accordance with the approved plan and submit reports to CAAT at the agreed intervals. All collected and analysed data shall be compiled into a data package. Throughout the trial, the applicant shall also collect and analyse supplementary data, including fatigue reports, and incorporate such data into the data package. Upon completion of data collection, analysis, and compilation, the applicant shall submit the data package together with the assessment results to CAAT for review and validation.

7.2.4.1 Trial implementation

For the data collection and analysis during trial implementation, the applicant shall:

- describe the aggregate findings and issues identified for each measure specified in the approved data collection plan,
- provide detailed information demonstrating how the results relate to the defined performance baseline and safety standards established in the data collection plan,
- demonstrate how the results confirm the effectiveness of the proposed FRMS relative to operations conducted within prescriptive requirements, and
- identify any evidence of excessive fatigue associated with the proposed FRMS operations and describe the mitigations implemented to ensure that the FRMS demonstrates continued effectiveness and compliance.

CAAT shall evaluate the data analysis results to determine whether they demonstrate the effectiveness of the proposed FRMS operation and may, as necessary, issue findings or request additional information.

Where findings are issued by CAAT, the applicant shall, within the initial approved duration of the trial implementation, as applicable:

- adjust the data collection plan accordingly and provide CAAT with evidence demonstrating the effectiveness of any proposed mitigations; and/or
- amend the proposed FRMS policies, processes, and procedures, as necessary, to support the revised data collection and analysis outcomes.

Any change to the proposed FRMS during the trial implementation shall be managed in accordance with the management of change process. CAAT shall evaluate the proposed amendments to determine whether the revised policies, processes, and procedures adequately support the proposed FRMS. Any amendment to the data collection plan or associated mitigations is subject to CAAT approval prior to implementation.

7.2.4.2 Assessment checklist

The checklist OPS-TCOMI-414: OPS - FRMS approval shall be used to assess demonstration and validation of the proposed FRMS.

7.2.4.3 Final report and Data package

Upon completion of the trial implementation within the temporary approved duration, the applicant shall submit the final report and data package to CAAT for validation. CAAT shall:

- Approve the proposed FRMS once CAAT is satisfied that the trial implementation is fully functional and delivers an acceptable level of safety performance; or
- Disapprove the proposed FRMS and apply appropriate corrective actions or enforcement measures commensurate with the level of safety risk associated with the deficiency.

7.2.4.4 Extension of temporary approval (Trial implementation)

Where the duration of the initially approved trial implementation is insufficient to allow the collection of adequate data to support the proposed FRMS, CAAT may extend the validity period of the trial implementation approval by means of an official notification.

The trial implementation may be extended to a maximum of 2 times, and the total duration of extension shall not exceed the duration of initial approval duration of trial implementation. Any written request by the operator for an extension beyond the period specified in the initial temporary approval shall be considered by CAAT.

CAAT may also extend the duration of the trial approval by issuing a new trial approval on its own initiative if CAAT considers that aviation safety requires a longer trial implementation approval period before FRMS implementation approval.

7.2.4.5 Suspension or Revocation of the temporary approval of trial implementation

CAAT may suspend or revoke a trial implementation approval under the following circumstances:

- the applicant does not comply with the requirements for implementation or use of FRMS within agreed duration, or
- CAAT considers that continued implementation or use of the proposed FRMS would adversely affect aviation safety, or
- the applicant refuses to grant CAAT reasonable access to any information or records produced under, or in support of FRMS, as requested in writing by CAAT for the purpose of assessing the effectiveness and safety of the proposed FRMS.

While it is anticipated that circumstances leading to the revocation of a trial approval will be infrequent, operators should note that such approval remains contingent upon CAAT being satisfied with respect to the requirements.

To maintain this satisfaction, CAAT requires access to information and records relating to the FRMS to assess its effectiveness. Should circumstances arise during the trial in which the operator fails to provide CAAT with the required information and records, CAAT may determine that the conditions of approval are no longer being met and may initiate action to suspend or revoke the trial approval.

7.2.4.6 FRMS documentation

Finally, the applicant shall finalize the documentation related to FRMS to ensure that crew members, schedulers, dispatchers, personnel exercising operational control, and personnel with direct management oversight comply with the approved FRMS operational procedures whenever the FRMS is applied to a flight or series of flights. The amended documentation shall be submitted to CAAT for approval.

7.2.5 Phase 5: Approval, Implementation, and Continued Oversight

7.2.5.1 FRMS implementation approval

Upon satisfactory completion of phase 4, CAAT may grant FRMS approval to operate in accordance with the approved FRMS flight operations, through the issuance of a written FRMS implementation approval, including:

- the proposed FRMS operations (e.g. specific route, schedule, etc.),
- an ongoing safety assurance program,
- Agreed method to report the implementation of flight operations conducted under FRMS),
- CAAT oversight plan

An approval for FRMS issued by CAAT shall remain valid unless suspended or revoked, provided the operator continues to comply with all applicable regulatory requirements, approved FRMS operational procedures, and associated reporting obligations. Such approval shall remain subject to ongoing oversight by CAAT, including audits, inspections, and review of submitted data.

CAAT may suspend or revoke the approval where the FRMS no longer meets applicable safety requirements or where the operator fails to maintain continued compliance. Detailed guidelines for Enforcement to the approved FRMS are provided in 7.2.5.4 of this Guidance Material.

7.2.5.2 Oversight process for FRMS

In the oversight of an operator's approved FRMS, CAAT shall verify that all processes associated with the approved FRMS are implemented in an integrated and coordinated manner, consistent with the scope and complexity of the applicable operations, and that the system continues to support the achievement and maintenance of an acceptable level of safety performance. For effective monitoring, oversight shall be conducted biannually during the first year following approval, and annually thereafter.

Both CAAT and the operator should monitor new developments in fatigue-related research and scientific evidence to ensure that oversight activities remain informed by current knowledge of fatigue risk.

A continued oversight plan for an approved FRMS shall be established to ensure the effective and systematic conduct of ongoing surveillance. The oversight plan shall define the scope and frequency of oversight activities and may include scheduled audits, desktop assessments, on-site inspections, and periodic reviews of safety performance indicators (SPIs) and other FRMS performance data.

In conducting oversight of an operator's FRMS, the effectiveness of the operator's safety assurance activities shall be evaluated by CAAT through the analysis of trends in established safety performance indicators (SPIs) and the assessment of performance against the agreed safety performance targets. It shall be verified that adverse or emerging trends are systematically identified, analysed, and managed, as necessary, through the application of risk assessment and mitigation processes.

Evidence for this evaluation shall be obtained, at a minimum, through the assessment of the following:

- amendments, corrections, or additions made to the FRMS documentation, processes, or procedures following initial approval,
- adjustments to prescribed outer limits, operational parameters, and associated mitigation measures in response to safety data or performance outcomes,
- organisational or operational changes that may affect the effectiveness of the approved FRMS,

- the adequacy and effectiveness of training programmes and training delivery, including the review of relevant personnel training records, and
- the scope, quality, and effectiveness of internal audits conducted to ensure continued conformity with approved FRMS processes.

7.2.5.3 Assessment checklist

The checklist OPS-TCOMI-415 OPS - Implementation of FRMS shall be used to oversight the approved FRMS.

7.2.5.4 Enforcement to the approved FRMS.

CAAT may enforce an approved FRMS under the following circumstances:

- The applicant does not comply with the requirements for implementation or use of an approved FRMS, or
- CAAT considers that continued implementation or use of the approved FRMS would adversely affect aviation safety, or
- The applicant refuses to grant CAAT reasonable access to any information or records produced under, or in support of FRMS, as requested in writing by CAAT for the purpose of assessing the effectiveness and safety of the proposed FRMS.

When deficiencies are identified within an approved FRMS, CAAT shall apply appropriate corrective or enforcement measures commensurate with the level of safety risk associated with the deficiency. Such measures may range from the requirement for administrative or operational changes within the approved FRMS to the suspension or revoke of FRMS approval.

