KINGDOM OF BAHRAIN
Ministry of Transportation
and Telecommunications

مملكة البحرين
وزارة المواصلات والاتصالات

Hand Book

Fatigue Risk Management System

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Table of Contents

1. Introduction 1
1.1 Purpose of Handbook 1
1.2 Definitions of Terms 2
1.3 Roles and Responsibilities 2
1.3.1 BCAA 2
1.3.2 Applicant 2
1.4 Method of Assessment 3
2. Fatigue Risk Management – Flight Crew Members 4
2.1 Entry Control Requirement 4
2.2 Assessment Criteria 5
2.3 Regulatory Milestone 2 5
2.3.1 FRMS Policy 5
2.3.2 FRMS Safety Objectives 6
2.3.3 Management Commitment and Responsibilities 7
2.3.3.1 Accountable Manager 8
2.3.4 FRMS Implementation Plan 8
2.3.4.1 FRMS Training Program Plan 9
2.3.4.2 FRMS Communication Plan 9
2.3.5 FRMS Training 9
2.3.5.1 Overall Requirements and Standards 9
2.3.5.2 Curriculum – Crew 10
2.3.5.3 Curriculum – Crew Schedulers – Initial and Recurrent 11
2.3.5.4 Curriculum – FRMS Manager and FSAG – Initial and Recurrent 11
2.3.5.5 Curriculum – Senior Management 12
2.3.6 FRMS Communication 12
2.3.7 Appointment of Key FRMS Personnel 13
2.3.7.1 FRMS Manager 13
2.3.7.1.1 FRMS Manager Roles and Responsibilities 14
2.3.7.1.2 FRMS Manager – Regulatory Milestone 2 Requirement 14
2.3.7.1.3 Staff Contingency and Succession Planning 15
2.3.7.2 Fatigue Safety Action Groups 15

2.3.7.2.1 Composition of FSAG 15
2.3.7.2.2 FSAG Terms of References 16
2.3.8 FRMS Documentation 18
2.3.9 Operator Application 19
2.4 Regulatory Milestone 3 19
2.4.1 Fatigue Risk Assessment and Mitigation 19
2.4.2 Hazard Identification 20
2.4.2.1 Reactive Processes 20
2.4.2.2 Safety Performance Indicators (SPIs) 21
2.4.2.3 Proactive Processes 23
2.4.2.4 Predictive Processes 26
2.4.2.5 Planned Safety Assurance Processes 27
2.4.2.6 Implementation of FRMS Processes by the Operator 27
2.4.3 FRMS Limits 28
2.4.4 Planned Safety Assurance Processes 29
2.4.5 BCAA Review 30
2.4.6 Trial FRMS Implementation Approval 31
2.4.6.1 Operator Initiated Changes to the FRMS – During Trial 31
2.4.6.2 BCAA Initiated Changes 31
2.4.7 FRMS Trial – Operator Responsibilities 32
2.5 FRMS Safety Assurance Processes 32
2.5.1 Monitoring of FRMS Performance 32
2.5.1.1 Pre-Trial 32
2.5.1.2 Trial FRMS Implementation 32
2.5.1.3 FRMS Investigation 33
2.5.1.4 FRMS Audit 34
2.5.1.5 FRMS Surveys 34
2.5.1.6 Fatigue Studies 34
2.5.2 Management of Change 35
2.5.3 Continuous Improvement 36
2.6 FRMS Promotion Process 37
2.7 Regulatory Milestone 4 37
2.7.1 Planning and Programming the FRMS Trial Validation (BCAA) 37

2.7.2 Assessment for Full FRMS Implementation Approval 37
2.7.3 BCAA Verification Process 38
2.7.4 Extending the Trial Period 39
2.7.5 Full FRMS not approved by BCAA 39
2.8 FRMS Requirements for Ultra Long Range (ULR) Operations 39
2.9 Applicable Regulation and Advisory Material 40

Appendix 1 Integration of FRMS into Safety Management System ..... APP 1-1

HAND BOOK FRMS

Record of Amendments

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HAND BOOK FRMS

1. Introduction

This publication outlines the guidelines for establishes the Subpart Q; **Flight and Duty Time Limitations and Rest Requirements** by a commercial Airline operator. Operator may depending upon their size, complexity and operating context, choose the appropriate FRMS schemes available in the industry.

Establishing a FRMS requires appropriately- resourced operators who are capable of developing and maintaining the system. Selection of suitable method for establishing the FRMS system depends on their size, complexity and operating context.

An operator may apply to BCAA for approval to implement a FRMS for its operations in accordance with the procedure given in CAP 34 and the FRMS Process Guide. BCAA has adopted ICAO's Standards and Recommended Practices (SARPs) in developing Civil Aviation Publication - CAP 34. BCAA has best aligned the FRMS with ICAO guidelines and EASA requirements. It is obligation on the part of the operator to develop, adopt and to follow the Fatigue Risk Management System (FRMS) once approved by BCAA for implementation.

From 15th January 2020, the new Subpart Q (FTL) - Flight & Duty Time Limitation and Rest Requirement is available to operators to transition to a new regime for the management of flight crew member fatigue.

1.1 Purpose of the Handbook

The FRMS Handbook provides AOC Operators or Applicants with information on how to obtain a BCAA approval of their Fatigue Risk Management System.

The FRMS Handbook and - FRMS Process Guide, outlines the steps for BCAA and the Applicant to guide through the process of an application for the BCAA approval.

The statements referring to what an operator 'must' do is consistent with the legislative requirements of Subpart Q (FTL). Where options are suggested in the document by using words such as 'should' or 'could', it is important to note that these relate to methods to assist in compliance with the ICAO FRMS Manual for Regulators and FRMS Implementation Guide for Operators.

The development by the operator and approval by BCAA, of a FRMS is an iterative process.
An operator may:

- Progressively develop their FRMS following the step by step process outlined here and in FRMS implementation guide; OR
- Simultaneously provide (as in the case of an experienced operator) with their application all the requirements outlined in Phase I-III.

Irrespective of the approach taken by the operator, the BCAA will need to ensure that the milestone checks and the checklists are completed and the documentation satisfactorily meets the requirements of Subpart Q(FTL) of ANTR OPS 1.

1.2 Definition of Terms

The definition of the terminologies used in this Hand Book are as given in Subpart – Q (FTL) of ANTR OPS 1.

The term *Trial FRMS Implementation* has been at times abbreviated in this document as simply *FRMS trial* or *the trial*.

"The terms *organisation*, *operator*, *applicant* have been used in this document to mean an AOC holder, or an applicant for a new AOC proposing to operate under Section 8 to CAP 34.

1.3 Roles and Responsibilities

1.3.1 BCAA

It is the responsibility of the BCAA to discuss an application for an FRMS approval and assign who have had FRMS assessor training.

BCAA, in assessing applications for trial or full FRMS implementation approvals, must refer to and follow the legal requirements of Subpart Q (FTL) of ANTR OPS 1, in the context of the assessment procedures and scientific principles set out in the Section. It is not the purpose or intention of this Hand Book to comprehensively set out all of the legal requirements.

The BCAA is responsible for assessing an operator's proposed FRMS over its development phases which will involve using the FRMS 's Assessment Checklist (ALD/OPS/F189) as part of implementation guide. BCAA will conduct assessments at various times, but formally during 'milestone' check points which are before and after Phase I and after Phases III and IV of the ICAO-recommended FRMS approval process.

NOTE: *The role and responsibility in developing the operator's FRMS lies with the operator and BCAA shall not perform the duties of the operator's FRMS Implementation Team and / or act as a consultant.*

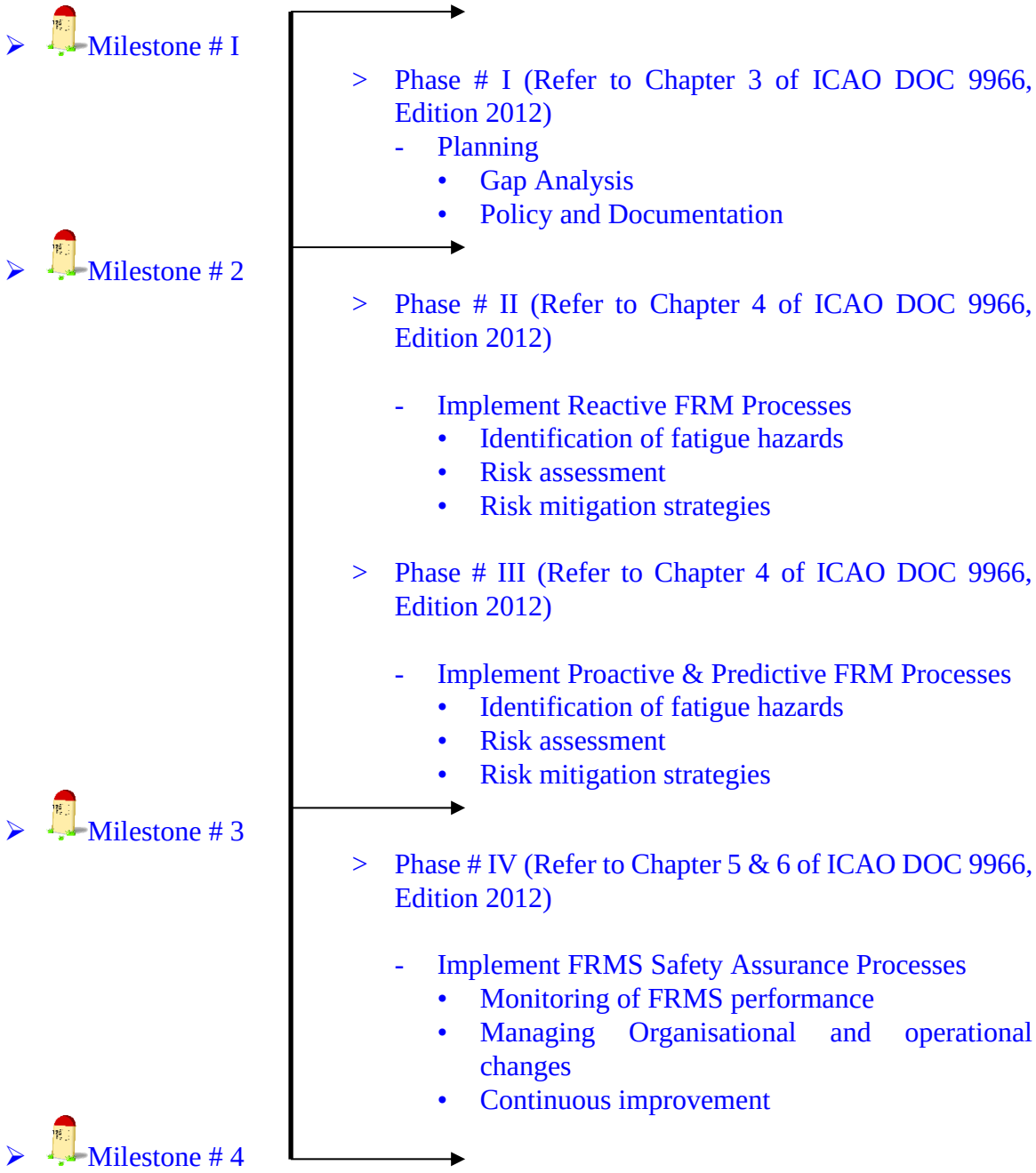
1.3.2 Applicant

The applicant is responsible for the development and implementation of their FRMS including all associated procedures and practices. The applicant is required to:

- Submit application (Form No. ALD/OPS/F187) to BCAA with a statement of intent if a pre application meeting is requested, followed by a formal application form (Form No. ALD/OPS/F188)
- All supporting documents
- attend meetings as scheduled by BCAA.
- pay applicable process fee as per published fee schedule.
- conduct operations in accordance with the approved initial trial processes
- furnish progressive reports and other information as required
  submit variation / change application to BCAA for approval, if any variation / changes to the FRMS proposed.
- once the FRMS is approved, conduct and maintain operations as per the approved FRMS.

