CHAPTER 35

FATIGUE RISK MANAGEMENT SYSTEM (FRMS)

1.0 PURPOSE

This chapter describes what should be included in an FRMS policy and other documentation required to record its activities. The policy and documentation define organisational arrangements that support the core operational activities of the FRMS (the FRMS processes and the FRMS safety assurance processes). The FRMS policy specifies the operator's commitment and approach to the management of fatigue risk. The FRMS documentation describes the components and activities of the entire FRMS. It makes it possible for the effectiveness of the FRMS to be audited (internally and externally) to check whether it is meeting the safety objectives defined in the FRMS policy.

Fatigue is a major human factors hazard because it affects most aspect of a crewmember's ability to do their job. It therefore has implications for safety. ICAO defines a Fatigue Risk Management System (FRMS) as:

a data- driven means of continuously monitoring and managing fatigue-related safety risks, based on scientific principles and knowledge as well as operational experience that aims to ensure relevant personnel are performing at adequate levels of alertness.

An FRMS aims to ensure that flight and cabin crew members are sufficiently alert so they can operate to a satisfactory level of performance. It applies the principles and processes from Safety Management System (SMS) to manage the specific risks associated with crewmember fatigue. Like SMS, FRMS seeks to achieve a realistic balance between safety, productivity and costs.

1.1 REFERENCE REGULATIONS

ICAO FRMS Manual for Regulators (Doc 9966), Annex 6 Part 1 Appendix 8, ICAO Safety Management Manual (Doc 9859), Nig. CARs 8.11.1.2

2.0 APPROVAL PROCEDURES

The NCAA is to:

- Ensure that the operator is managing their fatigue related risks to an acceptable level of safety;
- Recognise that an FRMS needs to be unique to each operator; and
- Recognise that operational maturity is required for a successful FRM implementation.

2.1 FRMS Policy

Items that the FRMS policy must cover is found in ICAO Annex 6, Part 1, Appendix 8, section 1.1.3:

- reflect the shared responsibility of management, flight and cabin crews, and other involved personnel;
- clearly state the safety objectives of the FRMS;
- be signed by the accountable manager;

- be communicated, with visible endorsement, to all the relevant areas and levels of the organisation;
- declare management commitment to effective safety reporting;
- declare management commitment to the provision of adequate resources for the FRMS;
- declare management commitment to continuous improvement of the FRMS;
- require that clear lines of accountability for management, flight and cabin crews, and all other involved personnel are identified; and
- require periodic reviews to ensure it remains relevant and appropriate.

2.2 FRMS Documentation

The documentation describes all the elements of the FRMS and provides a record of FRMS activities and any changes to the FRMS. The documentation can be centralized in an FRMS Manual, or the required information may be integrated into an operator's SMS Manual. However, it needs to be accessible to all personnel who may need to consult it, and to the NCAA for audit.

ICAO Annex 6, Part I, Appendix 8 requires that an operator must develop and keep current FRMS documentation that describes and records:

- FRMS policy and objectives;
- FRMS processes and procedures;
- accountabilities, responsibilities and authorities for these processes and procedures;
- mechanisms for ongoing involvement of management, flight and cabin crew members, and all other involved personnel;
- FRMS training program, training requirements and attendance records;
- scheduled and actual flight times, duty periods and rest periods with significant deviations noted; and
- FRMS outputs including findings from collected data, recommendations, and actions taken.

2.3 FATIGUE RISK MANAGEMENT PROCESSES

2.3.1 Identification of hazards

An operator shall develop and maintain three fundamental and documented processes for fatigue hazard identification:

2.3.1.1 ***Predictive.*** The predictive process shall identify fatigue hazards by examining crew scheduling and taking into account factors known to affect sleep and fatigue and their effects on performance. Methods of examination may include but not limited to:

a) operator or Industry operational experience and data collected on similar types of operations;
b) evidence-based scheduling practices; and
c) biomathematical models.

2.3.1.2 ***Proactive.*** The proactive process shall identify fatigue hazards within current flight operations. Methods of examination include but not limited to:

a) self-reporting of fatigue risks;

b) crew fatigue surveys;
c) relevant flight and cabin crew performance data;
d) available safety databases and scientific studies; and
e) analysis of planned versus actual time worked.

2.3.1.3 ***Reactive.*** The reactive process shall identify the contribution of fatigue hazards to reports and events associated with potential negative safety consequences in order to determine how the impact of fatigue could have been minimized. At a minimum, the process may be triggered by any of the following:

a) fatigue reports;
b) confidential reports;
c) audit reports;
d) incidents; and
e) flight data analysis events.

2.3.2 Risk Assessment

2.3.2.1 An operator shall develop and implement risk assessment procedures that determine the probability and potential severity of fatigue-related events and identify when the associated risks require mitigation.