The alternative enforcements, in increasing severity, are as follows:

a) The operator on notice to improve FRMS processes

Where CAAT oversight activities identify concerns that an operator's FRMS does not fully comply with applicable regulatory requirements, CAAT shall formally notify the operator and provide an opportunity to address the identified deficiencies. Based on audit findings, CAAT shall issue documented observations and findings and require the operator to develop and submit a corrective action plan (CAP) acceptable to CAAT. The implementation of the CAP shall be monitored by CAAT to verify that the deficiencies are effectively resolved within the agreed timeframe.

b) CAAT-mandated adjustment of maximum and/or minimum values (Suspension of an approved FRMS)

Where CAAT oversight activities identify that any element of an operator's FRMS is ineffective or does not achieve the intended level of safety performance, CAAT may require the operator to revise the established maximum and/or minimum operational values, including associated parameters and controls. Any CAAT-mandated suspension of an approved FRMS shall remain in effect until the operator demonstrates, through its change management and safety assurance processes, that the identified deficiencies have been effectively addressed and that the FRMS is functioning as intended, to the satisfaction of CAAT. The restoration of previously approved values shall be subject to CAAT review and formal acceptance.

c) Revocation of an approval for FRMS

Where a significant safety concern exists and has not been effectively resolved through preceding enforcement actions, the operator's FRMS approval shall be revoked by CAAT, and the operator

shall be required to conduct operations in accordance with the applicable prescriptive flight and duty time limitations.

While operating within prescriptive limitations, the operator may continue to develop and enhance its FRMS processes in order to address identified deficiencies and to re-establish regulatory confidence. An application for reinstatement of FRMS approval may be submitted to CAAT once objective evidence is available demonstrating that the FRMS system complies with applicable regulatory requirements.

Where CAAT determines that a revised FRMS is acceptable but not yet sufficiently mature or demonstrated to be effective, approval of FRMS may be granted subject to restrictive conditions. Such approval may include the application of operational limitations, including reduced maximum flight and duty periods and/or increased minimum rest periods, until CAAT is satisfied that FRMS operates effectively and consistently at an acceptable level of safety performance.

Appendix A - Example of FSAG Terms of Reference

The example provided below is not a template. The applicants should select and adapt only those elements that are applicable to their operations.

[Insert Company Name] Terms of Reference: Fatigue Safety Action Group (FSAG)

Purpose

The Fatigue Safety Action Group (FSAG) is responsible for coordinating all Fatigue Risk Management System activities at [insert Company name]. This includes responsibility for gathering, analyzing, and reporting on data that measures fatigue among flight crewmembers. The FSAG is also responsible for ensuring that the FRMS meets the safety objectives defined in the FRMS Policy, and that it meets regulatory requirements. The FSAG exists to improve safety, and does not get involved in industrial issues.

Terms of Reference

The FSAG is directly responsible to the Senior VP Flight Operations and reports through the Departmental Safety organization. Its membership will include at least one representative of each of the following groups: management, scheduling, and crewmembers, with other specialists as required.

The tasks of the FSAG are to:

- develop, implement, and monitor processes for the identification of fatigue hazards,
- ensure that comprehensive risk assessment is undertaken for fatigue hazards,
- develop, implement, and monitor controls and mitigations as needed to manage identified fatigue hazards,
- develop, implement, and monitor effective FRMS performance metrics,
- cooperate with the Safety Department to develop, implement and monitor FRMS safety assurance processes, based on agreed safety performance indicators and targets,
- be responsible for the design, analysis, and reporting of studies that measure crewmember fatigue, when such studies are needed for the identification of hazards, or for monitoring the effectiveness of controls and mitigations (such studies may be contracted out but the FSAG is responsible for ensuring that they are conducted with the highest ethical standards, meet the requirements of the FRMS, and are cost-effective),
- be responsible for the development, updating, and delivery of FRMS education and training materials (these activities may be contracted out but the FSAG is responsible for ensuring that they meet the requirements of the FRMS and are cost-effective),
- ensure that all relevant personnel receive appropriate FRMS education and training, and that training records are kept as part of the FRMS documentation,
- develop and maintain strategies for effective communication with all stakeholders,
- ensure that crewmembers and others receive responses to their fatigue reports,
- communicate fatigue risks and the performance of the FRMS to senior management,
- develop and maintain the FRMS intranet site,
- develop and maintain the FRMS documentation,

- ensure that it has adequate access to scientific and medical expertise as needed, and that it documents recommendations made by these specialist advisors and the corresponding actions taken,
- keeps informed of scientific and operational advances in Fatigue Risk Management System principles and practice,
- cooperate fully with the regulator in relation to FRMS auditing, and
- manage effectively and be accountable for FRMS resources.
- The FSAG will meet monthly. Minutes will be taken during meetings and distributed within 10 working days after each meeting. The FSAG will present an annual budget request in [designated part of the financial cycle] and an annual report of all expenditures.

Appendix B - Bio-Mathematical Models (BMMs)

Bio-mathematical fatigue models were originally developed as scientific tools to examine interactions between sleep loss, circadian rhythms, workload, and other factors influencing human alertness and performance. These models are created by calibrating computer simulations against empirical fatigue and performance data obtained from controlled laboratory studies (developmental data sets). After initial calibration, the models are further tested using new fatigue data collected from different experimental or operational conditions (validation data sets).

Scientific modelling is a continuous improvement process. Bio-mathematical models represent complex physiological processes and are therefore understood to be incomplete and subject to refinement. Model development typically involves ongoing efforts to identify where the model fails to predict observed fatigue outcomes, enabling researchers to improve underlying assumptions and increase model accuracy.

Several bio-mathematical models have been commercialized and marketed as tools to predict and identify fatigue hazard associated with scheduling. Several non-commercial models are also available in the public domain. When applied appropriately, these models may support FRMS processes by illustrating dynamic interactions such as sleep loss and recovery, and circadian biological clock, which may be difficult to visualise without computational assistance.

However, effective use requires a clear understanding of the capabilities and limitations of each model, including the extent to which data has been validated against fatigue data from similar and comparable operations.

BMMs Capabilities and Limitations

Currently available bio-mathematical fatigue models generally:

- predict group average fatigue levels, not the fatigue levels of individual crew members,
- do not account for impact of workload or personal and work-related stressors that may influence fatigue,
- do not account for the individual mitigation strategies that may or may not be applied, such as caffeine consumption, exercise, or napping, etc.,
- do not predict the safety risk associated with fatigue of crew members in a particular operation and therefore cannot replace operational risk assessment,
- Some models attempt to predict safety risk using data from various industries, however, the applicability of these methods to aviation operations has not been validated.
- Some BMMs cannot calculate or predict fatigue levels for work schedules that involve crossing multiple time zones, as they cannot adequately account for circadian disruption associated with large time-zone shifts and circadian misalignment.

Appropriate use within an FRMS

BMM outputs generated by a bio-mathematical modelling tool are intended to support Fatigue Risk Management System by identifying potential fatigue trends and hazards, and shall not be used for ‘go/no-go’ decision-making. A score produced by a BMM does not indicate that a schedule is free from fatigue risk, nor does it imply that additional fatigue mitigations would not be beneficial to flight crew member performance.

The most reliable use of current models is for assessing relative fatigue levels, such as determining whether one schedule presents a greater fatigue hazard than another schedule. Model predictions

should not be used solely when making decisions about schedule design, they must be interpreted together with operational experience and relevant fatigue-related data.

Training Requirements for the Use of Bio-Mathematical Fatigue Models

It is essential that all personnel involved in the implementation and operation of the FRMS have a general understanding of the limitations associated with fatigue predictions generated by the BMM used by the organization. Personnel responsible for entering data into the model and for generating or interpreting fatigue predictions shall complete specific training. This training should address at least the following:

- methods for accurate collection, handling and analysis of fatigue-related data,
- the use of appropriate default and/or adjusted parameter settings, and the correct procedures for data input into the BMM,
- the influence of predicted versus actual sleep data on BMM fatigue predictions within a duty or flight duty period (FDP),
- the correct interpretation of BMM fatigue-risk outputs, and
- the limitations of fatigue predictions when applied to scheduled operations.

For additional information, the Australian Civil Aviation Safety Authority has published the **Bio-mathematical Fatigue Models Guidance Document**, which provides detailed guidance on the use of bio-mathematical models in Fatigue Risk Management System processes.

Appendix C - Example of Fatigue Report Form

Fatigue Report Form

IF CONFIDENTIALITY REQUIRED TICK HERE •

NAME | Employee No. | Pilot/CCM (circle)

WHEN DID IT HAPPEN?

Local report date | Time of event (local report time)

Duty description (trip pattern)

Sector on which fatigue occurred — From | To

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

Aircraft type | Number of crew

WHAT HAPPENED?

Describe how you felt (or what you observed)

Please circle how you felt

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

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

alert ---------- drowsy

WHY DID IT HAPPEN?