1.4 Method of Assessment:

BCAA assessment of the applicant's FRMS may align with the process derived in ICAO's FRMS Manual for Regulators (DOC 9966, 2nd Edition, 2016) and as depicted below. Milestones 2, 3 and 4 need to be achieved before full approval of the FRMS can be approved. Completion of each phase prior to the applicable regulatory milestones is the responsibility of the operator.



The BCAA will monitor and review the progress of the operator's FRMS implementation from Phase I to IV to verify that the regulatory milestones throughout the process are identified and achieved before the following approvals are granted:

- approval to conduct the FRMS trial
- full approval of the applicant's FRMS.

HAND BOOK FRMS

The Applicant has to be in coordination with the designated representative/Inspector of BCAA throughout the implementation process.

2. Fatigue Risk Management – Flight Crew Members

2.1 Entry Control Requirements - Regulatory Milestone 1

Pre-application meeting requirements

The pre-application meeting is essentially the equivalent of Regulatory Milestone 1 of the FRMS approval process.

While an AOC holder can opt to operate under Full FRMS as per Subpart-Q of ANTR OPS 1 and comply with the requirements, BCAA may issue an approval for a trial to start with and subsequently full FRMS implementation. BCAA expects the applicant to have considered in detail whether their operation can be conducted in accordance with the applicable regulation and in compliance with the same. BCAA requires the AOC holder to have done a *requirements analysis* prior to BCAA conducting a pre-application meeting.

The Applicant will need to complete Form (ALD/OPS/F187) – Statement of Intent to Request BCAA Approval of an FRMS, and provide the same to BCAA in advance of the pre-application meeting.

The pre-application meeting agenda will cover the following items:

- entry control requirements
- application process
- assessment process – trial FRMS implementation and full FRMS implementation approvals
- implementation plan – at the minimum, outline the anticipated project dates for the submission of required documentation and implementation of FRMS processes
- the requirements analysis
- an interview of the nominated FRMS manager (if so appointed) to determine suitability for the role
- review of the operator's provision of resources for system development and management after approval
- BCAA will provide the operator Form (ALD/OPS/F189) – FRMS Assessment Checklist created to assist the operator in system development.

Pre-Application meeting requirements for an operator

Prior to the pre-application meeting the operator will need to:

1. Complete Form (ALD/OPS/F187)– Statement of Intent to Request BCAA Approval of an FRMS.

2. Conduct a *requirements analysis* for the proposed FRMS.

   Create an initial implementation plan ensuring adequate resourcing for the development of the FRMS.

Designate a FRMS Manager with the responsibility of overseeing the development and introduction of the FRMS. Commensurate with the scope of the FRMS, the nominee should be appropriately qualified, experienced and trained. This may include a plan for training to address any minor deficiencies prior to the Milestone 3 Approval for trial.

2.2 Assessment Criteria

Before full FRMS implementation approval is granted to an applicant, the BCAA must be satisfied that the operator's FRMS meets the requirements of Subpart – Q (FTL) (including all applicable requirement) of ANTR OPS 1, Subpart-Q (FTL) with respect to operator responsibility, crew responsibility, acclimatization, FDP, records, training etc., in particular the requirement set out in Chapter 8.1.5 & 8.9.1 of Section 8 to the CAP 34. The operator must demonstrate through establishing and exercising the FRMS processes and procedures in a trial, to demonstrate an acceptable level of safety which should be at least equivalent to or better than that required by the prescriptive rules contained in Subpart-Q (FTL) of ANTR OPS 1.

The assessment criteria are mentioned in the Form (ALD/OPS/F189) FRMS Assessment Checklist.

Applicants must comply, and document their compliance, with each requirement of Section 8 to this CAP 34. Form (ALD/OPS/F189) FRMS Assessment Checklist is provided to assist the applicant to comply with the requirements.

The FRMS must be integrated within an operator's approved SMS (Refer Appendix 1 for guidance).

2.3 Regulatory Milestone 2

Regulatory Milestone 2 constitutes assessment of the following FRMS Phase I elements:

2.3.1 FRMS Policy

The applicant's FRMS policy is required in the form of statement from the management (CEO/Accountable Manager) which ties many of the FRMS elements together. The policy must cover the overarching components required of a FRMS, must identify the lines of accountability and include a statement of the company's commitment to FRMS. The FRMS policy must be approved in writing by the CEO/ACCOUNTABLE MANAGER of the AOC holder and be accessible to all relevant areas and levels of the organisation (refer - Section 8 of CAP 34). The BCAA will confirm all aspects of an applicant's FRMS policy have met the requirements as detailed in Policy statements and that must:

1. Make it clear that while primary responsibility for the FRMS lies with the AOC holder, its effective implementation requires shared responsibility by management, FCMs (Flight Crew Members), and other relevant personnel.
2. Clearly indicate the safety objectives of the FRMS.
3. Be communicated, with visible endorsement, to all the relevant areas and levels of the organisation.

4. Declare management commitment to the provision of adequate resources for the FRMS.
5. Declare management commitment to continuous improvement of the FRMS.
6. Require that clear lines of accountability for management, FCMs (Flight Crew Members) and all other involved personnel are identified.
7. Require periodic reviews of the FRMS to ensure it remains relevant and appropriate and adhered to.

The FRMS policy should also contain a management commitment to an operational environment that promotes a healthy safety culture based on an *open and fair reporting culture*.

Types of cultures: -

Informed Culture—one in which those who manage and operate the system have current knowledge about the human, technical, organisational and environmental factors that determine the safety of the system as a whole.

Reporting Culture—in which people are willing to report errors and near misses.

Just Culture—a culture of 'no blame' where an atmosphere of trust is present and people are encouraged or even rewarded for providing essential safety-related information; but where there is also a clear line between acceptable and unacceptable behavior.

Flexible Culture—characterised as shifting from the conventional hierarchical mode to a flatter professional structure.

Learning Culture—in which there is the willingness and the competence to draw the right conclusions from its safety information system, and the will to implement major reforms when the need is indicated.

The signed FRMS Policy should specifically commit to openly accepting the displacement of crew from duty if, considering the circumstances of the flight to be undertaken, the crew member has reason to believe that he or she is suffering from, or is likely to suffer from, fatigue which may so impair performance that the safety of the operation may be affected.

2.3.2 FRMS Safety Objectives

The safety objectives in the FRMS policy specify what the operator wants the FRMS to achieve.

The FRMS objectives must clearly indicate safety as the priority.

FRMS objectives stated in the FRMS Policy should adhere to the **SMART** principles:

- **S**pecific
- **M**easurable
- **A**chievable
- **R**ealistic and
- **T**imeframe within which they are to be achieved.

To track whether the FRMS is meeting these objectives, its performance needs to be monitored. Examples of safety performance indicators and targets that can be used to measure how well the FRMS is meeting the safety objectives can be found in *2.4.2.2 Safety Performance Indicators (SPIs).*

For example, an operator may have a safety objective of reducing to zero the number of fatigue related incidents during the last 3 months of the FRMS trial prior to requesting BCAA approval of a full FRMS implementation.

Other FRMS objectives may include:

- proactive management of operational risk of reduced alertness in order to maintain a safe operation
- adequate flight crew member training and resourcing to avoid, detect and mitigate fatigue impairment
- reporting and acting upon fatigue hazards and incidents within the specified timeframe to minimise the chance of recurrence
- continued awareness and application of contemporary fatigue research as part of their continuous improvement reviews of their FRMS
- Ensuring healthy levels of participation by making sure all areas of the organisation feel well represented in the processes and decision-making that occurs in the FRMS.

The BCAA will verify if the operator has supported their objectives with specific SPIs and associated safety targets. The BCAA is to be satisfied that these have the potential to effectively measure progress towards achieving the FRMS objectives.

2.3.3 Management Commitment and Responsibility

Through the applicant's CEO/ACCOUNTABLE MANAGER the company must demonstrate a genuine commitment to the management of fatigue.

The BCAA will confirm the following aspects are visible throughout the applicant's documentation and are endorsed by management:

1. Sufficient resources are allocated to develop, establish, train for, implement and maintain the FRMS. These resources need to be clearly identified with evidence showing that the applicant has allowed for any associated capital or human resource expense.
2. Resource allocation is linked into the FRMS development in accordance with the FRMS implementation plan.
3. An appropriate organisational structure is documented and available to ensure the effective functioning of the FRMS. The structure will need to show all the FRMS linkages in the company from the CEO/ACCOUNTABLE MANAGER down through the Fatigue Safety Action Group (FSAG) – see *2.3.7.2 Fatigue Safety Action Groups* - to the training department, rostering staff and crew and with appropriate linkages to the SMS.
4. Stakeholder identification and a consultation process relative to the scope of the FRMS. Stakeholders should include, but not limited to: Management, flight crew representatives, rostering staff, the company's procurement officers, and contractors working under the

FRMS, and might include where appropriate, FRMS specialists, FRMS training staff accommodation providers, and other external parties.

5. There is appropriate integration with SMS. SMS processes are designed to address all types of aviation safety risks. FRMS processes are specifically designed to manage the risks associated with flight crew member fatigue and reduced alertness. BCAA s will assess the integration by reviewing the gap analysis carried out within the applicant's Phase I of the FRMS development. Should the FRMS be integrated with an SMS which has not been subject to approval, then a control measure will need to be identified to ensure unauthorised modification of the FRMS does not occur.
6. Clear FRMS decision making processes, including:

- clear roles and responsibilities and level for decision making
- escalation processes
- clearly defined time periods for response.

2.3.3.1 Chief Executive Officer (CEO/ACCOUNTABLE MANAGER)

The CEO/ACCOUNTABLE MANAGER of the AOC holder is responsible for:

- development and sign-off of FRMS policy
- endorsing and managing the changes to any element of the FRMS as stated in Chapter-8.7.7 of Section 8 to CAP 34.
- provision of adequate resources and authority to support the FRMS.