2.3.2.2 The risk assessment procedures shall review identified hazards and link them to:

a) operational processes;
b) their probability;
c) possible consequences; and
d) the effectiveness of existing safety barriers and controls.

2.3.3 Risk Mitigation

An operator shall develop and implement risk mitigation procedures that:

a) select the appropriate mitigation strategies;
b) implement the mitigation strategies; and
c) monitor the strategies' implementation and effectiveness.

2.4 FRMS Safety Assurance Process

2.4.1 The operator shall develop and maintain FRMS safety assurance processes to:

a) provide for continuous FRMS performance monitoring, analysis of trends, and measurement to validate the effectiveness of the fatigue safety risk controls. The sources of data may include, but not limited to:
   1) hazard reporting and investigation;
   2) audits and surveys; and
   3) reviews and fatigue studies.

b) provide a formal process for the management of change which shall include but not limited to:
   1) identification of changes in the operational environment that may affect FRMS ;

2) identification of changes within the organisation that may affect FRMS; and
3) consideration of available tools which could be used to maintain or improve FRMS performance prior to implementing changes; and

c) provide for the continuous improvement of the FRMS. This shall include but is not limited to:
1) the elimination and/or modification of risk controls have had unintended consequences or that are no longer needed due to changes in the operational or organisational environment;
2) routine evaluations of facilities, equipment, documentation and procedures; and
3) the determination of the need to introduce new processes and procedures to mitigate emerging fatigue-related risks.

2.5 FRMS Promotion Processes

2.5.1 FRMS promotion processes support the ongoing development of the FRMS, the continuous improvement of its overall performance, and attainment of optimum safety levels. The following shall be established and implemented by the operator as part of its FRMS:
a) training programs to ensure competency commensurate with the roles and responsibilities of management, flight and cabin crew, and all other involved personnel under the planned FRMS; and
b) an effective FRMS communication plan that:
1) explains FRMS policies, procedures and responsibilities to all relevant stakeholders; and
2) describes communication channels used to gather and disseminate FRMS-related information.

3.0 The FRMS Approval Process

3.1 Phased Approach to FRMS implementation

There is no “off-the-shelf” version of an FRMS that will suit all operators. Each operator needs to develop an FRMS that is appropriate to its organization and operations and the nature and level of the fatigue risk(s). A fully functioning FRMS does not happen overnight. The FRMS processes take time to plan and develop so the operator needs to implement its FRMS in stages, as is recommended for SMS.

FIGURE 3-1

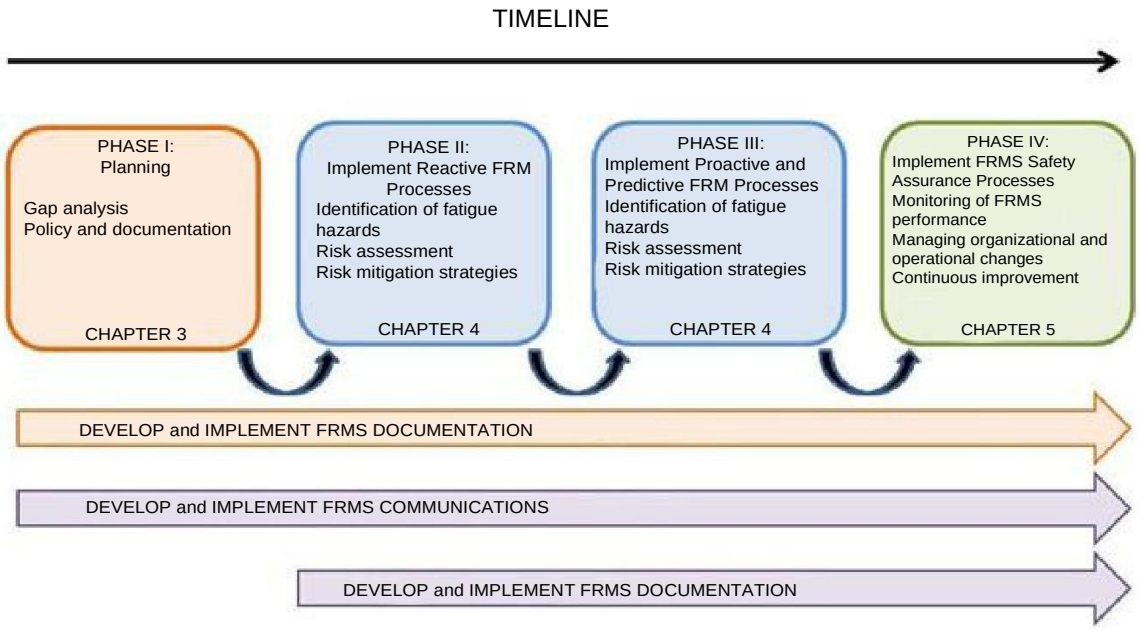

Figure 3-1 Phased approach to FRMS implementation

3.1.1 Phase 1 - Planning

The objective of Phase I is for the operator to arrive at an overall plan to demonstrate to the regulator how the FRMS will function, how it will be integrated with other parts of the operator's organization, who will be accountable for the FRMS, and who will be responsible for making sure that FRMS implementation is successfully completed.