Fatigue prior to duty?	Yes / No	How long had you been awake when the event happened?	hrs mins
Hotel	Yes / No		
Home	Yes / No	How much sleep did you have in the 24 hrs before the event?	hrs mins
Duty itself	Yes / No		
In-flight rest	Yes / No	How much sleep did you have in the 72 hrs before the event?	hrs mins
Disrupt	Yes / No		
Personal	Yes / No	flight deck nap? Yes / No	If yes, when start end
Other comments			

WHAT DID YOU DO? Actions taken to manage or reduce fatigue (for example, flight deck nap)

WHAT COULD BE DONE? Suggested corrective actions

Appendix D - Measurement tools

Fatigue Risk Assessment (FRMS) and FRMS Safety Assurance processes may require the measurement of an individual's fatigue, sleep, performance, or workload. As no single measurement method is considered a universal standard, multiple validated measures may be used to support fatigue risk assessment.

When selecting measurement tools, operators shall ensure that:

a) the measure is scientifically validated for its intended purpose,
b) the measure does not interfere with the performance of operational duties,
c) the measure has prior application in aviation to enable data comparability.

It is important that the FRMS apply measurement methods that are accepted by States, operators, operational personnel, and scientific authorities, in order to ensure data reliability and avoid unnecessary cost or burden.

The type and extent of data collected shall be proportionate to the expected level of fatigue risk. Each type of measure has strengths and weaknesses. Lower risk scenarios may be addressed using simpler and less intrusive measures, while higher risk scenarios shall be supported by more comprehensive assessment methods.

Measurement tools may be subjective or objective, each with identified strengths and weaknesses. A summary of available measures and their characteristics is provided in Table D-1, with further guidance available in applicable implementation manuals.

Table D-1. Summary of fatigue, sleep, performance and workload measures

	Measurement Tool	Subjective / Objective	Strengths	Weaknesses
Fatigue	Fatigue reports	Subjective	Simple, cost-effective, possibly completed online, allow immediate identification of possible fatigue risk	Subject to possible bias, requires an effective reporting culture
	Retrospective surveys	Subjective	Simple, cost-effective, large amounts of data can be collected	Subject to recall bias, items not always well validated
	Rating scales (e.g. KSS, SP, VAS)	Subjective	Simple, cost-effective, quick to complete, large amounts of data can be collected, many scales well used in aviation	Subject to possible bias
	Physiological measures (e.g. EEG, EOG)	Objective	Objective and not subject to bias	Intrusive, burden on individual, time consuming, labour intensive, expensive, artefact (noise) in data can be a problem
Sleep	Retrospective surveys	Subjective	Simple, cost-effective, large amounts of data can be collected, some well used in aviation	Subject to recall bias, items not always well validated
	Sleep diaries	Subjective	Simple, cost-effective, can obtain multiple measures at once (e.g. sleep and fatigue ratings), diaries well used in aviation	Subject to recall bias, most diaries not well validated, multiple days of data need to be collected, some burden on individuals
	Actigraphy	Objective	Objective and not subject to bias, well used in aviation	Moderately intrusive, burden on individual, analysis time consuming, labour intensive, moderate costs
	Polysomnography	Objective	Objective and not subject to bias, has been used in aviation	Intrusive, burden on individual, time consuming, expensive, labour intensive
Circadian rhythms	Physiological measures (e.g. core body temperature, melatonin)	Objective	Objective and not subject to bias, have been used in aviation	Intrusive, burden on individual, time consuming, expensive, labour intensive, artefact (noise) in data can be a problem
Performance	Retrospective surveys	Subjective	Simple, cost-effective, large amounts of data can be collected	Subject to bias, items not always well validated
	Performance tests (e.g. PVT)	Objective	Objective and not subject to bias, some measures have been well used in aviation	Moderately intrusive, burden on individual, analysis time consuming, labour intensive, moderate costs, distraction in testing environment may be an issue
Workload	Ratings scales (e.g. NASA TLX[44], Overall Workload Scale, VAS)	Subjective	Simple, cost-effective, some scales have been used in aviation	Subject to bias, items not always well validated
	Physiological measures (e.g. EEG, ECG)	Objective	Objective and not subject to bias	Invasive, time consuming, expensive, labour intensive, artefact (noise) in data can be a problem

Appendix E - Recommended Fatigue Training Topics

This appendix outlines the recommended fatigue management topics for inclusion in training programmes, applicable to organizations operating within prescriptive fatigue management requirements as well as those implementing a Fatigue Risk Management System (FRMS). The applicants should select the topics relevant to their operational context.

Prescriptive Approach	FRMS
Target Group: Individual operational personnel	
• The scientific principles that underpin fatigue management. • Individual responsibilities and those of the operator, for managing fatigue. • Causes and consequences of fatigue in the operation(s) in which they work. • How to identify fatigue in themselves and others. • How to use fatigue reporting systems, including how to report that they are too fatigued to undertake safety critical duties. • Personal strategies that they can use to improve their sleep at home and to minimize their own fatigue risk, and that of others, while they are on duty. • Sleep disorders and their treatment, where to seek help if needed, and any requirements relating to fitness for duty. • The operational impact of changing hours of work, both internally and externally (e.g. noise abatement, disruption of those sleeping on base, air traffic control services, meteorological services, dispatch services, etc.)	• An overview of the FRMS structure and how it works in the operator's organization, including the concepts of shared responsibility and encouraging effective reporting. • Their responsibilities and those of the operator, in the FRMS. • The scientific principles that underpin FRMS. • Causes and consequences of fatigue in the operation(s) in which they work. • FRMS processes in which they play a vital role, particularly in the use of fatigue reporting systems and implementing mitigations. • The importance of accurate fatigue data (both subjective and objective). • How to identify fatigue in themselves and others. • Personal strategies that they can use to improve their sleep at home and to minimize their own fatigue risk, and that of others, while they are on duty. • Sleep disorders and their treatment, where to seek help if needed, and any requirements relating to fitness for duty. • The operational impact of changing hours of work, both internally and externally (e.g. noise abatement, disruption of those sleeping on base, air traffic control services, meteorological services, dispatch services, etc.)

Target Group: Personnel involved in schedule (roster) design and management	

• The scientific principles that underpin fatigue management.
• How scheduling affects sleep opportunities and can disrupt the circadian biological clock cycle, the fatigue risk that this creates, and how it can be mitigated through scheduling.
• Use and limitations of any scheduling tools and Bio-mathematical models or other algorithms that may be used to predict an individual's fatigue across a schedule/roster.
• How to identify fatigue in themselves and others.
• How fatigue reports are generated and analysed.
• Personal strategies that they can use to improve their sleep at home and to minimize their own fatigue risk, and that of others, while they are at work.
	• An overview of the FRMS structure and how it works in the operator's organization, including the concepts of shared responsibility and encouraging effective reporting.
	• The scientific principles that underpin FRMS.
	• How scheduling affects sleep opportunities and can disrupt the circadian biological clock cycle, the fatigue risk that this creates, and how it can be mitigated through scheduling.
	• Use and limitations of any scheduling tools and bio-mathematical models or other algorithms that may be used to predict the levels of an individual's fatigue across rosters/schedules.
	• Their role in the FRMS in relation to fatigue hazard identification and risk assessment.
	• Processes and procedures for planned schedule changes, including:
	  ◦ assessing the potential fatigue impact of planned changes,
	  ◦ early engagement of the FSAG in the planning of changes with significant potential to increase fatigue risk, and
	  ◦ implementing changes recommended by the FSAG.
	• How to identify fatigue in themselves and others.
	• Personal strategies that they can use to improve their sleep at home and to minimize their own fatigue risk, and that of others, while they are at work.
	• Basic information on sleep disorders and their treatment, and where to seek help if needed.

Target Group: Executive decision-makers and operational risk managers	
• The scientific principles that underpin fatigue management. • An overall understanding of crew members or controller fatigue and the safety risk that it represents to the organization. • The responsibilities and accountabilities of different stakeholders, including themselves, in fatigue management. • Links between fatigue management and other parts of the operator's safety management system. • Regulatory requirements for fatigue management. • How to identify fatigue in themselves and others. • Personal strategies that they can use to improve their sleep at home and to minimize their own fatigue risk, and that of others, while they are at work. • Basic information on sleep disorders so they can make organizational decisions about how to manage affected individuals	• An overall understanding of the scientific principles that underpin FRMS and the safety risk that fatigue represents to the organization. • An overview of the FRMS structure and how it works, including the concepts of shared responsibility and an effective reporting culture, and the role of the FSAG. • The responsibilities and accountabilities of different stakeholders, including themselves, in the FRMS. • An overview of the types of fatigue mitigation strategies being used by the organization. • FRMS safety assurance metrics used by the organization. Links between the FRMS and other parts of the operator's safety management system. • Links between the FRMS and other parts of the organization, for example the scheduling department, operational sections, medical department, safety department, etc. • Regulatory requirements for the FRMS. • How to identify fatigue in themselves and others. • Personal strategies that they can use to improve their sleep at home and to minimize their own fatigue risk, and that of others, while they are at work. • Basic information on sleep disorders, their treatment, and where to seek help if needed, so they can make organizational decisions about how to manage affected individuals.
Target Group: FSAG members	
Not Applicable	• All FRMS components and elements. • The responsibilities and accountabilities of different stakeholders in the FRMS. • Links between the FRMS and other parts of the operator's SMS. • Links between the FRMS and other parts of the organization, for example the scheduling department, flight operations, medical department, safety department, etc. • Regulatory requirements for the FRMS. • The scientific principles that underpin FRMS. • How to identify fatigue in themselves and others.