2.3.4 FRMS Implementation Plan

Many elements needed for an FRMS may already be in place in an operator's organisation. One of the first steps in FRMS implementation is for the operator to undertake a gap analysis to:

- identify elements of the FRMS that are already available in existing systems and process
- identify existing systems and processes that could be modified to meet the needs of FRMS (to minimize "re-inventing the wheel")
- identify where new systems and processes need to be developed for the FRMS prior to approving the trial FRMS implementation
- establish and initiate a training plan
- establish and initiate a communication plan.

For example, an operator may already have a confidential safety reporting system as part of its SMS. Existing report forms may need to be modified to include the information needed to analyse the role of fatigue in safety events. Additional training may be needed for the staff responsible for analysing safety data to ensure that they know how to analyse for the role of fatigue in events. A procedure will need to be added for information on fatigue-related events to be communicated on a regular basis to the FSAG. Fatigue reports may also be used as an FRMS safety performance indicator. In this case, a procedure would need to be added for this information to be evaluated regularly as part of the FRMS safety assurance processes.

The results of the gap analysis are used as the basis for the development of the operator's FRMS implementation plan. Essentially, this provides a road map describing how the development of

each of the FRMS processes will proceed, with realistic timelines. The implementation plan should reflect the requirements of Section 8 to CAP 34 such that all required processes and procedures are in place with evidence they are reasonably capable of managing fatigue risk prior to the trial and with only some safety assurance processes and system validation still to be accomplished during the trial.

2.3.4.1 FRMS Training Program Plan

As part of the implementation plan the operator should have a program for FRMS training activities to support the implementation plan for the FRMS. Stakeholders need training to ensure that they are competent to undertake their roles and responsibilities in the FRMS as the implementation plan rolls out and prior to BCAA approving the implementation of the trial FRMS.

For the FRMS to be effective, all personnel who contribute to FRMS safety performance need to have appropriate training. This includes crew members, crew schedulers, operational decision-makers, all members of the FSAG, and personnel involved in overall operational risk assessment and resource allocation. It also includes senior management, in particular the executive accountable for the FRMS and senior leadership in any department managing operations within the FRMS.

2.3.4.2 FRMS Communication Plan

The implementation plan should include a FRMS communication plan that details the means of dissemination of FRMS policies, procedures and responsibilities to all stakeholders and describes communication channels used to gather and disseminate FRMS-related information. For more details of the requirements refer to *2.3.6 FRMS Communication.*

2.3.5 FRMS Training

2.3.5.1 Overall Requirements and Standards

Before approval for trial, the operator must establish an FRMS training program to ensure all work groups associated with the FRMS are appropriately trained for their roles. This could include:

- identifying training requirements relevant to the roles performed
- establishment of standards for initial and recurrent training for all personnel (crew and non-crew) are specified in the FRMS documentation
- ensuring initial training of crew prior to commencing any operational duty, and non-crew are provided initial training prior to any FRMS related decision making
- a training program with a formal assessment process to evaluate staff competency – this will need to include retraining and subsequent assessment requirements in the event of a trainee failing an assessment
- recurrent training – The recurrent training program will need to identify the specific intervals between the last training received and the next training to be delivered. For at least the first three years after the FRMS Approval, BCAA expects the training to be delivered at least annually. The frequency may be reduced thereafter (e.g. biennially) provided BCAA can be satisfied the training has been highly effective.

- adopting an appropriate training method which allows transfer of knowledge and assessment of competence
- ensuring FRMS Instructors have:
  - appropriate knowledge of fatigue science relevant to the scope of operations
  - comprehensive knowledge of the workings of the operator's FRMS
  - a formal training qualification demonstrating the ability to develop and deliver training, and design and conduct competence assessments.

The training program is subject to safety assurance processes including at least audit and formal annual review to ensure it is achieving the required outcomes and remains relevant.

2.3.5.2 Curriculum: Crew

The BCAA may verify the syllabus for initial training for crew includes at least the following:

Fatigue Science Module

- Basic physiology relating to the functioning of the body and brain, and the need for sleep
- Understanding of the impact of circadian rhythms, the Window of Circadian Low, sleep stages, sleep debt and zeitgebers
- Causes of reduced alertness in crew operations
- Consequences of reduced alertness for crew and in aviation operations
- Fatigue symptoms and identification of fatigue in self and others
- Fatigue mitigation strategies
- Basic information on sleep disorders and treatment.

FRMS Processes and Outcomes Module

- An overview of the FRMS structure, how it works and who is involved
- Crew and operator responsibilities with respect to the FRMS including mandatory fatigue reporting
- Requirements relating to fitness for duty and removal from duty due to fatigue
- The roles of crew in FRMS processes, particularly with respect to the fatigue reporting system and implementing mitigations
- The importance of accurate fatigue data - both subjective and objective
- Personal strategies to improve sleep and to minimize their own fatigue risk
- Participation in any internal FRMS sub-committees, e.g. pairing/roster review
- FRMS publications and information availability.

Crew will be required to make operational decisions based on their knowledge of fatigue. This requires the operator to be able to demonstrate that crew comprehend the information provided in training and can competently apply this. A formal method of assessment will also need to be incorporated in the training process.

In order to confirm that a crew can make correct operational decisions with respect to fatigue, a minimum pass mark of 80% should be considered as a minimum pass mark. The operator is required to have a documented process to deal with required retraining and reassessment could also form a part of the training program.

Given the syllabus, the operator shall decide the minimum time to deliver the training and assess competency.

The syllabus for recurrent training for crew should include at least the following:

- updated version of Fatigue Science from initial training (condensed if appropriate)
- updated version of FRMS Processes and Outcomes from initial training (condensed if appropriate)
- recent fatigue reports, events and incidents and the lessons learnt.

Any recurrent training is to be assessed with a pass mark of 80% or above indicating a minimum pass.

2.3.5.3 Curriculum: Crew Schedulers – Initial and Recurrent

The operator's training program should ensure that training is provided to crew schedulers prior to any FRMS related decision-making and includes:

- fatigue Science Module from crew initial training (condensed if appropriate)
- FRMS Processes and Outcomes Module from crew initial training
- how scheduling affects sleep opportunities and can disrupt the biological clock, the fatigue risk that this creates, and how it can be mitigated through scheduling
- the use and limitations of any scheduling tools and bio-mathematical models or other algorithms used to predict the levels of flight crew member fatigue/alertness
- the role of crew schedulers in the FRMS with respect to fatigue hazard identification, risk assessment and reporting
- processes and procedures for assessing the potential fatigue impact of planned scheduling changes
- processes and procedures for implementing scheduling changes recommended by the FSAG
- processes and procedures for removal of crew from duty due to fatigue.

The competence of crew schedulers should be assessed to ensure that they can appropriately discharge their roles and responsibilities with respect to the FRMS.

The BCAA may verify the training program has been clearly documented and has been implemented accordingly.

2.3.5.4 Curriculum: FRMS Manager and FSAG – Initial and Recurrent

Training is provided prior to any FRMS related decision making and includes:

- enhanced Fatigue Science Module
- enhanced FRMS Processes and Outcomes Module
- the responsibilities and accountabilities of different stakeholders in the FRMS
- linkages between the FRMS and parts of the operator's overall safety management system
- linkages between the FRMS and other parts of the organisation for example the scheduling department, flight operations, medical department, etc
- regulatory requirements for the FRMS

- comprehensive knowledge of the use and limitations of any scheduling tools and bio-mathematical models or other algorithms used to predict the levels of flight crew member fatigue/alertness
- understanding the application of an *open and fair reporting culture* and its principles
- processes and procedures for removal of crew from duty due to fatigue.

The FRMS Manager and FSAG being responsible for development of the FRMS Training Program, these persons are required to acquire fatigue and FRMS knowledge from other training organization acceptable to BCAA.

2.3.5.5 Curriculum: Senior Management

Training is provided to senior management including the CEO / ACCOUNTABLE MANAGER and includes:

- an overall understanding of flight crew member fatigue and the safety risk that it represents to the organisation
- 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 the stakeholders in the FRMS, including themselves
- an overview of the types of fatigue mitigation strategies being used by the organisation
- the use and limitations of any scheduling tools and bio-mathematical models
- FRMS safety assurance metrics used by the organisation
- understanding the application of *open and fair reporting culture* and its principles
- regulatory requirements for the FRMS.

2.3.6 FRMS Communication

Under Chapter 8.6.1 in Section 8 of this CAP 34, the operator's communication programs must be capable of supporting and continuously improving all elements of the FRMS in the delivery of optimum safety level.

The BCAA may verify that the FRMS Communication are effective at communicating FRMS policies, procedures and responsibilities to all stakeholders and communication channels are effective at gathering and disseminating FRMS-related information. FRMS Communication should address the following requirements:

- the confidential nature of communication from and by crew (reports, surveys, etc.) and the data gleaned from such activity
- a policy detailing the ethical use of information and data from crew communications
- all fatigue reports are responded to in order to ensure the reporter has confirmation the report has been received
- all fatigue reports which are subject to any level of investigation result in the generation of a further response to the reporter at the completion of the investigation processes to summarise any relevant actions and/or findings
- the Minutes of FSAG etc. are made available to all stakeholders through the intranet or by physical distribution (de-identification may need to be undertaken to ensure the confidentiality of reports, investigations etc)

- accurate concise and timely FRMS publications about fatigue and the activities and safety performance of the FRMS are:
  - developed and disseminated to all stakeholders
  - endorsed by CEO / ACCOUNTABLE MANAGER
  - produced at least quarterly to ensure fatigue issues are brought to the attention of stakeholders with regularity
  - appropriately focussed 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
  - appropriate to reinforce the concept of shared responsibility and the application of an *open and fair reporting culture.*

2.3.7 Appointment of Key FRMS Personnel

BCAA will review the organisation's structure, recruitment and training programs included in the company's manual and other supporting documents to verify that the organisation has sufficient and appropriately qualified personnel to administer the FRMS.

There needs to be a clear mechanism for ongoing involvement and lines of communication documented for all involved personnel through a functional group responsible for coordinating FRMS activities. The processes to support this are to be defined and documented. Refinement of this will continue throughout the development of the FRMS.

Changes to the names or details of individuals with roles and responsibilities under the FRMS do require prior approval by BCAA. The operator is required to notify BCAA, in writing by the FRMS Manager, of the changes within Ten (10) days (Chapter 8.7 of Section 8 to CAP 34). On receipt of the notification, the BCAA will review the changes to determine the changes for acceptability.

2.3.7.1 FRMS Manager

The organisation must identify an FRMS Manager (a post holder / responsible person) who is responsible for the development, implementation and maintenance of the FRMS.

If the operator has a SMS in place, it should be made clear that the FRMS Manager reports directly to the Safety Manager or directly to the CEO / ACCOUNTABLE MANAGER.

FRMS is contained within the SMS, and the SMS must form part of the operations manual, i.e. all elements of the FRMS must remain visible to BCAA and controls are to be in place to ensure no unintended amendment to the approved FRMS occurs.