It is recognized that some operators may wish to use outside consultants to "provide them with an FRMS" as a quick and relatively painless way of meeting their regulatory obligations. However, an FRMS requires ownership and commitment by the people who will be using it, and the regulator needs to see evidence of that ownership and commitment from the early stages of its inception. While experts can offer invaluable assistance within an FRMS at certain times, they do not have the operational knowledge and experience of the operator.

Consultants should not be the interface between the regulator and the operator. The relationship between the regulator and the operator concerning the use of FRMS should be identical to their relationship concerning the prescriptive flight and duty time limitation regulations.

Gap analysis and developing an implementation plan

Many elements needed for an FRMS may already be in place in an operator's organization. One

of the first steps in FRMS implementation is therefore 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”); and
- identify where new systems and processes need to be developed for the FRMS.

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 Fatigue Safety Action Group. 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.

Data on scheduled and actual flight and duty times are required to be collected under the prescriptive flight and duty time regulations. An operator that is moving some of its operations into an FRMS could add a variable to the existing flight and duty time databases to identify the operations covered by the FRMS, so that this information can be analysed separately as required for the FRMS (Standard 4.10.8 of Annex 6, Part I). Procedures will need to be added for this information to be communicated to the Fatigue Safety Action Group and recorded as required in the FRMS documentation.

Rostering-related data may already be available for FRMS performance indicators, for example, monthly exceedances on duty limits, use of captain’s discretion, use of extended duties, or violation occurrence reports. A procedure will need to be added for this information to be evaluated regularly as part of the FRMS safety assurance processes.

It may be efficient to schedule FRMS training to coincide with other training activities that already bring the target groups together.

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 timelines.

By the end of Phase I, the operator should have:

- a completed gap analysis.
- an FRMS Policy Statement signed by the accountable executive. Developing the policy at the beginning of the FRMS implementation process will assist in defining the scope of the FRMS.

- an FRMS implementation plan.
- an FRMS documentation plan. This can be expected to evolve as the FRMS becomes operational.
- an FRMS communication plan. This can be expected to evolve as the FRMS becomes operational.
- allocation of financial and human resources. The accountable executive for the FRMS needs to have the authority and control to ensure that this happens.
- an established Fatigue Safety Action Group (or equivalent). The stage at which the Fatigue Safety Action Group is established will vary, according to the size and complexity of the organization and the FRMS, and whether there are suitably qualified people in other parts of the organization who are available to begin the Phase I activities.

In order to move on to Phase II, the operator is required to provide its FRMS plan to the Authority for review. This is an opportunity for the NCAA to assess and identify potential problem areas prior to the Authority or the operator investing excessive time and effort.

3.1.2 Phase II - Implementation reaction FRMS processes

Phase II requires the operator to implement the (first version) of the FRM processes. It does this by gathering and analysing existing sources of information and data that are relevant to the operations covered by the FRMS. Types of information that may be available include confidential safety reports, accident reports and incident investigations, audits, and historical rostering data (for example, data on scheduled and actual flight and duty times, and exceedances). In effect, Phase II activities consolidate existing fatigue risk management processes and procedures in the organization and introduce controls and mitigations to manage identified deficiencies in the existing system.

By the end of Phase II, the operator should have accomplished the following steps:

- FRM processes based on reactive hazard identification are operational, including risk assessment and the development, implementation and monitoring of appropriate controls and mitigations.
- FRMS documentation processes are established to support the current version of the FRMS.
- FRMS training activities are established to support the current version of the FRMS. (Stakeholders need training to ensure that they are competent to undertake their responsibilities in the FRMS as the implementation plan rolls out.)
- FRMS communication processes are established to support the current version of the FRMS.

- The operator is ready to undertake coordinated safety analyses of this first version of the FRMS, similar to the process used when implementing SMS (ICAO Doc 9859, 10.4).

3.1.3 Phase III - Implementation proactive and predictive FRMS processes

Phase III adds proactive and predictive fatigue hazard identification processes into the FRM processes established in Phase II.

By the end of Phase III, the operator should have accomplished the following steps:

- FRM processes based on reactive, proactive and predictive hazard identification are operational, including risk assessment and the development, implementation and monitoring of appropriate controls and mitigations.
- FRMS documentation processes are established to support the current version of the FRMS.
- FRMS training activities are established to support the current version of the FRMS. (A single programme to the level required for the full FRMS implementation may be more efficient than partial training at each phase of the implementation.)
- FRMS communication processes are established to support the current version of the FRMS.
- The operator is ready to undertake coordinated safety analyses of this version of the FRMS (ICAO Doc 9859, 10.4).