Appendix F - Application for Approval of Individual Flight Time Specification Scheme (IFTSS)

Application for Approval of

Individual Flight Time Specification Scheme (IFTSS)

PART A – Details of Applicant and Declaration

Please complete this form in BLOCK CAPITALS using black or dark blue ink. Please read the attached Submission Instructions before completing the technical sections of this form. The making of a false statement for the purpose of procuring the approval of the Individual Flight Time Specification Scheme (IFTSS) is an offence under the Air Navigation Act. The Civil Aviation Authority of Thailand may, in any case in which it thinks it is desirable, require the applicant to furnish such evidence as it may desire and to make and subscribe a statutory declaration as to the truth of the facts set out in the application as required by the TCAR OPS Part ORO (ORO.FTL.125/ ORO.FTLS.125) and associated AMC/GM including the CAAT Guidance Material for Approval of Individual Flight Time Specification Scheme (IFTSS).

An "X" shall be inserted in the applicable checkbox.

Details of the Applicant

Your contact details must be current. Please provide the details in this section as they appear on the current AOC.

Operator Name:			
AOC Number:		Expiry Date:	
Address:			
Postal code:		Telephone:	
Email:		Fax:	

Details of Contact Person

Contact details will be used for this application only, including any questions and/or fee estimates.

Full Name - Surname:			
Position:			
Email:			
Telephone:		Mobile:	

Type of Application

The applicant shall select the type, intending to apply, according to the CAAT Guidance Material for Approval of Individual Flight Time Specification Scheme (IFTSS).

☐ IFTSS within Prescriptive Regulations for which FRMS is required.
☐ IFTSS Outside Prescriptive Regulations for which FRMS is not required.
☐ IFTSS Outside Prescriptive Regulations for which FRMS is required.
☐ Changing of the FRMS Manager.

Details of FRMS Manager *In case the FRMS Manager is required, if the FRMS Manager is not the same person as the safety manager, please provide his/her qualifications, work experience, and relevant knowledge attached to this application form.* *In the event of a change in the FRMS Manager, please provide the details of the newly appointed FRMS Manager.*			
Full Name - Surname:			
Email:			
Telephone:		**Mobile:**	

Applicability of the proposed IFTSS		
☐ Flight Crew Only	☐ Cabin Crew Only	☐ Flight Crew and Cabin Crew

Description of Proposed IFTSS *Briefly describe the proposed Individual Flight Time Specification Scheme (IFTSS), including the specific operation(s), operational context, and applicable regulatory requirement(s) under TCAR-OPS Part ORO Subpart FTL/FTLS that necessitate or justify this application.*

Submission Checklist The following evidences shall be submitted with this application form:	
I hereby confirm that the following evidences have been included with the application form	
Application Form (This completed form).	Yes ☐ No ☐
Completed Gap Analysis Tool	Yes ☐ No ☐
Safety Case	Yes ☐ No ☐
FRMS implementation plan	Yes ☐ No ☐
FRMS documentation, as applicable	Yes ☐ No ☐
Any others, please specify... _____ _____	Yes ☐ No ☐

Declaration of Applicant			
I declare that the information provided on this form is true to the best of my knowledge and belief. I have fully reviewed all submission instructions and have submitted all of the necessary documents for my application to be considered.			
Name of Accountable Manager:			
Signature:		**Date:**	

PART B – For Official Use Only		
Date of receipt:		
Enclosures Checked by	**Name**	
	Position	
Application	☐ **Accept** ☐ **Reject** ☐ **Pending** (fill the remark)	
Remark		

Verification by OPS Manager	
Name – Last Name:	
Signature:	
Date:	

SUBMISSION INSTRUCTIONS

1. Having a clear form will enable the Authority to process this application form more efficiently, with less risk of errors or rejections with subsequent delays to your nomination.
2. Please note that failure to submit a correctly completed form with the required supporting documents will lead to the formal rejection of your nomination by the Authority.
3. After thoroughly reviewing this instruction and the documents to submit section please send your completed nomination and supporting documentation to the Authority.

Appendix G - Gap Analysis Tool

Appendix G1 - IFTSS Gap Analysis Tool (FRMS not required)

IFTSS Gap Analysis Tool (FRMS not required)

The CAAT IFTSS Gap Analysis Tool (FRMS not required) is based on the principles and concepts contained in ICAO guidance material and is intended to assist applicants in evaluating their existing systems, processes, and organizational capabilities against the requirements for establishing an Individual Flight Time Specification Scheme (IFTSS) Outside Prescriptive Regulations for which a Fatigue Risk Management System (FRMS) is not required, in accordance with TCAR-OPS Part ORO Subpart FTL/FTLS and the CAAT Guidance Material for Approval of Individual Flight Time Specification Scheme (IFTSS).

Conducting a gap analysis of the AOC holder's existing arrangements against the elements necessary to support the proposed IFTSS is an important preliminary step in determining the suitability of the proposed scheme. It enables the operator to identify strengths, deficiencies, resource requirements, and any additional controls necessary to ensure that fatigue-related risks associated with the proposed IFTSS can be effectively managed and monitored.

This tool does not replace applicable regulatory requirements, nor does it constitute a comprehensive compliance checklist. Rather, it serves as a structured self-assessment tool to assist the operator in determining its readiness to develop, implement, and maintain the proposed IFTSS and to identify any areas requiring further development prior to application.

Completion of this tool does not, in itself, constitute approval of the proposed IFTSS. CAAT will conduct an independent assessment of the application, supporting documentation, and associated evidence before determining whether the proposed IFTSS is acceptable. Nothing within this assessment process relieves the operator of its responsibility to ensure the continued safe conduct of operations and compliance with all applicable regulatory requirements.

Operator Name:	**AOC No.:**	

We confirm that the filled information is correct and complies with:

- TCAR OPS Air Operations Regulation and TCAR OPS Parts ORO Subpart FTL / FTLS.
- CAAT Guidance Material for Approval of Individual Flight Time Specification Scheme (IFTSS).
- Company Operations Manual (Please specify)

_____

_____

_____

Filled by Name:	Accountable Manager Name:
Signature:	Signature:
Position:	
Date:	Date:

No	Subject	AOC Manual/Document Reference	Operator Comment
1.	**Organizational Capability**		
1.1	Does the established SMS demonstrate a proven track record of managing standard IFTSS effectively before seeking approval of the proposed IFTSS?		
1.2	Does the SMS maturity level, based on previous CAAT oversight results and the annual review, indicate it can support the increased complexity of the proposed IFTSS?		
1.3	Are there any currently unresolved findings from CAAT specifically related to deficiencies in the operator's safety risk management?		
1.4	Does the operator have a documented process for identifying and addressing safety risk management deficiencies promptly through the operator's SMS?		
1.5	Is the safety risk management process capable of analyzing how the proposed IFTSS might impact existing safety performance targets?		
1.6	Does the organization have sufficient safety personnel with the competence to monitor the safety impact of the proposed IFTSS?		
1.7	Is the Operations Manual prepared to incorporate the specific procedures required for the proposed IFTSS?		
1.8	Does the operator prepare the method to declare flight operations that are specifically conducted under the proposed IFTSS?		
1.9	Has the Accountable Manager formally informed the proposed IFTSS and committed the resources necessary for its implementation and monitoring?		
1.10	Are the responsibilities and authorities for the implementation, oversight, and monitoring of the proposed IFTSS clearly defined?		
1.11	Have affected crew members and relevant operational personnel been consulted during the development of the proposed IFTSS and associated mitigations?		
2.	**Nature and Scope**		

No	Subject	AOC Manual/Document Reference	Operator Comment
2.1	Is there a comprehensive description of the nature, scope, and operational environment for the proposed IFTSS?		
2.2	Does the documentation clearly identify which prescriptive regulation (Subpart FTL/FTLS or CS-FTL) is being deviated?		
2.3	Does the scope identify the specific fleets, aircraft types, and configurations to which the proposed IFTSS will be applied?		
2.4	Does the scope identify the specific crew bases, routes, or city pairings where the proposed IFTSS will be applied?		
2.5	Are the circumstances under which the proposed IFTSS applies clearly documented (e.g., only for specific long-range flights or only under unforeseen circumstances)?		
3.	**Hazard identification and Risk assessment**		
3.1	Is there a documented hazard identification and risk assessment methodology appropriate for the nature and complexity of the proposed IFTSS?		
3.2	Is the methodology integrated within the existing SMS to ensure a systematic and data-driven approach to managing the proposed IFTSS?		
3.3	Are suitable tools used to analyze the likelihood and severity of the consequences of fatigue-related hazards?		
3.4	Are the proposed mitigation measures directly consistent with the nature of the proposed IFTSS?		
3.5	Does the risk assessment address worst-case operational scenarios and identify specific mitigations for them?		
3.6	Are specific mitigations identified for these worst-case scenarios to ensure an equivalent level of safety?		
3.7	Is there a process to ensure that all residual risks (risks remaining after mitigation) are formally accepted by the appropriate level of management?		
4.	**Safety Case Development**		
4.1	Has the performance baseline been established by monitoring fatigue and alertness levels of crew operating within current prescriptive limits?		