2.3.7.1.1 FRMS Manager Roles and Responsibilities

The FRMS Manager is the responsible and focal point for the implementation and maintenance of an effective FRMS. The FRMS Manager will have clear accountabilities and authority including:

- ensuring that processes for the FRMS are established, implemented and maintained
- ensuring the FRMS documents and records are maintained
- coordinating FRMS hazard identification and risk management processes
- monitoring the performance of the FRMS
- continuous improvement of the FRMS
- reporting to the Safety Manager/CEO/ACCOUNTABLE MANAGER on the performance of the FRMS
- ensuring appropriate FRMS training is developed and delivered
- ensuring the promotion of the FRMS is carried out within the organisation.

NOTE: *The BCAA must be aware of details of the training conducted. If the training is competency based and forms part of a training system, then the designated inspector of BCAA will need to be suitably qualified to assess this training.*

2.3.7.1.2 FRMS Manager – regulatory Milestone 2 requirements

The FRMS Manager is required to have a comprehensive understanding of FRMS, acquired through formal training and practical experience. It is expected that the FRMS manager will have attended courses, training sessions and forums covering latest developments in fatigue science plus complete the company's internal FRMS training. It is recommended that BCAA conducts an interview with these personnel and assess their knowledge of operations and availability to the organisation and their knowledge and ability to fulfill their responsibilities. Should a shortfall in any area become apparent, this will need to be conveyed to the CEO/ACCOUNTABLE MANAGER without delay.

The FRMS Manager's knowledge, skills and attributes should include:

- a broad operational knowledge and experience in the functions of an aviation organisation
- a sound knowledge of FRMS principles and practices
- a sound knowledge and understanding of Human Factors
- well-developed interpersonal and communication skills
- proven organisational leadership ability
- investigative and analytical skills
- knowledge of and the ability to apply the principles underpinning an *open and fair reporting culture*
- knowledge of document control and management procedures
- familiarisation with different fleets, types of operations, routes, etc

- knowledge and understanding of bio-mathematical modelling or other fatigue related modelling the operator will use.

NOTE: *These knowledge requirements are scalable dependent upon the type of AOC and activities the FRMS will cover.*

For an FRMS Manager to be considered acceptable, the individual could have received formal training in the following:

- human performance limitations focusing on fatigue and FRMS
- Human Factors principles with respect to understanding the role of human performance in accident prevention
- SMS
- accident and incident investigation
- development, implementation, operation and maintenance of an FRMS
- crisis management and emergency response planning
- safety promotion
- continuous review and improvement
- Crew Resource Management (CRM), Threat and Error Management (TEM), Flight Data Monitoring/Analysis (FDM/FDA), Line Operations Safety Audit (LOSA).

2.3.7.1.3 Staff contingency and succession planning

The operator should have procedures to avoid potential disruption to system management in the absence of the FRMS Manager or other FRMS key personnel. The policies should cover short and extended period of absences or carriage of duties and responsibilities.

This contingency process will also need to cover the communication and handover processes to ensure personnel and BCAA are notified of the change as required by legislation.

2.3.7.2 Fatigue Safety Action Groups

In order to meet the requirements generally of chapter 8.3 in Section 8 of CAP 34 and specifically to provide the *mechanism* required for ongoing involvement in fatigue risk management of management, FCMs, and all other relevant personnel, an operator could create a functional group that is responsible for coordinating the fatigue management activities within the organisation. Such a group is referred to here as the FSAG, which must include suitably trained personnel, and provide for effective representation for all relevant system stakeholders.

2.3.7.2.1 Composition of the FSAG

In deciding the composition of the FSAG, the operator will need to consider its operational and organisation profile, its activities, its interactions with other parts of the organisation, and the need to ensure active and ongoing participation from all stakeholder groups within the organisation. Stakeholder representation should be proportional to the size of the stakeholder group operating under the organisation’s FRMS. The FSAG must comprise sufficiently, experienced, trained and qualified personnel.

For example, for an air transport operation stakeholder representation should include a representative(s) from:

- flight crew members
- staff responsibilities for crew scheduling
- management
- any other technical discipline, if included within the FRMS (e.g. cabin crew)
- appropriate subject matter experts—such as human factors or fatigue and SMS specialists
- other stakeholder representatives—such as third party contractors (if applicable).

Where the organisation is small but with a functioning SMS, it may not be practical to have a FSAG but instead to have fatigue as an agenda item on the Safety Action Group (SAG) meetings as long as the FRMS Manager and sufficiently trained and qualified personnel who are representative of all significant FRMS scoped stakeholders are included in the SAG.

NOTE: *It is not unusual for the members of FSAG to hold other positions within the company at the same time. However, such other positions shall not in any way contradict to designated functions and quantum of work scope could be handled.*

2.3.7.2.2 FSAG Terms of Reference

Terms of Reference (TOR) set out the parameters within which the FSAG or similarly named group will function and specify how the group is accountable.

The TOR for this group has to clearly define the following:

- the objective and position in the overall company structure
- the decision-making process
- frequency of meetings
- the groups scope and deliverables
- the group members roles and responsibilities.

In an organisation with an SMS, the Safety Review Board (SRB) or similar will oversee the FSAG, while for less complex organisations a Safety Committee may also have oversight of the FRMS and discharge the responsibilities of the FSAG.

An example of a TOR for a FSAG is included in Chapter 3 – FRMS Policy and documentation of the ICAO DOC 9966 2nd Edition, 2016 Manual for Oversight of FRMS Approach. As an example, the TOR may cover the following (not limited to):

- schedule of FSAG Meetings with formal agendas and minutes circulated to all relevant parties in a timely manner
- meetings will include review of all fatigue data including reports required by the FRMS
- the FRMS Manager chairs the FSAG meetings
- attendees of FSAG Meetings with representation from all FRMS stakeholder groups
- FSAG members assist the FRMS manager fulfil his/her duties.

The statement of duties and responsibilities of the FSAG may include any or all of the following:

- develop and maintain the FRMS documents and records
- at a pre-defined frequency, gather, analyse and report on data that facilitates the assessment of fatigue related operational risks among flight crew members
- ensure the FRMS meets the safety objectives stated in the FRMS Policy
- develop, implement and monitor processes for the identification of fatigue hazards
- ensure comprehensive risk assessments are undertaken for fatigue hazards
- develop, implement, and monitor controls and mitigations as needed to manage identified fatigue hazards. Report to the Safety Manager and CEO / ACCOUNTABLE MANAGER if resources are insufficient to have the required controls
- develop, implement, and monitor effective, measurable FRMS safety performance indicators
- develop, implement and monitor FRMS safety assurance processes, based on agreed targets
- develop, implement and monitor a specific process for removal of crew from duty due to fatigue
- continuous review of the latest fatigue science findings and operational advances in fatigue risk management principles and practice including the design, analysis, and reporting of studies that measure flight crew member fatigue
- lead the continuous review and improvement process making recommendations for amendments to the FRMS
- establish any internal FRMS-related sub-committees, development of the terms of reference and ensuring the appropriate functioning of such sub-committees
- monitor differences between scheduled and actual flight times, duty periods and rest periods that will be considered "significant" within the context of their operations. Take immediate action if limits are identified as being regularly exceeded. This monitoring should be analysed for individual routes as well as across all company routes as a whole
- be responsible for the development, updating, and delivery of FRMS education and training materials
- ensure that all relevant personnel receive appropriate FRMS education and training within specified time frames, and that training records are kept
- develop and maintain strategies for effective communication with all FRMS stakeholders
- ensure staff receive a response to their fatigue reports
- communicate fatigue risks and the performance of the FRMS to senior management
- ensure adequate access to scientific and medical expertise is available, and recommendations made by these specialist advisors are documented and the corresponding actions taken
- effectively manage FRMS resources.

2.3.8 FRMS Documentation

Before issuing an approval for either the trial FRMS implementation or the full FRMS implementation, the BCAA must be satisfied that the FRMS Manual, whether published as a stand-alone document or part of the SMS or the Operations Manual, shall include-

(a) the limits arising from compliance with each applicable requirement that the holder has chosen to apply to an FCM (Flight Crew Members), showing:

(i) each maximum limit under the requirement which must not be exceeded; and

(ii) each minimum limit under the requirement which must not be reduced; and

(b) for FCMs conducting a particular operation — each limit mentioned in subparagraph (a) as modified by the AOC holder for the FCMs and the operation, but not so as to exceed a maximum limit, or reduce a minimum limit, set out in the applicable requirement; and

(c) where the need to take account of possible hazards (identified and documented) for FCMs conducting a particular operation, each limit mentioned in subparagraph (b) as modified by taking the possible hazard into account.

(d) The Employee responsibilities for operational fatigue management, and fatigue risk management.

(e) determination of Home base for each FCM, and inform each FCM of his or her home base; and

(f) set out in operations manual details of these home base determinations along with procedures to ensure that any change in an FCM's home base will not adversely affect aviation safety.

(g) Chapter 8.1.2 (policy & procedure), 8.1.4, 8.1.5 (rest of the requirements) of Section 8 to CAP 34. Prior to Regulatory Milestone 3 (assessment for trial FRMS implementation approval), the FRMS Manual is considered a draft document and may be amended at the discretion of the operator.

NOTE: *An operator applying for BCAA approval of a FRMS may be currently operating to an approved FTL / FRMS for part of their operation. It is the responsibility of the operator to maintain separation between these two sets of documentation. Upon receiving approval to trial/Full Version of their FRMS under the present regulation [Subpart-Q (FTL)of ANTR OPS 1], the FRMS Manual approved under the earlier provisions and exemptions if any granted therein, will cease to apply for that part of their operation for which the FRMS approved.*

The documentation that describes the following elements shall be developed and provided with the application and will be assessed at Regulatory Milestone 2:

- FRMS policy and objectives
- accountabilities, responsibilities and authorities for FRMS processes and procedures
- the organisational structure as it relates to FRMS—should also show links to SMS
- identification of the specific operations to which the FRMS will apply
- FRMS Implementation Plan—and associated gap analysis
- FRMS processes and procedures:
    - for the purposes of Regulatory Milestone 2 the documentation should include, as a minimum

- the proposed fatigue risk assessment process
- the proposed safety assurance process

- FRMS training programs, training requirements and attendance records:
  - for the purposes of Regulatory Milestone 2 the documentation should include a training plan as a minimum
  - the training plan may be included as part of the implementation plan

- FRMS Communication procedures and processes:
  - for the purposes of Regulatory Milestone 2 the documentation should include a communication plan as a minimum
  - the communication plan may be included as part of the implementation plan
- the planned terms of reference for the FSAG.

All documents and records relating to the FRMS such as FCM rosters, actual duty periods and flight times, actual split-duty rest periods, standby periods and off-duty periods, the FDPs and flight time limits, etc. are to be retained (in a secured manner) by the operator for at least ten (10) years from the date of the record, and must be made available to BCAA upon request.

The amendment and distribution of FRMS documentation will require a document control process in place.

The FRMS manual shall provide a list of required documentation and its control.