3.1.4 Phase IV - Implementation of FRMS safety assurance processes

Phase IV activates the FRMS safety assurance processes. By the end of Phase IV, the following steps need to be accomplished.

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

- FRMS documentation processes are fully implemented.
- FRMS training processes are fully implemented.
- FRMS communication processes are fully implemented.

In other words, by the end of Phase IV, the FRMS should be fully functional and integrated with the operator's SMS and other parts of the organization, as appropriate. It should be continuously improving and able to respond to changes in the organization and the operating environment.

Regulatory approval for the full FRMS is sought at the end of Phase IV.

3.1.5 Operational example of staged FRMS implementation

Operator A is a major airline that flies primarily long-range, trans-oceanic flights with multinational crews. It has been flying for 20 years with an excellent safety record. Operator A is interested in starting an FRMS for both of its long-range fleets. The CEO decides to implement FRMS for the entire operation to enhance safety and efficiency.

This example works through the steps that Operator A could follow to establish a fully operational FRMS. It assumes that management at Operator A are familiar with information in the **FRMS Implementation Guide for Operators** (2011, a joint publication by ICAO, IATA, IFALPA) and are ready to start implementation.

Phase I

1. Responsibility for FRMS implementation assigned to a designated FRMS manager.
2. FRMS manager assembles an implementation team and organizes training for the team on FRMS basics and fatigue science.
3. Accountable executive for the FRMS allocates resources and authority to support FRMS development.
4. FRMS manager identifies internal stakeholders (department representatives).
5. FRMS policy statement is drafted.
6. Gap analysis undertaken by FRMS manager and implementation team.
7. FRMS documentation plan developed and first draft established.
8. FRMS communication plan developed and first draft established.
9. Implementation plan developed, with initial timeline.

10. Fatigue Safety Action Group established with required stakeholder membership and meets regularly with the implementation team (if different employees) to discuss progress.

Phase II

11. Fatigue Safety Action Group works through the FRM process, using existing information and data for reactive fatigue hazard identification.

    a) Step 1 — Decide whether domestic, international long-haul and ULR operations require different FRM processes. Carry out the following steps for each set of FRM processes.

    b) Step 2 — Collect and analyse available data and information (for example, confidential safety reports, accident reports and incident investigations, audits, and historical rostering data).

    c) Step 3 — Identify fatigue hazards(s).

    d) Step 4 — Establish risk assessment processes and procedures. Clarify linkages to SMS risk assessment and processes for prioritization of risks to be mitigated. (In this large airline example, the FRMS policy statement indicates that the Fatigue Safety Action Group is responsible for prioritizing fatigue risks and for developing, implementing and monitoring fatigue controls and mitigations. It is required to provide monthly reports of these activities to the SMS Safety Review Board, with the intent that this report will become part of the FRMS safety assurance process in the overall FRMS.)

    e) Step 5 — Select and implement controls and mitigations. Set safety performance indicators.

    f) Step 6 — Set up processes for monitoring the effectiveness of controls and mitigations.

12. Perform training to ensure that stakeholders are competent to undertake their roles and responsibilities in the FRMS. In this example, it is decided to undertake training to support the full FRMS. Communication channels are set up to provide training updates and reminders when Phases III and IV of the FRMS implementation become active.

13. FRMS communication channels established.

14. Fatigue Safety Action Group provides a coordinated safety analysis of the existing FRMS to the SMS Safety Review Board. (The SMS Safety Review Board is responsible for the FRMS safety assurance functions, in this example.)

Phase III

15. For each set of FRMS processes established in Phase II, the Fatigue Safety Action Group identifies appropriate tools for proactive and predictive fatigue hazard identification.

    a) Proactive fatigue identification tools are used for assessing routine and complex hazards.

16. Proactive and predictive fatigue hazard identification are integrated in to the FRM processes established in Phase II.

17. All stakeholders have received suitable training and are competent to undertake their roles and responsibilities in the FRMS.

18. FRMS communication channels are operational.

19. Fatigue Safety Action Group provides a coordinated safety analyses of the existing FRMS to the SMS Safety Review Board.

Phase IV

20. FRMS safety performance indicators are decided collaboratively by the Fatigue Safety Action Group and the SMS Safety Review Board and approved by the accountable executive for the FRMS.

21.

- Decide which information will be analysed for trends (for example, fatigue reporting rates between similar city pairs, operations, or fleets)
- Develop criteria for comparing performance with safety objectives (for example, is the overall risk level increasing, is the number of higher risk events increasing, are safety objectives in the FRMS policy being achieved, are regulatory requirements being met).
- Decide how emerging fatigue hazards are identified. For example, set triggers to identify when action is needed (at what level do adverse trends in performance indicators trigger an investigation of the causes of the trend).