No	Subject	AOC Manual/Document Reference	Operator Comment
4.2	Does the safety case clearly describe the "expected impact" of the proposed IFTSS when compared against this established baseline?		
4.3	Have the specific maximum and/or minimum values of the proposed IFTSS been clearly defined in comparison with the prescriptive limits?		
4.4	Are the data collection tools clearly identified (e.g., sleep diaries, PVT, actigraphy, or subjective fatigue ratings)?		
4.5	Is there a justification for the sample size to ensure that data collected from affected crew members provides statistically meaningful results?		
4.6	If using data from other operators, has a comparability assessment been conducted (e.g., similar time zones, aircraft types, and crew complements)?		
4.7	Have Safety Performance Indicators (SPIs) and threshold values been defined to assess and monitor the data, if applicable?		
4.8	Are the proposed mitigation measures supported by scientific principles or validated operational data?		
4.9	Has the operator provided a clear conclusion demonstrating that the proposed IFTSS is not expected to increase fatigue levels or reduce alertness compared with the baseline, and that an acceptable level of safety will be maintained?		
4.10	Does the operator have a process to verify that the mitigation measures identified in the safety case are actually in place and effective?		
4.11	Has an implementation plan been established, including timelines, responsibilities, and monitoring arrangements?		
4.12	Is there a process to compile all data, including fatigue reports and aggregate findings regarding the proposed IFTSS, into a formal data package?		
4.13	Is there a defined reporting channel and interval for submitting the data package to CAAT during the implementation?		
4.14	Is there a procedure to adjust the data collection plan or mitigations if evidence of excessive fatigue is identified during the implementation?		
4.15	Does the operator understand that any significant changes to the proposed IFTSS during the implementation must be managed through a		

No	Subject	AOC Manual/Document Reference	Operator Comment
	Management of Change process and approved by CAAT?		

For CAAT Use	
Gap Analysis Assessment Result: ☐ SATIFY / ☐ UNSATIFY	
Comments:	
Verification by OMI Name:	Signature:
	Date:
Verification by POI Name:	Signature:
	Date:
Verification by OPS Manager Name:	Signature:
	Date:

Appendix G2 - Variation to IFTSS (FRMS required) Gap Analysis Tool

Variation to IFTSS (FRMS required) Gap Analysis Tool
The CAAT IFTSS Gap Analysis Tool (FRMS required) is based on the principles and concepts contained in ICAO guidance material and is intended to assist applicants in evaluating their existing systems, processes, and organizational capabilities against the requirements for establishing an Individual Flight Time Specification Scheme (IFTSS) for which a Fatigue Risk Management System (FRMS) is required, in accordance with TCAR-OPS Part ORO Subpart FTL/FTLS and the CAAT Guidance Material for Approval of Individual Flight Time Specification Scheme (IFTSS). Conducting a gap analysis of the AOC holder's existing arrangements against the elements necessary to support the proposed IFTSS is an important preliminary step in determining the suitability of the proposed FRMS. It enables the operator to identify strengths, deficiencies, resource requirements, and any additional controls necessary to ensure that fatigue-related risks associated with the proposed IFTSS can be effectively managed and monitored. This tool does not replace applicable regulatory requirements, nor does it constitute a comprehensive compliance checklist. Rather, it serves as a structured self-assessment tool to assist the operator in determining its readiness to develop, implement, and maintain the proposed IFTSS and to identify any areas requiring further development prior to application. Completion of this tool does not, in itself, constitute approval of the proposed IFTSS. CAAT will conduct an independent assessment of the application, supporting documentation, and associated evidence before determining whether the proposed IFTSS is acceptable. Nothing within this assessment process relieves the operator of its responsibility to ensure the continued safe conduct of operations and compliance with all applicable regulatory requirements.

Operator Name:	**AOC No.:**	

We confirm that the filled information is correct and complies with:
- TCAR OPS Air Operations Regulation and TCAR OPS Parts ORO Subpart FTL / FTLS.
- CAAT Guidance Material for Approval of Individual Flight Time Specification Scheme (IFTSS).
- Company Operations Manual (Please specify)

_____
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_____

Filled by Name:	Accountable Manager Name:
Signature:	Signature:
Position:	
Date:	Date:

No	Subject	AOC Manual/Document Reference	Operator Comment
1.	**FRMS Documentation**		
1.1	Where Fatigue Risk Management System (FRMS) is integrated within the Safety Management System (SMS), does the SMS framework demonstrate alignment and consistency with the FRMS requirements prescribed in TCAR OPS ORO.FTL.120 or ORO.FTLS.120?		
1.2	Where the Fatigue Risk Management System (FRMS) is incorporated within the Safety Management System (SMS) documentation, does the SMS documentation clearly identify, integrate, and describe the FRMS and its associated components and elements? **Note:** If the operator has established a separate FRMS Manual independent of the SMS Manual, this item may be recorded as "Not Applicable".		
1.3	Has an operations manual, exposition, or other documented material been developed that outlines all aspects relevant to the Fatigue Risk Management System (FRMS), such as an FRMS Manual?		
1.4	Has the Operations Manual and/or FRMS Manual clearly identified and described all processes, procedures, and records associated with the FRMS, including but not limited to: - FRMS policy and objectives - accountability, responsibilities, and authorities of FRMS personnel - related documentation and records - practical operating procedures - FRMS processes and procedures, including details of Fatigue Risk Assessment (FRA) and FRMS assurance methods - FRMS promotion procedures - FSAG Terms of Reference.		

No	Subject	AOC Manual/Document Reference	Operator Comment
1.5	Has an FRMS policy been established that: - Identify all elements of FRMS, including the objectives, documentation, practical operating procedures, procedures for hazard identification, risk assessment and mitigation, safety assurance, safety promotion procedures and change management. - Clearly define shared responsibility by management, flight and cabin crew members, and other involved personnel. - Clearly identify all operations to which the FRMS is applicable; - Appropriate to the size, nature and complexity of the operator; - State the safety objectives of the FRMS; - Is signed and clearly endorsed by the accountable executive/manager; - Declare management's commitment to effective reporting, adequate resourcing and continuous improvement. - Be communicated, with visible endorsement, to all the relevant areas. - Require periodic reviews to ensure it remains relevant and appropriate.		
1.6	Does the operations manual contain procedures for the periodic review of FRMS documentation (including the FRMS Manual and FRMS Policy) to ensure their continued suitability, adequacy, and effectiveness?		
2.	**Fatigue Safety Accountabilities**		
2.1	Does the operator understand and acknowledge that as the accountable person for the FRMS, they must provide enduring resources to implement and maintain the FRMS?		
2.2	Have the FRMS authorities, responsibilities, and accountabilities of all relevant personnel been defined and documented? Note: Organization chart for relevant FRMS personnel should be documented.		
2.3	Has an FRMS Manager been appointed with responsibility for the day-to-day implementation, management, and continuing effectiveness of the FRMS?		
2.4	Does the FRMS Manager have control of the financial and human resources required for the FRMS? If not, how is fatigue funding and resourcing assured?		
2.5	Does the FRMS Manager have appropriate authority for decision-making for all matters with operational fatigue risk implications (e.g. aircraft selection, FCM allocations, training)? If not, how are matters with operational fatigue risk implications managed?		