2.3.9 Operator Application

Once the operator has developed the FRMS to the point where they have completed Phase I and are confident that they meet the requirements for Regulatory Milestone 2 as detailed above, they should apply via (ALD/OPS/F188)– Application for Approval of a Fatigue Risk Management System to the BCAA. The application must be accompanied with the required documentation.

Once the application and associated documentation has been submitted, BCAA may now complete the Regulatory Milestone 2 assessment. The BCAA must record the processing time spent as the application proceeds from this point.

2.4 Regulatory Milestone 3

Regulatory Milestone 3 constitutes assessment of FRMS Phase II and III and the approval to conduct an FRMS trial.

2.4.1 Fatigue Risk Assessment and Mitigation

Fatigue risk assessment follows SMS principles, combining risk identification, analysis, evaluation and treatment. It evaluates the potential for injury, equipment damage, or loss due to a fatigue hazard and provides recommendations to management of that risk.

The operator's risk management process must include risk assessment and mitigation procedures to determine the probability and consequence of fatigue-related events and identify when the associated risks require mitigation. The operator must ensure that:

- fatigue hazards are identified
- once the risk is identified and classified, appropriate remedial action or mitigation measures are implemented to reduce the level of risk to *as low as reasonably practicable* (ALARP)
- all levels of residual risk which fall into the tolerable range have a designated level of management who are required to sign-off as accepting the risk
- any residual or remnant risk (however named), which remains after mitigation, is subject to further mitigation as a result of continuous improvement
- formal records of the risk management processes are maintained
- risk management processes involve relevant SMEs and stakeholders
- all persons involved in the FRMS have undertaken the required training as prescribed in their FRMS.

The formality under which this information is gathered is scalable. At a minimum an operator would require:

- a risk matrix detailing the fatigue risks
- the risk profiles, the treatment measures
- the residual risk
- the responsible person
- the relevant dates.

International Standards of Risk Management require that the operator will not continue with an operation where the level of risk is at an intolerable level. The designation of what constitutes intolerable risk must be set out in the safety risk management section of the operator's FRMS documentation.

2.4.2 Hazard Identification

The operator must develop and maintain documented reactive, proactive and predictive processes for fatigue hazard identification, risk assessment and mitigation.

2.4.2.1 Reactive Processes

FRMS reactive processes are designed to identify the contribution of crew member fatigue to safety reports and events associated with potential negative safety consequences in order to determine how the impact of fatigue could have been minimised. An operator may need to consider the experiences of other operators conducting similar operations.

The reactive hazard identification processes involve the consideration of actual or potential effects of reduced alertness on operational safety with the aim of reducing the likelihood of similar occurrences.

Examples of triggers for reactive processes:

- fatigue reports
- confidential reports
- audit reports
- aircraft incidents
- flight data analysis (FDA) indicating a potential or actual event.

The reactive hazard identification processes are closely aligned with the fatigue investigation processes. Depending on the severity of the event, a fatigue analysis could be undertaken by the FSAG. The findings of any fatigue investigation should be recorded as part of the FRMS documentation.

In analysing the potential contribution of fatigue to any event, the operator will need a formal process to establish whether

- a flight crew member was, on the balance of probability, in a fatigued impaired state
- the actions or decisions of the flight crew member were causal in any actual or potential adverse outcome
- those actions or decisions were consistent with the type of behaviour expected of a fatigued person or flight crew member.

In analysing whether a flight crew member was, on the balance of probability in a fatigued state, the operator has to consider:

- how much sleep the flight crew member needs to feel fully rested
- how much sleep the flight crew member achieved in the previous 24 hours (acute sleep loss)
- how much sleep the flight crew member achieved in the previous 72 hours (cumulative sleep debt)
- how long the flight crew member had been awake at the time of the event (extended wakefulness)
- the position in the circadian cycle of the flight crew member at the time of the event
- the task load at the time of the event (unusually heavy or light)
- Any well-being issue affecting the crew member such as medication taken, sleep disorder or short term illness which may provide for an early onset of fatigue.

Any adverse event that occurs should be assessed to evaluate its causal nature. Fatigue impairment is difficult to assess and these guidelines provide a commencement point. Even though a flight crew member may be suffering from fatigue, this may not be a contributing factor to the event, but it should not be ignored.

2.4.2.2 Safety Performance Indicators (SPIs)

FRMS safety assurance procedures must be used to check on and validate the effectiveness of the fatigue-related risk controls used by the AOC holder (Chapter-8.5, Para 8.5.1 of Section 8 to CAP 34). To achieve this, the operator must develop and set acceptable levels for SPIs specific to its operation.

SPIs should be developed to measure the full range of FRMS activities and be appropriate for measuring the effectiveness of the FRMS and the level of fatigue safety risk in operations. SPIs are developed as a result of risk management and need monitoring.

The operator should:

- develop and document SPIs to assess the functionality of the entire FRMS and the associated processes
- provide valid scientifically defensible reasons to justify their selection of SPIs
- establish the basis on which they selected the thresholds for SPIs.

SPIs can include at least:

- schedule-related indicators – dependent on the type of operation conducted
- proactive/reactive fatigue indicators
- documented specific measures or tolerances which must be achieved to keep the associated risks within a tolerable range
- identified critical SPI measures and/or tolerances which if reached require notification to BCAA
- a clear understanding which personnel are responsible for monitoring risk and when they are to report if the risk is not being effectively managed within pre-determined parameters.

NOTE: *It is not possible for BCAA to document a set of SPIs to cover every type of operation. For example, the values for the SPIs identified by a smaller operator are not likely to be relevant indicators for a more complex operator.*

Examples of schedule-related SPIs:

- number of bids for pairings identified as potential high fatigue risk, e.g. back-to-back night flights
- number of crew duty day exceedances into allowable excesses, e.g. longer than 14 hours
- number of flight duty periods determined to be significantly later than scheduled
- number of flight duty periods longer than a specified number of hours without a rest break within the duty
- 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
- number of duty periods with more than a specified number of flight sectors
- number of duty periods with more than a specified number of aircraft changes
- number of times crew monthly flight hours reach a predetermined threshold, e.g. 90% of allowable maximum
- number of times the use of 'captain's discretion' is invoked
- number of successive early wake-ups for sign-on
- 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
- number of flight deviations or flight completion not accomplished on specific city pairings, due to fatigue, lack of staff, medical emergencies, etc.

As part of this process, the operator defines the parameters by which they determine what is "significant" with respect to at least the following:

- FDPs being longer than scheduled
- reduced rest breaks within duty periods
- reduced rest breaks between duties.

Examples of proactive/reactive fatigue indicators include:

- measured data outside acceptable thresholds, e.g. sleepiness ratings, Psychomotor Vigilance Task (PVT) scores, or inadequate layover sleep duration
- numbers of fatigue reports - analysed by crew base, seat, augmented flights, fleet types, operational types, etc
- number of fatigue-related incidents
- number of fatigue-related Flight Operational Quality Assurance (FOQA) / Flight Data Analysis Program (FDAP) events associated with a particular schedule for which fatigue reports have been received
- absenteeism/fatigue calls.

Examples of safety assurance indicators include:

- 100% conformance with the FRMS audit program
- a low and reducing over time number of findings raised against the FRMS during internal audit, including no high level findings
- a high level (90% or above) of all FRMS investigations completed in the designated time frame
- a high level (90% or above) of Action Items stemming from audit or investigation completed by the due date.

Examples of safety promotion indicators include:

- 100% of FRMS induction training is delivered to all relevant personnel prior to the FRMS trial commencing
- 100% of FRMS recurrent training is delivered to all relevant personnel in accordance with the documented training timetable
- after the first three years of FRMS operations, the number of persons failing the competence assessment at FRMS recurrent training falls to less that 0.5%
- the number of FRMS promotional publications required to be produced annually is achieved as per the schedule.

2.4.2.3 Proactive Processes

FRMS proactive processes focus on monitoring fatigue levels in an operation.

The success of proactive processes depends on the willingness of flight crew members to continually participate requiring an operator to cultivate a reporting culture. To achieve this, the FRMS documents the obligations of the crew to participate in the FRMS processes through reporting of fatigue hazards and events, be involved in monitoring activities, actively engage in training and manage their non- work activity to achieve adequate rest in order to be adequately rested for subsequent duties.

The following are the examples of possible methods of proactive fatigue hazard identification:

- self-reporting of fatigue risks
- crew fatigue surveys
- flight crew performance data
- safety databases and scientific studies
- analysis of planned versus actual time worked.

Outlined below are various methods [For additional information refer to Chapter 5 – FRM Processes of the ICAO DOC 9966 2nd Edition, 2016 Manual for Oversight of FRMS Approach] which could inform the development of proactive hazard identification processes:

Fatigue reporting

The proactive hazard identification process related to self-reporting of fatigue risk is informed by:

- a fatigue reporting method which facilitates the simple and expeditious reporting of fatigue
- a fatigue reporting form
- obligations on crew, schedulers, managers and other relevant persons to report fatigue hazards and events

The operator should provide adequate detail in their FRMS on the following:

- locations of report forms
- the methods of submission – whether electronic and/or hard copy
- the timelines for submission – consideration should be given to the consequences or possible consequences of the event in relation to submission and investigation timelines. It is possible that some events will require immediate investigation and possible action. The operator should have a process within their FRMS detailing the circumstances in which a report should be made including the reporting times required for specific events/hazards, e.g. within 24 hours of the fatigue event/hazard occurrence.

To enable this data collection the operator can provide a copy of the fatigue report form in the FRMS manual. The fatigue report form is an integral part of the FRMS [Chapter 5 of the ICAO DOC 9966 2nd Edition, 2016 Manual for Oversight of FRMS Approach contains additional information of fatigue reporting forms, with an example of the form in Appendix A]

The fatigue report form will need to capture relevant factors including:

- sleep and duty history for a minimum of three days
- time of sustained wakefulness from sleep period at the time of the event and any naps taken in between
- time location and circumstances of the hazard/event
- a scientifically validated alertness or sleepiness scale
- a facility to indicate confidentiality is required
- space for the reporter to state what may have contributed to any fatigue experienced
- a facility to record any fatigue symptoms and any mitigation strategy used to reduce the risk
- a free text field for commentary.

The operator can have procedures in place to ensure:

- all fatigue reports are responded to in the first instance (directly or by automated response to acknowledge receipt)
- a response, detailing the action taken and the outcomes, is provided to the originator for any report which results in investigation or mitigation.

Crew fatigue surveys

The proactive hazard identification process related to crew-fatigue surveys is informed by:

Conducting retrospective surveys at regular intervals (not exceeding two years) to enquire about sleep and fatigue patterns [Chapter 5 – FRM Processes of the ICAO DOC 9966 2nd Edition, 2016 Manual for Oversight of FRMS Approach contains additional information on Crew Fatigue Surveys with Appendix A describing measures which can be used for retrospective surveys and perspective monitoring] **Management System Handbook 2.0 FRMS – Flight**

- conducting prospective surveys as a focused activity to monitor fatigue during a duty period trip or roster
- ensuring adequate participation of the target population of crew members (ideally more than 70%) to ensure the survey represents the range and variance of experiences with fatigue and duty
- ensuring surveys are conducted in a scientifically valid manner and that results are subjected to appropriate scrutiny and enquiry, identifying a set of triggers which would require a survey to be conducted when a predetermined threshold was reached, e.g. introduction of a new route, new type; a change in layover times in away ports; a spike in fatigue reports.