22. Processes are established for identifying changes that could impact the FRMS.

23. Processes are established for evaluating how well Fatigue Safety Action Group recommendations are implemented in other parts of the organization, for example, in scheduling and flight operations.

24. The following safety assurance processes are established.

- Monthly reporting by the Fatigue Safety Action Group to the SMS Safety Review Board. To include updates on fatigue hazards identified and on the status of agreed safety performance indicators.
- SMS Safety Review Board is able to call for special reports from the Fatigue Safety Action Group, for example, after significant operational changes such as a newly established route.
- Quarterly review of trends in confidential crew reports relating to fatigue, to be undertaken by the Fatigue Safety Action Group and reported to the SMS Safety Review Board.
- Quarterly review of trends in exceedances of flight and duty time limits specified in the FRMS Policy, to be undertaken by the Fatigue Safety Action Group and reported to the SMS Safety Review Board.
- Quarterly review of trends in FRMS safety performance indicators identified in the FRMS policy, to be undertaken by the Fatigue Safety Action Group and reported to the SMS Safety Review Board.
- Annual review of fatigue hazard identification and mitigation activities of the Fatigue Safety Action Group by an independent FRMS Scientific Advisory Group.
- Internal audit of the FRMS by a team selected by the SMS Safety Review Board.
- Annual report of the Fatigue Safety Action Group to the SMS Safety Review Board and the accountable executive for the FRMS, to include the recommendations of the independent FRMS Scientific Advisory Group, findings of audits, and actions taken in response to them.

25. First quarterly audit of FRMS safety performance by the team selected by the SMS Safety Review Board. If audits are satisfactory for one year, internal audit will revert to every six months.
26. FRMS documentation fully implemented.
27. FRMS training fully implemented.
28. FRMS communications fully implemented.

3.2 FRMS Approval Process

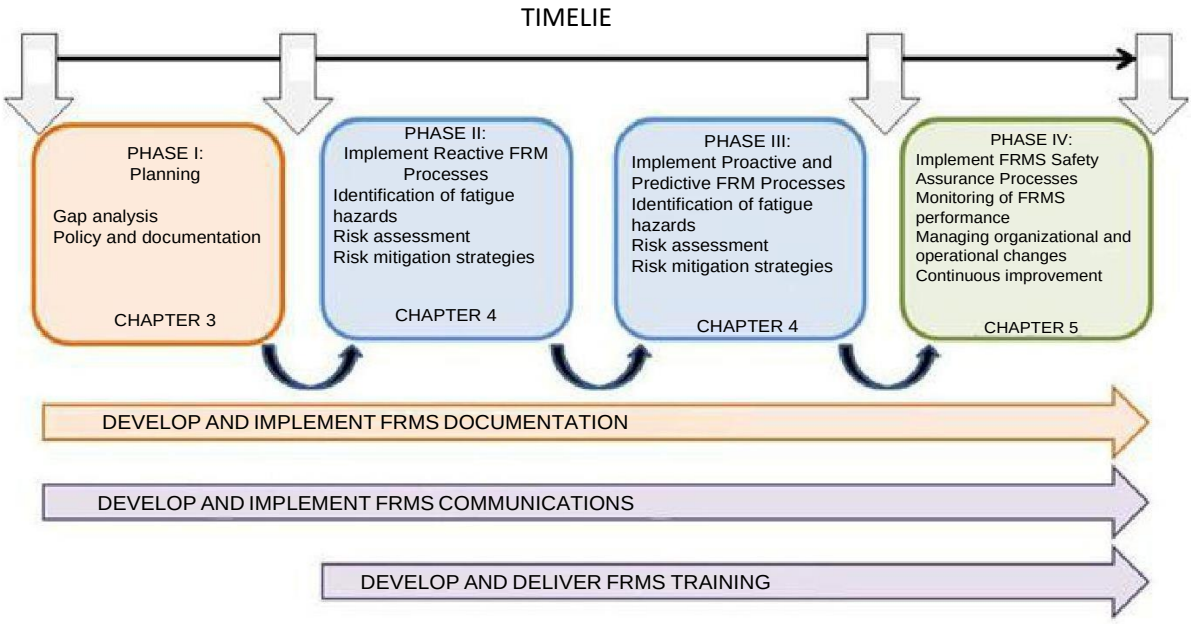

Figure 3-2 The FRMS approval process

The progressive implementation of an FRMS requires a regulatory approval process that monitors and documents its progression.

The regulatory milestones throughout the FRMS approval process are identified at the arrow points in Figure 3-2. All of these need to be achieved before final approval of the FRMS can be given.

To gain full approval, an FRMS for a large and complex operator is likely to take several years, so that enough time has elapsed to allow assessment of safety assurance functions. However, the regulator can still allow the operator to use FRM processes to move beyond prescribed flight and duty time limitations on a trial basis in order that the safety assurance functions can be developed.