No	Subject	AOC Manual/Document Reference	Operator Comment
2.6	Is there a fatigue safety committee/group for the purpose of implementing, maintaining and reviewing the FRMS and the related safety performance?		
2.7	Is the fatigue safety committee/group chaired by the FRMS Manager or by an appropriately assigned deputy, with adequate knowledge of fatigue science and the FRMS?		
2.8	Does the fatigue safety committee/group include relevant operational or departmental heads, as applicable?		
3.	**Roles and Responsibilities of key personnel**		
3.1	Is the FRMS Manager qualified to manage and oversee the day-to-day operations of FRMS (experience, training, qualification)?		
3.2	Does the FRMS Manager have access to the Accountable Manager, directly or via a Safety Manager concerning the implementation and operation of the FRMS?		
3.3	Have any other responsibilities assigned to the FRMS Manager been evaluated to ensure they do not compromise the effectiveness of the FRMS role?		
3.4	Do all personnel understand their authorities, responsibilities and accountabilities related to all FRMS processes, decisions and actions?		
4.	**Fatigue Hazard Identification**		
4.1	Is the FRMS reporting system based on “just culture”, with personnel encouraged to report any fatigue-related hazard or event without fear of retribution?		
4.2	Is there a process for the reporting of fatigue hazards/incidents by all employees?		
4.3	Is there a process for anonymous reporting of fatigue hazards/incidents?		
4.4	Are there procedures to ensure reports of fatigue hazards/incidents are confidential?		
4.5	Are there procedures for analysis (through inquiry or investigation as appropriate) of all reported fatigue hazards/incidents/accidents?		
4.6	Are there self-evaluation processes, such as reviews, surveys, operational audits and assessments related to fatigue risk in the current operation?		
4.7	Are there procedures to review fatigue hazards from relevant industry reports, for follow-up actions or risk evaluation?		

No	Subject	AOC Manual/Document Reference	Operator Comment
4.8	Is there a process to conduct formal fatigue hazard analyses, such as: - introduction of new shift/roster systems; - introduction of new long-range or greater operations; - changes in crewing of high-risk tasks; - operations being performed in the WOCL (0200 to 0559)?		
4.9	Has the operator identified key sources of data that contribute to fatigue hazard identification, including: - reports from employees, - incident and accident data, performance on FDM or LOSA, - reports of fatigue-related symptoms/behaviors, - individual sleep and wake data, and - analysis of rosters and actual work hours?		
4.10	Does the operator use predictive, proactive, and reactive risk management strategies?		
4.11	Does the operator use hazard identification processes in determining all relevant limits, such as DP, FDP, and Rest?		
4.12	Is there a process to identify fatigue hazards arising from outsourced or contracted activities that may affect crew scheduling, rostering, or operational support?		
5.	**Fatigue Risk Assessment**		
5.1	Are there procedures to ensure that fatigue hazards are appropriately risk assessed, considering the context, with probability and severity determined in relation to the possible consequences?		
5.2	Is there a set of criteria for evaluating fatigue-related risk and the level of risk the operator is willing to accept?		
5.3	Is there a documented hazard identification and risk mitigation procedure involving the use of appropriate fatigue risk analysis methods, which may include objective tools such as bio-mathematical models, scheduling analysis, or operational data analysis?		
5.4	Are the fatigue risk assessments and mitigations approved by the appropriate level of management?		
5.5	Is there a procedure for monitoring the effectiveness and the periodic review of existing fatigue risk mitigations?		

No	Subject	AOC Manual/Document Reference	Operator Comment
5.6	Is there a procedure for remedial and mitigation actions whenever unacceptable fatigue risk levels are identified?		
5.7	Is there a procedure to prioritize identified hazards for risk mitigation actions?		
5.8	Is there a systematic and ongoing review of all aviation fatigue-related operations, processes, facilities and equipment, relevant to the hazard identification and risk management processes?		
5.9	Are there documented corrective and preventative actions to respond to fatigue hazard/event analysis?		
5.10	Are all risk analyses documented, reported, and recorded for review by the operator, employees, and CAAT?		
5.11	Are corrective/preventative actions, including timelines and methods, documented?		
6.	**Fatigue Risk Controls: Practical Operating Procedures**		
6.1	Does the operator have a validated process for ensuring that both planned and actual work hours provide sufficient sleep opportunity for crew members (e.g. rostering software)?		
6.2	Are all planned duty schedules and rosters analyzed for fatigue hazards prior to publishing?		
6.3	Are the reporting and required actions clearly described when insufficient sleep opportunities are identified within a given pairing/trip/roster?		
6.4	Are crew members provided with instructions and guidance in relation to delays to promote sufficient sleep opportunities?		
6.5	Are the processes or systems for assessing sleep opportunities reviewed on a regular basis to ensure they are operating effectively?		
6.6	Does the system provide the processes necessary to ensure appropriate management of FRMS-related records?		
6.7	Is there evidence of meaningful consultation with all relevant staff in all FRMS-related matters?		
6.8	Are reporting and procedures clearly defined for occasions when Crew members have insufficient sleep or experience extended wakefulness?		
6.9	Are all fatigue reports (Duty and Non-Duty related) dealt with in a “just and fair” manner?		

No	Subject	AOC Manual/Document Reference	Operator Comment
6.10	Does the organization provide appropriate tools for Crew members to assess fatigue-related symptoms and behaviors in themselves and others?		
6.11	Are reporting procedures and required actions clearly defined for occasions when employees exhibit fatigue-related symptoms, or observe fatigue-related symptoms in a colleague?		
7.	**Fatigue Safety Assurance**		
7.1	Are the fatigue performance indicators relevant to the operator's safety policy as well as management's high-level fatigue management objectives/goals?		
7.2	Do the fatigue performance indicators include alert/target settings to identify unacceptable performance levels, and planned improvement goals?		
7.3	Is the setting of fatigue alerts or higher risk of fatigue criteria based on objective fatigue metrics principles?		
7.4	Do the fatigue performance indicators include quantitative monitoring of fatigue involvement in high-consequence safety outcomes (e.g. accident and incident rates) as well as lower-consequence events (e.g. rate of noncompliance, deviations)?		
7.5	Have the fatigue performance indicators and their associated performance thresholds been developed in consultation with relevant personnel and agreed upon with CAAT?		
7.6	Is there a procedure for corrective or follow-up action to be taken when fatigue related targets are not achieved, and fatigue target/alert levels are exceeded/breached?		
7.7	Are the fatigue performance indicators being periodically reviewed?		
8.	**Fatigue Hazard/event Reporting**		
8.1	Are Crew members able to access, complete, and submit a fatigue report in a simple and timely manner?		
8.2	Is there a feedback process to notify contributors that their reports have been received and any actions taken?		
8.3	Is there a process for reporting on fatigue hazards where the individual is not identified?		

No	Subject	AOC Manual/Document Reference	Operator Comment
8.4	Is there a process for formal review of reports with established risk thresholds for analysis, enquiry, and investigation (if required)?		
9.	**Fatigue Investigation and Analysis**		
9.1	Are there procedures in place to conduct fatigue-related enquiries and investigations?		
9.2	Do the procedures ensure all reported occurrences and deficiencies are investigated and/or addressed?		
9.3	Is the analysis of occurrences and deficiencies adequate to identify contributing and causal factors?		
9.4	Are corrective/preventive actions generated from the event analysis and investigations?		
9.5	How is the technical competence of staff assigned to investigate occurrences and deficiencies determined?		
9.6	Are there timelines and responsible action holders identified for corrective actions?		
10.	**FRMS Continuous Improvement**		
10.1	Is there a regular periodic internal audit of the FRMS?		
10.2	Does the internal FRMS audit/assessment contribute to the management FRMS review processes and timings?		
10.3	Are FRMS review outcomes and associated corrective actions documented, assigned, and tracked to closure through the organization's corrective action process?		
10.4	Does the management review of FRMS include the sampling of completed/existing fatigue hazard identification, risk assessments, remedial actions and mitigations?		
10.5	Does the management review of FRMS include the sampling of fatigue performance indicators for data currency and modification of performance settings?		
10.6	Does the management review of FRMS cover external resources where applicable (e.g. provider of bio-mathematical modelling tools)?		
10.7	Is the FRMS Manager involved in the process for the FRMS audit/assessment reports at an appropriate time and at the appropriate level?		
10.8	Does the management review of FRMS processes include employee consultation and feedback?		
11.	**FRMS Training and Education**		