Crew performance data

The proactive process related to crew performance data is informed by:

[Chapter – FRM Processes of the ICAO DOC 9966 2nd Edition, 2016 Manual for Oversight of FRMS Approach contains additional information on Crew Performance data with Appendix A describing a performance test commonly used to measure crew member fatigue]

- a validated process to monitor crew fatigue levels both during and outside of operations subjectively by surveys and sleep diaries
- a validated process to monitor crew fatigue levels during operations objectively by actigraphy [Use of actiwatches to monitor sleep patterns] Psychomotor Vigilance Task (PVT) testing and polysomnography [the gold standard technology for measuring sleep duration and quality]
- a process to consider information from the Flight Data Analysis Program against potential fatigue risk indicators and fatigue reports
- the use of trained flight deck observers conducting observations by way of a validated process of flight crew performance (e.g. LOSA) to identify potential risks introduced by reduced alertness.

Safety databases and scientific studies

The proactive process related to safety databases and scientific studies is informed by:

- the use of external databases and research papers to complement internal processes to ensure pre-existing validated information about fatigue risks in other operations is evaluated for relevance to the proposed FRMS operations
- operators having adequate processes to remain up to date with changes in the state of knowledge of fatigue risk management.

The proactive process related to analysis of planned versus actual time is informed by:

- analysis of planned activity against completed activity with a focus on detecting changes to schedules, exceeded limits, and use of captains discretion to continue with a delayed duty.

2.4.2.4 Predictive Processes

The operator must use predictive processes which identify fatigue hazards by examining crew scheduling and taking into account factors known to affect sleep and fatigue and their effects on performance.

3 possible ways of doing this:

- operator or industry operational experience and data collected on similar types of operations
- evidence-based scheduling practices
- bio-mathematical models.

To enable assessment of bio-mathematical model data, BCAA must receive training in the model proposed to a level which enables the BCAA to assess the data likely to be presented by an operator. BCAA should avail themselves of this training.

BCAA will appropriately review the proposed limits, and provide advice on the acceptability of the case for deviation.

The applicant will need to:

- clearly document the scientific basis for scheduling rules
- document the pairing and roster build processes to allow for audit and analysis of the suitability of these processes.

Outlined below are various methods [For additional information refer to Chapter 5– FRM Processes of the ICAO DOC 9966 2nd Edition, 2016 Manual for Oversight of FRMS Approach which could inform the development of predictive hazard identification processes:

<u>Previous experience</u>

- brain-storming using experienced operational personnel, schedulers, management
- review of safety reports citing fatigue from the existing operation
- analysis and trending of previous reports of use of *captain's discretion* to extend duty
- analysis and trending of previous 'stand by' usage
- reports and crew fatigue reports, or published scientific research and other information on similar routes
- focussed monitoring of normal operations for fatigue hazards.

Evidence based scheduling practices

- building schedules which incorporate the consideration of fatigue science
- during pairing and roster construction appropriate consideration is given to sleep loss and recovery, circadian rhythms, cumulative fatigue, task fatigue.

Use of a bio-mathematical modeling tool

- selection of a bio-mathematical modelling tool which is appropriate for the type of operation
- the individuals operating the bio-mathematical modelling tool being trained in the use of the tool
- the fatigue profiles predicted by the bio-mathematical modelling tool must be validated by the operator by the collection and analysis of data
- the process of validation of the fatigue profiles predicted by the bio-mathematical modelling tool is commenced by reviewing normal operations in the first instance, and subsequently in operations under the formal FRMS Trial period
- the assumptions and limitations of the bio-mathematical modelling tool are documented and understood by all relevant stakeholders.
- the fatigue scores generated by the bio-mathematical modelling tool are subject to ongoing updates and recalibration of fatigue thresholds based on scientific advances and validated data analysis
- the output of the bio-mathematical modelling tool is not used for "go/no go" decision making about whether an individual is fit for duty.

BCAA have compared attributes and limitations of various fatigue models available internationally, such as Boeing Alertness Model (BAM), Circadian Alertness Simulator (CAS), Fatigue Assessment Tool by InterDynamics (FAID)., Fatigue Risk Index (FRI), System for Aircrew Fatigue Evaluation (SAFE), Sleep, Activity, Fatigue, and Task Effectiveness model and Fatigue Avoidance Scheduling Tool (SAFTE-FAST), Sleep/Wake Predictor (SWP) etc., While BCAA will not endorse any particular fatigue model and its operators's discretion to use any application/model suitable for the kind and type of operation it handles. A model which does not account for time zone change/circadian issues is not appropriate for an operation which has the fatigue factors and will not be acceptable to BCAA.

2.4.2.5 Planned Safety Assurance Processes

The operator will now have completed Phase II and III of the development of their FRMS. The BCAA should be provided with a revised system manual that reflects developments in the areas of risk management, communications, training and the inclusion of planned safety assurance processes.

2.4.2.6 Implementation of FRMS Processes by the Operator

At Regulatory Milestone 3, the operator is expected to have implemented both proactive and predictive risk management processes. Prior to recommending approval for the trial implementation of the FRMS, the BCAA must be satisfied that these risk management processes

are present and operational and appear to be reasonably capable of continuously and effectively monitoring and managing fatigue-related safety risks using scientific principles and knowledge, and operational knowledge, and experience. The BCAA must also be satisfied that they will enable the AOC holder to safely assess the extent to which FCMs (Flight Crew Members) and other relevant personnel perform at levels of alertness sufficient to ensure the safety of operations.

The BCAA must confirm that reactive, proactive and predictive processes are operational, including risk assessment and the development, implementation and monitoring of appropriate controls and mitigations. This may include review of

1. Reactive risk assessment processes, which may include:
    a. the fatigue hazard log;
    b. how the risk matrix was developed and the use of the agreed upon severity and likelihood measures;
    c. the methodology for the development of mitigation strategies;
    d. fatigue report procedures;
    e. any crew surveys; and
    f. FSAG meeting minutes.
2. Proactive and predictive processes, which may include:
    a. assessment of agreed fatigue roster metrics;
    b. any information from bio mathematical modelling;
    c. development of FRMS performance indicators and their targets;
    d. supporting scientific documentation;
    e. FSAG meeting minutes;
    f. The use of other operational best practices;
    g. the fatigue hazard log; and
    h. Further proposed mitigations to reduce the risk.

2.4.3 FRMS Limits

At Regulatory Milestone 3, the FRMS Manual must concisely document the limits developed through the FRMS processes including maximum values for flight times and flight duty periods(s) and duty period(s), and minimum values for rest periods. An FRMS may be required for other than increasing FDPs or decreasing break times, for example an operator may require a deviation from a standard crew rest facility. The FRMS is to clearly identify this deviation.

These deviations are to be based upon supporting scientific principles and knowledge— which should include appropriately gathered operational data—and be subject to the FRMS safety assurance processes.

In determining the values of the prescriptive limits, the operator can incorporate and consider the impact of at least the following matters which may be applicable to their operation:

- rest at home base and away from home base
- state of acclimatisation at the start of a flight duty period
- flight and duty limits
- duty period/s which infringe on a window of circadian low
- number of sectors to be flown—including identifying the maximum number of sectors to be flown
- augmented/unaugmented crew numbers and crew complement
- the class(s) of crew rest facility
- procedures for facilitating inflight rest
- the process for handling delays and extensions
- the process for handlings diversions
- ground duties and mixed duties
- standby and positioning
- split duties
- training—both airborne and in simulators.

In reviewing the FRMS limits, the BCAA must consult the relevant type of operation and, where possible, take the limits detailed in that scheme as benchmark limits.

For any deviations from the standards prescribed within the schemes, the Applicant will provide BCAA a valid, scientifically defensible safety case to justify each of the deviations. This is essentially the function of the FRMS and the safety case may not become fully apparent until the verification process that occurs during the trial period.

2.4.4 Planned Safety Assurance Processes

While the safety assurance processes are required to be operational by the end of Phase IV and prior to application for full approval, there is to be a planned process, available for review at Regulatory Milestone 3—the time of application for a trial approval. This plan should ensure:

- planned roles and responsibilities for assuring the safety performance of the FRMS are established
- the necessary authorities and communication channels are active and appear to be reasonably capable of continuously and effectively enabling fatigue safety related communications sufficient to ensure the effectiveness of the FRMS
- initial FRMS SPIs have been developed and agreed on - it is anticipated that over the trial period the SPIs will be refined where required such that by the end of the trial there can be some confidence in the effectiveness of the SPIs and targets
- appropriate feedback is established between the FRM processes and the FRMS safety assurance processes.

2.4.5 BCAA Review

The BCAA will review and conduct verification and testing exercises to ascertain relevant elements of the FRMS are in place before recommending the approval of the conduct of the FRMS trial:

- the reactive processes
- proactive and predictive processes
- the implementation of appropriate risk controls and mitigations and processes of monitoring their ongoing effectiveness
- the results of all risk assessment processes and agree with the operator on the initial FRMS safety performance indicators and safety targets
- directly sampled records quoted in the risk assessment and assess the operator's procedures against supplied risk assessments
- the training program—completion of initial training and plan for ongoing training—and training records
- FRMS communication processes are established to support the current version of the FRMS and appear to be reasonably capable of continuously and effectively enabling fatigue safety related communications sufficient to ensure the effectiveness of the FRMS
- documented interview with a selection of employees from all the areas involved with FRMS
- the outer limits for the proposed FRMS operation and adjust them accordingly if there is insufficient evidence to support the case
- the operator has documented, planned safety assurance processes and procedures that could reasonably be expected to be effective.

The BCAA should be satisfied that the risk controls are sufficient and is satisfied as to the FRMS safety performance indicators and targets. Sampling verification of the operators system should also take place. This may involve interviews with flight crew members, discussions with FSAG members and may include attending FSAG meetings. Further verification may include attending training sessions and examination of reports.

The BCAA will provide the operator, where necessary, with a list of corrective actions that must be addressed before the trial may commence. These checks form the basis for the Regulatory Milestone 3 assessment and once the BCAA is satisfied, arrangements should be made to issue the operator with an instrument that approves a trial FRMS implementation in accordance with Chapter 8.8 in Section 8 to CAP 34.

It is important to note that this milestone does not signify the only time a BCAA is to interact with an operator. Processes may be commenced on a gradual basis throughout all phases and the BCAA should avail of any opportunity to assess them.

Any deficiency or anomaly is to be recorded and a report provided to the operator. The trial FRMS implementation is not to be commenced until system correction (if required) occurs to the satisfaction of the BCAA.

2.4.6 Trial FRMS Implementation Approval

The approval of the trial FRMS implementation is conditional upon the BCAA being satisfied that each element of the AOC holders FRMS complies with and meets the requirements, attributes and characteristics of a FRMS under Section 8 to CAP 34.

If BCAA is satisfied, the AOC operator is granted a trial approval giving consideration to the trial duration limitation in Chapter 8.8 in Section 8 to CAP 34 (12months).

Once the approval for a trial FRMS implementation has been issued, BCAA should have regular contact with the applicant to receive and review copies of fatigue related data collected and the associated reports. All communication which occurs after the commencement of the trial until the grant of full FRMS implementation approval must be recorded.

The entry control should also remain vigilant to changes in the company including operational tempo and authorised activities. Regular meetings with the operator and a review of activities will assist in developing an understanding of the performance of the FRMS. In certain circumstances an additional trial period may be appropriate, e.g. after a long period of inactivity or after a significant change to the FRMS is approved. Changes to the proposed FRMS during the conduct of the trial will require BCAA approval.

NOTE: *If during the trial the BCAA assessment team identifies that the FRMS trial is not fulfilling safety obligations, the trial must be cancelled.*

If BCAA cancels the trial FRMS approval, all stakeholders must be notified that the operation has reverted back to the appropriate prescriptive regime of Subpart-Q of ANTR OPS 1

2.4.6.1 Operator Initiated changes to the FRMS – During Trial

Any change to the FRMS that requires BCAA approval in accordance with Chapter 8.7 of Section 8 to CAP 34 requires a change to the instrument and should be applied for via an application form sent to PAC.

2.4.6.2 BCAA Initiated Changes

After issuing the Instrument of Approval for the conduct of an FRMS Trial, BCAA may, for safety purposes, give a direction to the AOC holder/operator to amend, change or modify the FRMS and any of its elements, indicating the following:

- the area/s of the FRMS which need to be modified
- the period within which the change has to be completed.

The direction must be made in writing.
Should the operator fail to comply with the direction within the specified period, the BCAA may commence the process to revoke the approval to conduct trial FRMS.

2.4.7 FRMS Trial – Operator Responsibilities

During the trial, regular communication with the BCAA should be maintained.

The FRMS Manual is finalised prior to commencement of the trial and is then subject to the FRMS change management procedures are documented in Chapter 8.8 of Section 8 to CAP 34.

***NOTE**: As per Chapter 8.7.5 of* Section 8 to CAP 34, *the operator may make changes, without BCAA approval, in the form of correction of typographical errors, or changes to names of individuals (limited to persons other than the persons approved/accepted as post holders by BCAA) documented in the Manual or changes under paragraphs 8.7.5(a), (b) and (c). Any other change will require BCAA approval. BCAA must be notified of all changes. It should be stressed that any operator- initiated changes under paragraphs 8.7.5(a), (b) and (c) require the greatest care, their appropriateness and integrity will be the focus of any subsequent BCAA audit activity, and as such would have a significant bearing on whether a full FRMS implementation approval would be given.*

The Applicant must meet the requirements of Chapter 8.8 in Section 8 to CAP 34 and notify BCAA that they are ready for final assessment for the full FRMS implementation approval.

2.5 FRMS Safety Assurance Processes

The operator needs to develop and maintain FRMS safety assurance processes to:

- provide for continuous FRMS performance monitoring, analysis of trends, and measurement to validate the effectiveness of the fatigue safety risk controls
- provide a formal process for the management of change
- ensure the continuous improvement of the FRMS.

The Operator's procedures supporting their safety assurance processes must cover the requirements outlined in Chapter 8.5 of Section 8 to CAP 34.

2.5.1 Monitoring of FRMS Performance

2.5.1.1 Pre-Trial

Over Phase I, II, & III, the operator will transition from a planned safety assurance procedures to an operational safety assurance process in accordance with their implementation plan. Phase IV represents an opportunity to exercise these processes using the limits that are supported by the operator's data and safety case and thereby validate the FRMS safety assurance procedures.

2.5.1.2 Trial FRMS Implementation

It is important to understand that at this point the operator, whilst operating under an FRMS trial, does not have a fully approved FRMS. During this phase of development the operator will conduct audits and it is expected that the entry control will also perform these as well. There should be no confusion as to their purpose. These checks, audits or assessments, however named, form the basis for the verification and validation of the FRMS and will be used by the BCAA as the foundation

upon which a final decision is made for FRMS approval (Regulatory Milestone 4). These assessments are a part of the entry control process.

The operator will need to establish ongoing validation of the effectiveness of the fatigue safety risk controls by gathering and analysing relevant data.

Sources of data for FRMS performance monitoring analysis and measurement include hazard reporting—the nature of the reports and the quality and quantity of reports—and investigations, audits and surveys, and reviews and fatigue studies.

Reports of fatigue hazards, fatigue events and fatigue incidents are reviewed by the FSAG and evaluated on the basis of risk.

2.5.1.3 FRMS Investigation

To assist in achieving compliance with Chapter 8.5 of Section 8 to CAP 34, an operator should develop a FRMS investigation process that ensures:

- all fatigue events/incidents reports and any other reports in which fatigue may be identified are formally reviewed, based on predetermined thresholds, to identify whether fatigue events/incidents are subject to investigation and if so, the level of the investigation
- the fatigue investigation is clearly documented and a fatigue report form used to ensure a consistency. An example of a fatigue report form may be found in Appendix A of the ICAO DOC 9966 2nd Edition, 2016 Manual for Oversight of FRMS Approach.
- the fatigue investigation is conducted in accordance with current best practice techniques and addresses the causal factors that contributed to the event. This includes:
    - assigning persons to conduct any fatigue investigation who are formally trained and competent in investigation techniques, fatigue science and the FRMS
    - provision of specialist assistance to assist the investigation if and 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 FDAP event
    - stipulating a timeframe for the completion of the investigation and the provision of the report to the FSAG
    - 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 sought by the investigator
    - reinforcing *open and fair culture* principles are applied in evaluating any findings or recommendations from the investigation
    - a fatigue investigation initiated by reported fatigue should not try and confirm or invalidate whether the FCM was actually fatigued. The effort should be in trying to understand the contributing factors that led to the fatigue and whether the reported fatigue is indicative of an ongoing or systemic issue that may need to be addressed through some form of mitigation.

***NOTE**: Investigation reports form a part of records and reports to be retained by an operator and are to be made available to BCAA upon request or during surveillance activity.*

2.5.1.4 FRMS Audit

For BCAA to be satisfied that an FRMS is capable of delivering ongoing safety outcomes, the operator will need to ensure the FRMS is subject to an independent audit annually, or more frequently should SPIs suggest this is required.

The scope of the FRMS audits is to be clearly outlined and will need to cover all FRMS processes and outcomes and include associated items, which may impact on the operational alertness of crew, for example suitability of hotels for crew accommodation.

The FRMS will need to include formal audit checklists relevant to the various scope items to aid in conducting the audits thoroughly and with adequate depth of penetration.

The BCAA will verify the audit process:

- comprehensively covers all the FRMS elements
- ensures persons assigned to conduct an FRMS audit are formally trained and competent in lead auditor techniques, human performance limitations and the FRMS
- includes procedures to manage audit findings which include at least entry of findings into the relevant database; provision of the reports - to whom and in what time frame; and assigning of responsible persons to ensure close out of findings.

The operator's FRMS could have provisions to commission an independent scientific review of the FRMS and the workings of the FSAG to ensure that decision made and actions take are scientifically valid.

NOTE: *BCAA should be provided a copy of the report of any audit of any aspect of the FRMS within 30 days of completion of the audit.*

2.5.1.5 FRMS Surveys

Surveys are conducted retrospectively and prospectively.

Survey methods and purposes are scientifically defensible and the results subject to analysis.

Data and results of analysis from surveys is fed through the governance framework to track the performance of the FRMS

For more detail on FRMS Surveys see *2.4.2.3 Proactive Processes - Crew Surveys*.

2.5.1.6 Fatigue Studies

Processes are in place to consider advances in fatigue science, the availability of enhanced fatigue management tools or processes and changes in operational knowledge.

These processes include at least the following:

- the attendance of relevant stakeholders (e.g. the FRMS Manager) at relevant forums to remain conversant with developments in fatigue science
- participation by relevant stakeholders in workshops or other educational activities with respect to fatigue
- subscribing to publications related to fatigue science.

2.5.2 Management of Change

The BCAA will verify if the operator has established processes to identify and manage changes to their operations, which may affect the FRMS.

At least the following areas require the application of formal change management procedures:

- new schedule(s)
- new airports / sectors
- new type(s) of operation
- addition of a new aircraft type
- addition of extra aircraft of the same or similar type
- introduction of new equipment and/or operational procedures
- new crew accommodation
- structural change in the operational department(s)
- change in key FRMS personnel
- advances in relevant scientific knowledge about fatigue.

The change management procedures will need to ensure the primary involvement of the functional group that is responsible for coordinating the fatigue management activities within the organisation's FSAG, as the primary stakeholder. The sign-off procedure must be consistent with the prescribed procedures outlined in the Chapter 8.7 of Section 8 to CAP 34 before a proposed change, which may impact on the FRMS or the operational alertness of crew in any manner, is implemented.

Prior to the introduction of any change, the FRMS must ensure:

- hazard identification and risk management processes are deployed prior to the introduction of any change
- safety assurance processes are deployed during the implementation of the change to monitor and measure the impact of the change
- consideration is given to the available tools which could be used to maintain or improve FRMS performance prior to the introduction of any change.

The operator's FRMS will need to ensure the safety assurance processes continue to be deployed after the implementation of the change to ensure no unexpected risks or hazards are introduced by the change.

2.5.3 Continuous Improvement

The FRMS must include a continuous improvement process (see Chapter 8.5.5 in of Section 8 to CAP 34 Through evaluation and review, this will ensure:

- all safety performance targets are being met
- all SPIs are within the defined tolerances
- the FRMS is compliant with regulatory requirements
- the FRMS is meeting the set safety objectives
- the organisation fosters a learning culture that ensures improvement consistent with developments in the human factor limitations field
- the system improves overall in light of company experiences.

As part of evaluation processes a formal review is conducted at least annually to drive continuous improvement.

The consideration by the highest level safety committee of the functionality of the FRMS shall be taken in during annual review. Having independent oversight ensures the FSAG does not review its own performance.

The FRMS must include a formal review of the FRMS and all associated processes to check the adequacy of facilities, equipment, documentation and procedures.

The formal review process also includes:

- incorporation of findings, outcomes and actions identified through safety assurance processes which may enhance the FRMS
- reviewing the risk management processes to ensure the ongoing adequacy and requirements for risk controls and mitigators
- reviewing the FRMS against scientific advances in fatigue management
- incorporating new scientific knowledge and processes to enhance the management of operational alertness
- reviewing the communication channels to ensure effective two-way communication to all stakeholders.

The inputs to this review include summary reports from the FSAG highlighting fatigue related issues such as:

- trends identified from fatigue reports
- risks identified and treatment measures deployed
- investigations conducted
- reports of the audit of the FRMS
- relevant findings from FDAP (Flight Data Analysis Program), LOSA (Line Operations Safety Audit) etc.
- regulatory status
- implications of scientific developments
- resourcing issues
- recommendations and rationale for change to any FRMS process or structure
- trends in background reporting rates that might indicate issues with communications channels and stakeholder engagement.

The outputs from the review process include formal acknowledgement that the FRMS is achieving its objectives or alternately acceptance of recommendations for changes and the allocation of the appropriate resources to affect the required changes.

2.6 FRMS Promotion Process

FRMS promotional processes primarily consist of:

- training programs to ensure competency commensurate with the roles and responsibilities of management, crew and all other involved personnel in the FRMS
- an effective communication plan which explains FRMS policies, procedures and responsibilities to all relevant stakeholders; and describes communication channels used to gather and disseminate FRMS-related information

Safety promotion processes development is commenced at Phase I and continues to be developed throughout the entire FRMS building process.

Chapter 8.6 in of Section 8 to CAP 34 outlines the procedures that must be covered when establishing FRMS promotion processes.

For a detailed explanation on the requirements, refer to *2.3.4.1 FRMS training program plan* and *2.3.4.2 FRMS Communication Plan*

2.7 Regulatory Milestone 4

Regulatory Milestone 4 consists of the FRMS verification and full FRMS implementation approval.

2.7.1 Planning and Programming the FRMS Trial Validation (BCAA)

While this is part of the entry control process, the verification of the safety assurance processes within Phase IV of an operator's FRMS trial will use BCAA audit methodologies. The assessment will be conducted over a period of time and will take into consideration the operator's individual circumstances. The BCAA will use the methodologies contained within the BCAA Surveillance / Audit Policy.

The BCAA will need to recognise that the safety assurance processes and procedures under the FRMS Trial approval may not yet reach full maturity levels and the rate of change may be higher than otherwise expected.

Any breach or non-compliance from approved FRMS Trial will be managed as outlined in BCAA's Surveillance Manual.

2.7.2 Assessment for Full FRMS Implementation Approval

The applicant must provide BCAA sufficient time (at least 3 months) to review the evidence provided and issue the full approval before the trial period ends.

BCAA may on written application issue an AOC holder with a full FRMS implementation approval if the AOC holder has had a trial FRMS implementation for at least 12 months and satisfies BCAA that the FRMS is capable of demonstrably delivering the safety outcomes and the continuous improvement of the same as per Chapter 8.9 of Section 8 to CAP 34.

The operator may request BCAA to conduct the final assessment for the full FRMS approval implementation by providing evidence that the FRMS is delivering the required safety outcomes.

2.7.3 BCAA Verification Process

During the trial period, the operator needs to validate the safety assurance processes and demonstrate a fully functioning FRMS within the agreed outer limits.

The BCAA will conduct verification process through:

- regular visits
- desktop reviews of sample data
- analyses of documentation
- documented interview of personnel involved with FRMS.

At Regulatory Milestone 4, the BCAA will verify the following:

- the operator can demonstrate that its FRMS safety assurance procedures are used to review the FRMS SPIs against its agreed targets and can identify and undertake necessary actions
- the functioning of the FSAG can demonstrate the identification and management of any new fatigue hazards and its subsequent risk assessment and management
- the safety assurance functions monitor the effectiveness of the mitigations and suitability of the outer limits of the FRMS
- all procedures are being correctly applied and the effectiveness of risk mitigations and assumptions made
- the operator has completed all training identified in the implementation plan, and has added effective recurrent training into its training program
- the operator's communication strategies have been implemented and there is evidence that they provide for the continuous and effective communication of FRMS policies, procedures and responsibilities to all stakeholders
- that there is evidence the operator's communication channels—such as fatigue reporting mechanisms—provide for continuous and effective gathering and dissemination of FRMS-related safety information
- the operator's documentation and procedures have been kept up-to-date, and represent the operating FRMS at the completion of the trial.

NOTE: *During the verification process conducted by a BCAA as a function of milestone 4, or if an operator requires further changes during the trial period, it is possible that a BCAA may be presented with data from an operator that raises concerns in their capacity to support a limit or a change. In most circumstances, this should be resolved within the expert group. Occasionally, further advice may be required, e.g. examining in depth bio-mathematical information.*

The BCAA must document the final assessment. On the completion of the assessment, the BCAA will make a recommendation to the delegate, using the

Standard Form Recommendation (SFR), to issue or not issue the full FRMS implementation approval. The SFR must document the outcomes of the assessment and the reasons for the recommendation.

The BCAA must only recommend the issue of the full FRMS implementation approval if the operator has addressed the corrective measures (if any) and has met the requirements of ANTR OPS 1 Subpart Q.

If the final recommendation is a refusal to issue the full FRMS approval, it is the responsibility of the BCAA to inform the operator of the recommendation before the same is submitted to the BCAA delegate for action.

For detailed information on the SFR process, refer to the FRMS Process Guide.

2.7.4 Extending the Trial Period

The purpose of the lengthy trial period is to enable capture of safety assurance data over all seasons of operation. Prior to the operator receiving trial FRMS implementation approval, a trial period will be determined and stated on the instrument. Any extension beyond the date stipulated in the instrument of approval will be considered by BCAA based on the degree to which the operational changes may have invalidated previously collected FRMS data.

The operator should be ready three months before the end of the trial period for BCAA to conclude its assessment for the full FRMS implementation approval.

2.7.5 Full FRMS not approved by BCAA

Should the full FRMS implementation approval not be signed, then the operator must have an alternate mechanism by which they manage flight and duty times for flight crew members. The operator would need to have a system in place to be able to comply with Subpart Q of ANTR OPS 1/CAP 34 to permit them to continue to operate at the conclusion of the trial.

2.8 FRMS Requirements for Ultra Long Range (ULR) Operations

This section is reserved. Until this section is written any application which includes ULR operations will require a coordinated response from BCAA which will likely involve a local, FRMS trained BCAA & other trained FRMS specialists.

2.9 Applicable Regulations and Advisory Material

2.9.1 Applicable Regulations

Regulations are available on the BCAA web site http://www.mtt.gov.bh

Document	Title
	Civil Aviation Law
	Air Navigation Technical Regulation – ANTR OPS 1
Subpart-Q	Flight & Duty Time Limitations and Rest Requirements
	AMC/GM for Flight and Duty Time Limitations and Rest Requirements
ICAO DOC 9966, 1st Edition 2012	Fatigue Risk Management Systems Regulators Manual
ICAO DOC 9966 2nd Edition, 2016	Manual for Oversight of FRMS Approach

2.9.2 Advisory Material

Document	Title
CASA Fatigue Management guidance	Available at www.casa.gov.au/fatigue/
International Civil Aviation Organization (ICAO) guidance	Fatigue Management resources, available at http://www.icao.int/safety/fatiguemanagement/Pages/Resources.aspx
FRMS Implementation Guide for Operators	https://www.icao.int/safety/fatiguemanagement/Pages/default.aspx
Hand Book on FRMS Implementation	Published by BCAA in http://www.mtt.gov.bh
FRMS Process Guide	Published by BCAA in http://www.mtt.gov.bh

Appendix 1

Integration of FRMS into Safety Management System

For effective integration, the components of the FRMS need to be extended throughout the safety management system.

The table below outlines the suggested steps towards integration of FRMS into SMS.

Step	Action	Notes
1	Form a fatigue safety action group (FSAG) or equivalent	The FSAG may be separate to, or a subcommittee of, the safety committee or safety action group. It is responsible for coordinating and overseeing all FRMS activities. This includes providing advice to operational management staff, managing project resources, supporting operations staff, ensuring employee representation, providing subject-matter expertise for investigations, ensuring the FRMS is appropriate for the organisation and is being continually improved and managing fatigue risk throughout any changes to the organisation.
2	Draft FSAG terms of reference, FRMS accountabilities, responsibilities and authorities	The FSAG considers which SMS accountabilities, responsibilities and authorities can be incorporated into the FRMS.
3	Do a gap analysis of existing SMS documentation, procedures and processes and FRMS requirements	The gap analysis must include: which SMS documentation, procedures and processes can be applied to the FRMS without change which SMS documentation, procedures and processes can be applied to the FRMS with modification where neither of the above apply, which FRMS-specific documentation, procedures and processes required which documented processes and procedures require modification to ensure FRMS staff involvement such as screening of event reports and investigations.
4	Develop the FRMS policy and objectives	FRMS policy should state the purpose and objectives of the FRMS, including the responsibility of both management and employees for managing fatigue-related risk. It must also reflect the commitment of management to: ensure sufficiently qualified staff, resources and equipment are available to meet FRMS requirements ensure initial and recurrent FRMS training is provided to all relevant personnel, including management and the accountable manager ensure the continuous improvement of the FRMS indicate that all employees involved with the FRMS are required to comply (i.e. making appropriate use of rest periods, undertaking FRMS-related training, reporting fatigue-related risks and incidents etc.)

5	Use the results of the gap analysis to develop FRMS-related documentation, procedures and processes	You must decide how you will incorporate FRMS-related documentation into the SMS documentation. FRMS procedures and processes should determine your approach to identifying fatigue-related risks (i.e. reactively, through reporting mechanisms; and proactively, by fatigue surveys/questionnaires/performance data).
6	Develop a plan for SMS/FRMS integration	The implementation plan should cover the process of integrating the FRMS with the SMS; provide a timeline showing: -all activities -who is responsible for each activity -communication activities associated with implementation of the plan (see below). You also need to contact BCAA regarding approval of the FRMS (see below).
7	Develop a comprehensive FRMS communication plan	The communication plan outlines what needs to be communicated to relevant stakeholders, how and when. FRMS-related communications must be careful to manage employee expectations, by clearly explaining how the FRMS will, and will not, affect them. Communication to employees should start early on in the implementation process.
8	Review current operations to assess where/when fatigued-related risks may exist and use the risk management process to determine the best way to control them. These results should be reflected in FRMS documentation.	This stage of the process should include a review of rostering arrangements and possible rostering improvements aimed at better managing fatigue-related risk better. FRMS procedures and processes must also reflect how you will monitor the effectiveness of your fatigue-related risk management.
9	Develop fatigue- and FRMS-related training material	Initial fatigue-related training should establish a common level of understanding among employees about fatigue and the impairment it causes. As the FRMS develops, training content should then expand to cover the FRMS itself.
10	Determine whether to use bio-mathematical models to assist identify potential increases in fatigue-related risk.	If you decide to use a bio-mathematical model, you must integrate its application into the FRMS documentation and processes. This material should reflect when and how the model is used (e.g. when developing rosters, fatigue studies, incident investigation etc.). It is strongly recommended that you do not use biomathematical models to determine the level of fatigue of a particular individual. These models are based on broad population averages not the characteristics and circumstances of any one individual.

11	Develop periodic review processes for FRMS to ensure continuous improvement.	The review must look into the FRMS's capability, operational integrity and fitness for purpose, and how FRMS performance will continue to be measured to ensure ongoing improvement. FRMS components can be assessed separately, or as part of more general safety audits.