Suggested documentation to be completed by the regulator during the course of the approval process is highlighted in each of the sections below. All of the information and evidence collected by the regulator during the approval process contributes to the overall assessment when deciding to grant final approval of the FRMS.

3.2.1 Regulatory Milestone 1 - Notification by the operator

Throughout the progressive implementation of an FRMS there should be contact between the regulator

and the operator, starting from the time the operator begins the implementation process. Such early interaction helps establish an open and informed working relationship between the regulator and the operator and allows the regulator to provide clear indication of its expectations and requirements.

The NCAA will require a written notification from an operator planning to develop an FRMS

At this point, the NCAA expects that the operator has already undertaken some preparatory actions. These may include:

- designation of a specific organizational manager(s) with proper authority;
- ensuring that a key person(s) has gained or is gaining adequate knowledge;
- allocation of resources to support FRMS development.

Once initial contact has been established by the operator, the NCAA will then provide the operator with a detailed checklist of its regulatory requirements for an FRMS. While necessarily detailed, this checklist will allow the operator flexibility in the way it can meet these requirements. Developing such a detailed checklist takes time and effort but once achieved it provides a key tool for both the operator and the regulator. It will form the basis of the operator's GAP analysis, required as part of the development of its FRMS implementation plan. For the NCAA, it forms the first part of the subsequent audit processes for both approval and oversight purposes. An outline of the checklist items for each of the subsequent regulatory milestones is discussed below.

Regulatory Milestone 2 - Review of FRMS plan, policy and documentation

Based upon the FRMS checklist, the NCAA will develop a more comprehensive tool that can be used to record where each required component of the FRMS has been documented in the operator's procedures, the method used by the operator to demonstrate compliance with the required FRMS components, and any regulator comments on the operator's proposal. This tool is the FRMS evaluation form (Form: O-OPS 009).

Regulatory documentation

1. Review of FRMS plan

The NCAA will review the operator's implementation plan, including the GAP analysis, the operations to which the FRMS is intended to be applied, the key personnel involved and the expected timelines, to allow early detection of any areas needing improvement in the operator's ability to implement an FRMS prior to the State or the operator investing excessive time and effort.

A positive review of the FRMS implementation plan means that the NCAA has been provided with evidence that the operator understands what is required.

The Flight Operations Inspector (FOI) will evaluate the FRMS Implementation Plan with CL: O-OPS 046A.

2. Review of the initial FRMS policy and documentation proposal

Using the FRMS evaluation form (mentioned above), the NCAA will conduct a desktop review of the policy and documentation to determine whether the operator's initial FRMS policy and documentation proposal adequately addresses the regulatory requirements. This will include evaluating:

- policy content;
- the organizational structure;
- the risk-based deviation recording process that will document the extent and reason for significant exceedances of scheduled flight and duty periods, significant reductions of rest periods; and significant numbers of uses of the captain's authority to complete the flight period;
- the proposed fatigue risk assessment process;
- the proposed safety assurance process;
- integration processes with the safety department;
- quality control audit procedures;
- initial training plan and procedures (including fatigue reporting);
- terms of reference for the Fatigue Safety Action Group;
- details of the safety promotion activities; and
- methods for monitoring and managing changes to the FRMS.

The NCAA may also wish to conduct some documented interviews of key personnel involved with the development of the implementation plan to check the level of organizational knowledge and commitment to the plan.

A positive review of the FRMS policy and documentation proposal means that the NCAA has been provided with evidence that the operator has a commitment to meet these requirements of implementing an FRMS.

The Flight Operations Inspector (FOI) will evaluate the FRMS policy and documentation with Checklist CL: O-OPS 046B.

3.2.3 Regulatory Milestone 3 - Review of initial FRMS processes

Once the plan for the development of the FRMS and the policy and documentation proposal have been positively reviewed, the operator can begin implementing the FRM processes. This incorporates Phases II and III of the operator's implementation process and may take a significant period of time and may require several meetings with the operator.

To achieve the third milestone of the regulatory process, the NCAA:

1. reviews the operator's reactive risk assessment process, including the tools used, such as the fatigue hazard log, how the risk matrix was developed and the use of the agreed upon severity and likelihood measures, the methodology for the development of mitigation strategies, fatigue report procedures, any crew surveys, and Fatigue Safety Action Group meeting minutes;

2. reviews the proactive and predictive hazard identification processes, including assessment of agreed fatigue roster metrics, any information from biomathematical modeling, development of FRMS performance indicators and their targets, supporting scientific documentation, Fatigue Safety Action Group meeting minutes, other operational best practices, the fatigue hazard log, and further proposed mitigations to reduce the risk;

3. reviews the results of all the risk assessment processes (reactive, proactive and predictive) and agrees on initial FRMS performance indicators and targets;

4. directly samples some of the records quoted in the risk assessment and assesses the operator's procedures against supplied risk assessments;

5. conducts the final review of the initial training programme and training records (and may possibly attend one of the initial training courses). The NCAA will review the training proposals for the operator's employees to check that they cover both generic fatigue material and operation-specific FRMS aspects. Training will need to be given in a proportionate manner to the employee groups' involvement in the FRMS. As part of the training programme, all employees who are involved with the fatigue reporting system need to be specifically trained on how the system works, how they use the system information, and at what point an individual would need to be further assessed due to trends in his filed fatigue reports. The Authority may choose to attend a training session rather than just review the training material and/or syllabus.