No	Subject	AOC Manual/Document Reference	Operator Comment
11.1	Is there a program to provide FRMS training/ familiarization to personnel involved in implementing the FRMS?		
11.2	Has the operator conducted a training needs analysis, or similar, to identify the required training and assessment of relevant personnel with respect to establishing they are competent for their role in the FRMS?		
11.3	Has the accountable executive/manager undergone appropriate FRMS familiarization, briefing or training?		
11.4	Are personnel involved in conducting fatigue risk mitigation provided with appropriate Fatigue Risk Management System training/familiarization?		
11.5	Is there evidence of a whole-of-operator FRMS education or awareness efforts?		
11.6	Is there a process that measures the effectiveness of FRMS training?		
11.7	Does the operator's fatigue risk awareness training program include: - a basic overview of sleep, why we need it, and what happens if we don't get it; - definition of fatigue and fatigue-related risk; - examples of the consequences of fatigue, including operational performance, health, and lifestyle factors; - an overview of the reasons why fatigue-related risk needs to be managed, including legal liabilities; - personal Fatigue Risk Management System strategies, such as sleep hygiene, lifestyle, diet, exercise and relaxation.		
11.8	Does the operator's training include initial and recurrent training?		
11.9	Is the training and assessment program captured in the audit of the FRMS?		
12.	**FRMS Communication**		
12.1	Are there appropriate communication processes that assist the FRMS to function effectively?		
12.2	Is there evidence of a publication, circular, or channel for regularly communicating fatigue /FRMS matters to employees?		
12.3	Is the operator's FRMS manual and related guidance material accessible to all relevant personnel?		
12.4	Is there a means of monitoring the effectiveness of the dissemination of Fatigue Risk Management System information throughout the operator?		

No	Subject	AOC Manual/Document Reference	Operator Comment
12.5	Does the operator participate in sharing fatigue information with relevant external industry product and service providers or operators, including the relevant aviation regulatory operators?		
13.	**FRMS Management of Change**		
13.1	Are there procedures to identify changes in both the operational environment and within the AOC itself, where such changes may affect the FRMS?		
13.2	Are there procedures to amend or modify the FRMS, given changes to the operational environment and the AOC?		
13.3	Does the operator define significant and nonsignificant changes with respect to their maximum and minimum limits of DP, FDP, and Rest Period?		
13.4	Are there procedures to assess whether proposed changes to the FRMS or IFTSS may introduce new fatigue-related hazards, increase fatigue-related risks, or adversely affect the maintenance of an acceptable level of aviation safety?		
13.5	Are there procedures for notifying CAAT about changes, and seeking approval for proposed changes, where required?		
14.	**FRMS Implementation Plan and Safety Case**		
14.1	Does the Safety Case clearly describe the nature, type, and scope of operations to which the FRMS will apply (e.g., fleets, routes, bases, and duty types)?		
14.2	Does the Safety Case identify all operations proposed to be conducted outside the prescriptive limits of TCAR OPS ORO.FTL or ORO.FTLS, including specific details of each exceedance?		
14.3	Has the operator provided justification for each exceedance based on operational necessity and supported by fatigue science?		
14.4	Have the specific maximum and/or minimum values of the proposed Individual Flight Time Specification Scheme been clearly defined in comparison with the prescriptive limits?		
14.5	Does the Safety Case describe the process used to identify fatigue-related hazards associated with each proposed exceedance?		
14.6	Has a documented risk assessment been completed for each identified fatigue hazard, including the likelihood and consequence of fatigue impacts?		
14.7	Are mitigation measures clearly described, and do they correspond to the assessed fatigue risks?		

No	Subject	AOC Manual/Document Reference	Operator Comment
14.8	Does the Safety Case include evidence or reference to scientific principles and data supporting the effectiveness of proposed mitigations?		
14.9	Are methods for monitoring, measuring, and evaluating the ongoing effectiveness of fatigue risk controls described, including any bio-mathematical modelling used?		
14.10	Does the Safety Case define measurable Safety Performance Indicators (SPIs) related to fatigue risk and system effectiveness?		
14.11	Is there a clear description of data sources, collection processes, and analysis methods to support continuous monitoring of fatigue risk?		
14.12	Are accountabilities for FRMS implementation, oversight, and continuous improvement clearly defined within the Safety Case?		
14.13	Does the Safety Case demonstrate how the FRMS integrates with or complements the operator's Safety Management System (SMS)?		
14.14	Are procedures described for assessing fatigue risk arising from operational or operational changes?		
14.15	Does the FRMS implementation plan include a phased or trial implementation, with defined timelines, evaluation criteria, and reporting arrangements? Note: Reporting interval to CAAT during the FRMS trial phase and throughout full implementation shall be specified.		
14.16	Are there mechanisms in place to review, update, and improve the FRMS based on performance data and lessons learned?		
14.17	Does the Safety Case specify the documentation and record-keeping arrangements for all FRMS activities?		
14.18	Does the Safety Case demonstrate the operator's capability (resources, systems, and personnel competence) to implement and sustain the FRMS?		

For CAAT Use

Contents checked against Ops manual: ☐ SATIFY / ☐ UNSATIFY

Comments:	
Verification by OMI Name:	Signature:
	Date:
Verification by POI Name:	Signature:
	Date:
Verification by OPS Manager Name:	Signature:
	Date:

Appendix H - Evaluation steps for the proposed FRMS Safety Case

The FRMS trial proposal shall include a safety case. To assess the FRMS trial proposal, the State shall apply steps to evaluate safety cases to support deviation or derogation to prescribed limits. However, in the case of assessing an FRMS safety case proposal, the assessment will be conducted in greater depth and will necessarily include oversight and audit visits to the organization.

These steps are:

1) assessing the nature, scope and impact of the proposed change,
2) assessing hazard and consequence identification,
3) evaluating the fatigue-risk assessment methodology and how the decision to accept risk has been made,
4) assessing the appropriateness of the risk mitigation measures,
5) assessing whether the claims, arguments and evidence made in the safety case are valid,
6) assessing plans for continued monitoring of the safety impact of the proposed limits, work schedules and mitigations, and
7) assessing the previous safety behaviours demonstrated throughout the organization (including safety reporting policies and practices).

These steps are discussed further below:

1) Assessing the nature, scope and impact of the proposed FRMS trial

Objective:
Assured that the operator understands the limitations and methods it is proposing, including the direct or indirect impact on the fatigue levels of those who will work under the arrangements described in the FRMS trial proposal.

Methods:

- Submitted documentation clearly identifies the proposed limitations and methods and how these differ from the prescribed limits, and the operations to which they are intended to apply.
- Submitted documentation demonstrates that the operator has considered any direct or indirect impacts the proposed FRMS trial will have on those operations and other services.

2) Assessing Hazard and consequence identification

Objective:
Assured that a fatigue hazard identification process has been carried out and that the consequences of the hazards are documented.

Methods:

- Review the method used to identify and assess the fatigue hazards and their consequences for the proposed FRMS trial.
- Review any other direct or indirect hazards identified in relation to the FRMS trial and their consequences.
- Transitional risks to the operation associated with the FRMS trial are considered.

3) Evaluating the Fatigue risk assessment methodology and how the risk has been accepted

Objective:

Assured that the level of risk associated with the FRMS trial is acceptable.

Methods:

- Examine the record of the risk assessment.
- Review how the consequences were classified regarding severity and likelihood definitions.
- Review the qualifications of the individual(s) who made these classifications.
- Determine whether the risk assessment appears reasonable both before and after organizational mitigations have been applied.
- Evidence is provided that existing fatigue controls and mitigations are effective.
- Confirm that an appropriately authorised person has accepted the remaining risk level and that the acceptance has been recorded.

4) Assessing the Risk mitigation measures

Objective:

Assurance that the mitigations identified are sufficient to manage the fatigue risk expected.

Methods:

- Determine who was involved in the process of identifying and establishing the mitigations to ensure the process was conducted at the correct level within the organisational structure of the operator, with the involvement of the relevant people.
- Carefully examine the proposed fatigue mitigations using knowledge of the operator proposing the FRMS trial as well as other operators in similar situations to establish if the mitigations are appropriate and likely to be effective.
- Review the operator's processes and procedures to evaluate the appropriateness of their plan for risk management and training.
- Consider other aspects of operational personnel's performance that may be affected by the mitigations.

5) Assessing the claims/arguments and evidence made in the risk assessment are valid

Objective:

Assurance that the claims and arguments are robust and supporting evidence is accurate and correctly interpreted.

Methods:

- Review the safety arguments to confirm that a justification of an acceptable level of safety has been demonstrated.
- Safety arguments are supported by well-validated research or best practices.
- Transitional risks are mitigated. Look to see if the management of wider organisational risks may be detrimentally affected by the proposed FRMS trial.
- Clear conclusions are included in the risk assessment.
- Proposed mitigations have considered all the legal requirements applicable to the crew members. Ensure they have been captured and addressed.