6. conducts documented interviews with a selection of employees from all the areas involved with the FRMS as part of its review of the information;

7. reviews the outer limits for the proposed FRMS operation and adjusts them accordingly if there is insufficient evidence to support the case;

8. produces an audit report and, where necessary, a list of corrective actions.

If the operator is required by the Authority to make corrective actions, time should be given for an action plan to make these corrections. Once the operator has taken the corrective actions, the Authority will go back into the above process at the relevant point and produce an audit closure report.

Where no corrective actions are necessary, or once corrective actions are complete, the Authority may then permit the operator for the trial of the proposed FRMS operations within the newly agreed outer limits. At this point, the FRMS does not have final approval as the safety assurance processes have not yet been implemented.

The Flight Operations Inspector (FOI) will evaluate the initial FRMS process using Checklist CL: O-OPS 046C.

3.2.4 Regulatory Milestone 4 - Approval of FRMS

Before final approval of the FRMS can be given, evidence must demonstrate that the FRMS is delivering the required safety outcomes. The operator now needs to validate the safety assurance processes and demonstrate a fully functioning FRMS within the agreed outer limits, which may be outside of the prescriptive limitations. Validation of the safety assurance processes will take time, and this will require the Authority to conduct regular visits, desktop reviews of sample data, analyses of documentation, and interviews of key personnel. All of the components of an FRMS, including the safety assurance processes, need to be functioning in a coordinated way within the operator's overall safety processes. During this trial period, the Authority will closely monitor all activities.

Importantly, the Authority will identify a time limit for the course of this trial period. While adequate time needs to be given to allow the operator to demonstrate that all components of an FRMS (including the safety assurance processes) are functioning, an operator cannot be allowed to operate outside of the prescriptive limits for an indefinite period. Protracted trial periods diminish the value of having an approved FRMS, if an operator can continue using an "FRMS in progress" that is not actively trying to meet approval requirements.

The operator will need to demonstrate that its FRMS safety assurance processes are used to review the FRMS performance indicators against its agreed targets and can identify and undertake any necessary actions. Where trends demonstrate that either the mitigations or the outer limits are not appropriate to achieve the safety performance targets, or where changes affecting the overall FRMS are detected by the safety assurance processes, the failing areas of the FRMS operation(s) are reassessed through the FRM processes.

These processes are documented and form part of the Fatigue Safety Action Group review of the system and are recorded in the minutes. The functioning of the Fatigue Safety Action Group must also demonstrate the identification and management of any new fatigue hazards and its subsequent risk assessment and management. The assurance functions monitor the effectiveness of the mitigations and suitability of the outer limits of the FRMS. The whole system will also be internally audited to check the procedures are being correctly applied and the effectiveness of risk mitigations and assumptions made. These audits must be documented.

During the course of this trial period, the Authority will have the opportunity to gain confidence in the operator's ability to respond appropriately to the data being collected and should be supplied with evidence that the operator is managing its fatigue risk appropriately. This should include the monitoring of the operator's safety performance after any changes. In some cases, the Authority may have observed the operator lowering flight and duty times that would otherwise be permitted using prescribed limitations using its FRMS processes.

In this final phase prior to approval, the operator will also have demonstrated that it has added effective recurrent training into its training programme. Further, the regulator should ensure that all initial training as identified in the accepted implementation plan has been completed prior to final approval of the FRMS.

Still using the FRMS evaluation form, the regulator should then conduct the final audit of the operator's FRMS. By now, this evaluation form documents the progress made by the operator throughout the approval process. At the final approval audit, the Authority will examine evidence of the operator's FRMS safety assurance functions by reviewing the agreed FRMS performance targets and assessing any trends. It should also check that the system has been subject to internal auditing of the processes. The Authority may choose to audit some of the primary sources of input into the system (for example, fatigue reports). However, the Authority will be mindful of the confidential nature of some of the methods of reporting (such as fatigue reports) examining such reports only to confirm the operator's assessment of trends. The integrity of the operator's effective safety reporting system, and the maintenance of reporter confidentiality that is required to support it, will be a priority for the Authority. The Authority will expect the operator to have already documented trends and re-evaluated the fatigue-related risk using the risk assessment functions.

The Authority will also conduct a review of the operator's final documentation and procedures to ensure required corrections or additions have been made. Finally, it should review the final training package, including the recurrent training programme.

Once all the criteria in each of the steps have been met, and all of the FRMS processes are functioning in a cohesive manner with regard to the specific operations to which they have been applied, approval can be given. This means that the operator is no longer on a trial period and may now use the FRMS to adjust flight and duty hours within the approved outer limits for the particular operations identified. Any changes to the scope of the FRMS cannot be implemented without Authority approval for its application to new operations.

The Flight Operations Inspector (FOI) will use CL: O-OPS 046D to evaluate the general requirements for validating the safety assurance process.

The final part of the approval process will be for the Authority to set up the ongoing audit requirements and the audit calendar. As part of this, the Authority may require that the operator send monthly updates (or another designated period of time) of trends on all or some of the agreed FRMS performance indicators.

In the same way that normal oversight audit functions are recorded, Authority will ensure that where an operator uses an FRMS, it has an adequate record-keeping process. These records will store the outcomes, findings and rectification notifications of the approval process and ongoing oversight.

4.0 Oversight of an FRMS

Once approval of an operator's FRMS has been given, it is the NCAA's responsibility to continue monitoring the effectiveness of the FRMS, that it complies with the regulations, and that it demonstrates an acceptable level of performance. Organizational conditions change, and many, such as external pressures on the operator, economic issues, and the overall performance of the operator, may have consequences for the effectiveness of the FRMS. Therefore, after final approval, the oversight of the FRMS forms part of the regulator's periodic surveillance programme of the operator.

4.1 Regulatory planning functions

In order to ensure appropriate levels of oversight, formal audits will need to be planned. Consideration will need to be given to:

- **Establishing an FRMS audit/inspection schedule as part of the oversight programme.**
  The Authority will visit the operator at least once a year. Ad hoc visits could also be made and, as part of the oversight, the Authority may also have more frequent documentation sent to it by the operator.

- **Inspectorate resources.**
  Inspectors need to have knowledge of fatigue science, experience in regulating FRMS, as well as practical knowledge of the operator.

4.2 Special requirements for FRMS oversight

In overseeing the operator's FRMS, the Authority will examine evidence of the operator's FRMS safety assurance functions by reviewing the agreed FRMS performance targets and assessing any trends. It will also check that the system has been subject to internal auditing of the processes. The Authority may choose to audit some of the primary sources of input into the system (for example, fatigue reports). It will need to confirm that the operator is documenting trends and, where necessary, is identifying potentially adverse trends and managing them appropriately as part of the risk assessment functions. The Authority will also conduct a review of the operator's documentation and procedures to assess any corrections or additions that have been made post-approval. It will also review the current training package, including all staff training records.

As part of normal oversight, the Authority will conduct interviews with a variety of people involved with the FRMS and monitor changes of key FRMS personnel. Where key personnel have changed, the Authority should seek to ensure the new personnel are included in its list of interviewees. Occasionally, an inspector might also ask to attend an operator's Fatigue Safety Action Group meeting to gain better insight in its FRMS processes, although the inspector cannot be part of the Fatigue Safety Action Group activities.

The Authority is seeking to ensure that all of the FRMS processes are functioning in a cohesive manner with regard to the specific operations to which they have been applied.

The FRMS oversight checklist CL: O-OPS 046E to be used.

4.3 Enforcement

The Authority will establish a process to be used when deficiencies in an FRMS are identified. Enforcement actions should be commensurate to the level of risk resulting from the deficiency. These actions may range from administrative changes or FRMS operational changes, to a withdrawal of FRMS approval.

The three enforcement alternatives in increasing severity are:

- **Operator on notice to improve FRMS processes:**
  Where concerns exist that the operator's FRMS may not meet regulatory requirements, then the operator should first be given an opportunity to improve the specific aspects of its FRMS so that it does meet regulatory requirements. Based on the findings of the audit process, the Authority will provide advice to the operator and identify a mutually-agreed corrective action plan.

- **Authority-mandated lowering of maximum values (and/or increasing minimum values):**
  Where the Authority's oversight produces concerns that an element of an operator's FRMS may be ineffective, the Authority may revise an operator's maximum and minimum values. These Authority-set limits should remain in place until the operator can provide evidence that its FRMS processes are effective and the Authority has regained regulatory confidence in the operator.

- **Withdrawal of FRMS approval:**
  Where there is a significant safety concern that has not been addressed by the above enforcement alternatives, it is the Authority's obligation to withdraw the FRMS approval and require the operator to operate within prescriptive flight and duty limitations. While complying with the prescriptive flight and duty limitations, the operator may attempt to improve its FRMS processes and other safety systems and SMS processes, in order to re-establish regulatory confidence and re-apply for FRMS approval. Should the Authority consider that the operator's FRMS meets its requirements at this point, the Authority may approve the FRMS on restricted conditions (for example, decreased maximum values for flight and duty periods and minimum values for rest periods) until such time as it is confident of the maturity and effectiveness of the system.