6) Assessing plans for CONTINUED MONITORING of the safety impact of the PROPOSED LIMITS, DUTY SCHEDULES AND MITIGATIONS

Objective:

Assurance that the hazards associated with the FRMS trial proposal have been correctly identified and the effectiveness of the mitigations will be measured using agreed SPIs.

Methods:

- The operator has processes in place and demonstrated the capability to allow continued monitoring through existing SMS activities.
- Agreed FRMS safety performance indicators (SPIs) are established for monitoring throughout the trial. Common types of SPIs include:
    - operational SPIs that monitor the duty-related causes of fatigue (e.g. use of captain's discretion),
    - SPIs based on reactive fatigue data (e.g. numbers of fatigue reports on a particular work pattern),
    - SPIs based on proactive monitoring of actual fatigue levels of relevant operational personnel (e.g. high levels of subjective sleepiness at the end of a work period).
- A review process is identified to assess the impact of changes to the operator or the operating environment.

Appendix I - Example of FRMS Safety Performance Indicators (SPIs)

As part of the development of FRMS SPIs, the operator shall establish the parameters used to determine which data and measures are relevant. These criteria should address at least the following:

- FDPs being longer than scheduled,
- Reduced rest within duty periods (breaks, inflight rest),
- Reduced rest between duties.

These examples are not exhaustive. An AOC holder may consider developing additional SPIs to address specific operational areas where potential fatigue-related issues are known or where the impact of fatigue has not yet been assessed.

I1: Operational or schedule-related SPIs

- Number of crew duty day exceedances into allowable excesses e.g. longer than 14 hours
- Number of flight duty periods greater than a specified number of minutes longer than planned e.g. 30 or 60 minutes
- Number of flight times more than a specified number of minutes longer than planned e.g. 30 or 60 minutes
- Number of flight duty periods starting within window of circadian low (WOCL) Number of landings within the WOCL greater than a specified number during a specified time period
- Number of duty periods with more than a specified number of flight sectors
- Number of times crew monthly flight hours reach a predetermined threshold e.g. 90% of allowable maximum
- Number of times the use of “Commander's discretion” is invoked Number of successive early wakeups for reporting time
- Number of successive early wakeups combined with long transits between flights Number of successive early wakeups combined with long duty days
- Number of reduced rest breaks within duties (by more than a specified number of minutes determined to be “significant”)
- Number of reduced rest breaks between duties (by more than a specified number of minutes determined to be “significant”)
- Number of reserve crew call-outs on particular flights, at a particular crew base etc. due to fatigue
- Number of flight deviations or flight completion not accomplished on specific city pairings, due to fatigue, lack of staff, medical emergencies etc.
- Number of early starts in a 28-day period
- Number of sectors in long duty periods

I2: Safety assurance SPIs

- The level of conformance with the FRMS audit program
- Number of risk controls/mitigations reviewed within a set period
- Number of risk controls/mitigations implemented within a set period
- Number of findings raised against the FRMS during internal audit against a pre-set standard
- The amount of reduction in findings raised against the FRMS from year to year
- The ratio of FRMS investigations completed within a designated time frame to those that went beyond the time
- The ratio of completed Action Items from audit findings or investigation recommendations within a designated timeframe to those that went beyond the time

I3: Safety Promotion SPIs

- The number of days from the FRMS trial commencing and FRMS induction training delivered to all relevant personnel
- The number of days from the first day after hiring and FRMS induction training being delivered once the FRMS is approved
- The percentage of FRMS recurrent training delivered within the documented training timetable
- The number of persons failing the competence assessment at initial FRMS training (include number of re-sat exams)
- The number of persons failing the competence assessment at FRMS recurrent training (include number of re-sat exams)
- The number of FRMS promotional actions achieved as per the pre-determined schedule
- Annual publications
- Multimedia presentations/videos
- Training opportunities

Appendix J - Form for Assessment of Safety Case to support Variation

Form for Assessment of Safety Case to support Variation

Assessment of Safety Case to support Variations
The CAAT Form for Assessment of Safety Case to support Variations provides a structured framework for the systematic review of applications for variations to prescribed limits of the Flight and Duty Time Limitation and Rest Requirements, TCAR-OPS Part ORO Subpart FTL/FTLS, under Exceptional Circumstances. Completion and submission of this form is a mandatory requirement for any application seeking a variation to the applicable prescriptive regulations under Exceptional Circumstances. Following the interrelated evaluation steps defined by ICAO, the primary purpose of this assessment is to enable CAAT to determine whether an applicant's safety case demonstrates that the proposed variation can achieve a level of safety performance equivalent to, or better than, that provided by the applicable prescriptive regulations. This form does not replace applicable legislation, nor does it constitute a simple compliance checklist; rather, it is used to verify that the applicant understands the proposed changes and has the mature risk management capability necessary to manage operational fatigue risks effectively. As part of the safety case submission, the applicant shall use this form to document their assessment, supporting arguments, evidence, and proposed risk mitigations prior to CAAT's formal evaluation. Nothing within this assessment process exempts an operator from its ultimate responsibility to ensure the continued safe conduct of operations and compliance with all other applicable regulatory requirements.

Operator Name:	AOC No.:	

We confirm that the filled information is correct and complies with:
- TCAR OPS Air Operations Regulation and TCAR OPS Parts ORO Subpart FTL / FTLS.
- CAAT Guidance Material for Approval of the Individual Flight Time Specification Scheme (IFTSS).
- Company Operations Manual (Please specify)

_____
_____
_____

Filled by Name:	Accountable Manager Name:
Signature:	Signature:
Position:	
Date:	Date:

No	Subject	AOC Manual/Document Reference	Applicant Comment
1.	**Nature, Scope, and Impact of the Proposed Variations**		
1.1	Does the documentation clearly identify the prescriptive elements being varied and the proposed changes?		
1.2	Are the specific operations to which these variations apply clearly identified?		
1.3	Have all affected regulatory requirements, operational procedures, and related organizational processes been identified?		
1.4	Has the applicant identified and assessed the direct and indirect operational impacts of the proposed variation on affected operations, personnel, and supporting services?		
2.	**Hazard and Consequence Identification**		
2.1	Does the documentation describe a systematic methodology for identifying fatigue hazards and assessing their potential consequences associated with the proposed variation?		
2.2	Were other direct or indirect hazards related to the variation identified and their consequences documented?		
2.3	Have the specific risks associated with the transition to the new variation been documented and considered?		

No	Subject	AOC Manual/Document Reference	Applicant Comment
3.	**Risk Assessment and Acceptance**		
3.1	Is there a formal record of the risk assessment available for examination?		
3.2	Is the risk assessment supported by a documented methodology and justified assumptions both before and after mitigations are applied?		
3.3	Is there evidence provided that existing fatigue controls and mitigations are currently effective?		
3.4	Has an appropriately authorized person accepted the residual risk and has this been recorded?		
4.	**Risk Mitigation Measures**		
4.1	Was the process for identifying and establishing mitigations conducted at the correct organizational level with the involvement of all relevant personnel?		
4.2	Are the proposed mitigations appropriate and likely to be effective for this specific variation?		
4.3	Do the applicant's documented processes and procedures support the implementation, monitoring, and ongoing management of the proposed variation?		
4.4	Have other aspects of human performance that may be affected by the mitigations been identified and considered?		
4.5	Is the applicant managing risk through operational controls rather than relying only on training to mitigate fatigue?		
5.	**Claims, Arguments, and Evidence Validity**		
5.1	Do the safety arguments logically demonstrate that an equivalent or improved level of safety will be maintained?		

No	Subject	AOC Manual/Document Reference	Applicant Comment
5.2	Are the safety arguments supported by appropriate scientific evidence, operational data, industry best practices, or relevant studies?		
5.3	Does the safety case clearly state its conclusions and demonstrate how they are supported by the evidence presented?		
5.4	Have the proposed mitigations taken into account all legal requirements applicable to the crew member, including national, international, safety, and social requirements?		
5.5	Has the applicant defined the data sources, collection methods, and success criteria that will be used to validate the effectiveness of the proposed variation?		
6.	**Continued Monitoring Plans**		
6.1	Has the applicant demonstrated the capability to conduct continued monitoring through existing SMS activities?		
6.2	Have specific Safety Performance Indicators (SPIs) been established to monitor this specific variation?		
6.3	Is there a process to assess the impact of organizational changes on this variation?		

For CAAT Use	
Safety Case Assessment Result: ☐ SATISFY / ☐ UNSATISFY	
Comments:	
Verification by OMI Name:	Signature: Date:
Verification by POI	Signature:

Name:	Date:
Verification by OPS Manager Name:	Signature:
	Date: