CAAS FRM 2017: Fatigue Risk Management for Crews

11-January-2017
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4 FATIGUE RISK MANAGEMENT OF CREW

4.1 Subject to the provisions of the ANO, it is the responsibility of the operator to establish a fatigue risk management scheme appropriate to the nature of the flight operations.

4.2 Comprehensive guidance and instructions must be included in the manual for the benefit of both crew and those members of the operating staff who are concerned with rostering and scheduling. It may be necessary to issue one set of instructions for crew and a separate, more detailed set for other operating staff.

4.3 Factors to be taken into account in producing these instructions, and the nature of the limitations to be specified are contained in Appendix C and C1. Any variation to the limitations detailed in Appendix C and C1 requires approval by the Authority. Any variation agreed upon in this manner shall be in relation to particular schedules and duty periods. It is not permissible for such variations to be reflected in the operator’s general instructions on flight, duty and rest periods. Requests for such variations should be made to the Authority in writing, giving full details of the adjusted fatigue management scheme and its corresponding risk assessment.

4.4 The extent to which a pilot-in-command is authorised in abnormal circumstances to exceed the operator’s limitations on flight duty periods must be clearly defined in the manual. Instructions on this point should be as clear and concise as possible, so that pilots-in-command can readily determine the extent of their discretionary powers.

4.5 Instructions must include filing of reports by pilots-in-command or any crew members each time they exercise the discretion conferred upon them by the operator.

4.6 Instructions must be issued to crew covering abstention from alcoholic drinks for a suitable period prior to flight. The minimum acceptable period will be eight hours. Crew must also be advised of the precautions to be taken if they are undergoing medication.

4.7 Responsibility within an operator’s organization for issuing instructions and making decisions on questions of flight, duty and rest periods and for processing discretion reports must be clearly defined and assigned to a member of the executive staff. The name of the person concerned, or the title of the office that he holds, must be included in the operations manual.

4.8 The operator is required to maintain and provide readily interpreted records for each aircraft crew member. It follows that there must be suitable arrangements for collecting the information necessary to compile the records. Accurate records are essential to persons responsible for the rostering of aircraft crew.

4.9 An operator approved for Ultra Long Range (ULR) operation shall regularly monitor and review its ULR operation with regards to flight time limitations and ULR training requirements as specified in Appendix C and Chapter 4. The form and manner of such monitoring and review are subject to the approval of the Authority.

4.10 An operator shall not implement a Fatigue Risk Management System (FRMS) except in accordance with the requirements in Appendix C and C2.
APPENDIX C

FATIGUE RISK MANAGEMENT FOR FLIGHT AND CABIN CREW

EFFECTIVE DATE: 28 JUNE 2013
REVISION NO: 24 (ISSUE 3)

Note: Appendix C is structured into:
(a) Section A for operation of ALL flights; and
(b) Section B for additional requirements for ULR (Ultra Long Range) operation.
(c) Attachment 1 Recommended Procedures for Controlled Rest on the Flight Deck

SECTION A OPERATION OF ALL FLIGHTS
DEFINITIONS

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<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acclimated</td>
<td>A crew member is considered acclimated when that crew member has spent 3 consecutive local nights free of duty within a time zone which is 2 hours wide. The crew member will remain acclimated thereafter until a duty period finishes at a place where local time differs by more than 2 hours from that at the point of departure.</td>
</tr>
<tr>
<td>Augmented flight crew</td>
<td>A flight crew that comprises more than the normal operating flight crew number required to operate the aeroplane and in which each flight crew member can leave their assigned post and be replaced by another appropriately qualified flight crew member for the purpose of in-flight rest.</td>
</tr>
<tr>
<td>Cabin crew member</td>
<td>A crew member who performs, in the interest of the safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.</td>
</tr>
<tr>
<td>Day Off</td>
<td>A day off is an extended rest period to cater to the requirement of managing cumulative fatigue. During a day off, crew shall also be free of all duties.</td>
</tr>
<tr>
<td>Duty</td>
<td>Any task that flight or cabin crew personnel are required by the operator to perform, including, for example, flight duty, administrative work, training, and positioning.</td>
</tr>
<tr>
<td>Duty period</td>
<td>A period which starts when flight or cabin crew personnel are required by the operator to report for or to commence a duty and ends when that person is free from all duties.</td>
</tr>
<tr>
<td>Duty with Take-off/s and/or Landing/s within the Window of Circadian Low</td>
<td>Defined as the duty involving take-off/s and/or landing/s during the period from 0200 to 0459 hours local time (i.e. at the departure or arrival airport).</td>
</tr>
<tr>
<td>Early Start Duty</td>
<td>An Early Start Duty would be a scheduled departure that commences in the period 0500 to 0659 hours local time.</td>
</tr>
<tr>
<td>Fatigue</td>
<td>A physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a crew member’s alertness and ability to safely operate an aircraft or perform safety-related duties.</td>
</tr>
<tr>
<td>Fatigue Risk Management System (FRMS)</td>
<td>A data-driven means of continuously monitoring and managing fatigue-related safety risks, based upon scientific principles and knowledge as well as operational experience that aims to ensure relevant personnel are performing at adequate levels of alertness.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Flight crew member (FCM)</td>
<td>A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.</td>
</tr>
<tr>
<td>Flight duty period (FDP)</td>
<td>A period which commences when a crew member is required to report for duty that includes a flight or a series of flights and which finishes when the aeroplane finally comes to rest at the end of the last flight on which he/she is a crew member.</td>
</tr>
<tr>
<td>Flight time</td>
<td>The total time from the moment an aeroplane first moves for the purpose of taking off until the moment it finally comes to rest at the end of the flight.</td>
</tr>
<tr>
<td>Home base</td>
<td>The location nominated by the operator to the crew member from where the crew member normally starts and ends a duty period or a series of duty periods.</td>
</tr>
<tr>
<td>Late Finish Duty</td>
<td>A Late Finish Duty would be a scheduled arrival that ends in the period 0100 to 0159 hours local time.</td>
</tr>
<tr>
<td>Local Night</td>
<td>A period of 8 hours falling between 2200 hours and 0800 hours local time.</td>
</tr>
<tr>
<td>Normal operating flight crew</td>
<td>The minimum flight deck crew required for public transport operation in compliance with the Air Navigation Order and the Certificate of Airworthiness.</td>
</tr>
<tr>
<td>Operator</td>
<td>A person, organisation or enterprise engaged in or offering to engage in an aircraft operation.</td>
</tr>
<tr>
<td>Positioning</td>
<td>The transfer of a crew member from place to place as a passenger on surface or air transport at the behest of the operator.</td>
</tr>
<tr>
<td>Reporting time</td>
<td>The time at which crew personnel are required by the operator to report for duty.</td>
</tr>
<tr>
<td>Rest period</td>
<td>A continuous and defined uninterrupted period of time, subsequent to and/or prior to duty, during which flight or cabin crew personnel are free of all duties. In the event that the rest is subsequent to a duty period, the rest period shall commence 1 hour after the crew are free of all duties. Away from base the rest period shall commence either 1 hour after the crew are free of all duties or the time taken to reach the accommodation designated for the rest period, whichever duration is lesser.</td>
</tr>
<tr>
<td>Roster</td>
<td>A list provided by the operator of the times when a crew member is required to undertake duties. The roster shall include, but not restricted to, the elements of flight time, flight duty period, standby duty, rest period and day off.</td>
</tr>
<tr>
<td>Standby duty</td>
<td>A defined period of time, at the airport, at the hotel, or at home, during which a crew member is required by the operator to be available to receive an assignment for a specific duty without an intervening rest period.</td>
</tr>
<tr>
<td>Suitable accommodation</td>
<td>A furnished bedroom which provides for the opportunity of adequate rest/sleep.</td>
</tr>
<tr>
<td>Unforeseen operational circumstance</td>
<td>An unplanned event, such as aircraft unserviceability, industrial action, operational contingencies and other such unforeseeable occurrences. It excludes circumstances that are known sufficiently in advance such as scheduled charters, planned runway shortening etc.</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

1.1 The Air Navigation Order (ANO) requires that the operator of an aircraft to which the paragraphs apply shall have in place a scheme to manage fatigue risk for flight and cabin crew. This scheme shall be based upon scientific principles and knowledge, with the aim of ensuring that flight and cabin crew members perform at an adequate level of alertness.

1.2 Accordingly, the operator shall establish:
   (a) Flight time, flight duty period, duty period and rest period limitations that are in compliance with Appendix C and C1;
   (b) A Fatigue Risk Management System (FRMS) in compliance with Appendix C and C2; or
   (c) An FRMS in compliance with Appendix C and C2 for part of its operations and the requirements of paragraph 1.2(a) for the remainder of its operations.
2 RESPONSIBILITIES OF THE OPERATOR AND THE CREW

Rationale

2.1 The objective of fatigue risk management regulations is to ensure that flight and cabin crew members remain sufficiently alert so that they can operate to a satisfactory level of performance and safety under all circumstances. The fundamental principle is for every crew member to be adequately rested when he/she begins a flight duty period, and whilst flying, be sufficiently alert to operate to a satisfactory level of performance and safety in all normal and abnormal situations.

The operator’s responsibilities

2.2 Duty rosters shall be prepared and published sufficiently in advance to provide crew members the opportunity to plan adequate rest. Consideration shall be given to the cumulative effects of undertaking long duty hours interspersed with minimum rest, and of avoiding rosters that result in the serious disruption of an established pattern of working and sleeping. Rosters should cover a period of at least 4 weeks.

2.3 Flights shall be planned to be completed within the allowable flight duty period taking into account the time necessary for pre-flight duties, the flight and turn-around times, and the nature of the operation.

2.4 In order to avoid any detriment to a crew member’s performance, opportunities to consume a meal shall be arranged when the flight duty period exceeds 5 hours.

2.5 The operator shall nominate a home base for each crew member, from where the crew member will normally start and end a duty period or a series of duty periods. The home base shall be assigned with a degree of permanence.

2.6 The operator shall not permit a crew member to operate an aeroplane if it is known or suspected that the crew member is fatigued to the extent that the safety of flight may be adversely affected.

Crew members’ responsibilities

2.7 A crew member must not operate an aeroplane when he or she knows that he or she is fatigued or feels unfit to the extent that the safety of flight may be adversely affected.

2.8 Crew members should make best use of the facilities and opportunities that are provided for rest and for the consumption of meals, and they should plan and use their rest periods to ensure that they are fully rested.
3 CONTINUOUS ASSESSMENT OF FATIGUE

3.1 The operator shall establish a mechanism to assess fatigue risk as an ongoing continuous process. This may be part of an existing system or a separate one to cater for fatigue assessment. An analysis of the fatigue assessment is to be submitted to the Authority every 3 months. This submission may be discontinued as and when it is acceptable to the Authority that fatigue risk is being adequately managed by the operator for its operating routes. A similar process shall apply for any new routes that an operator proposes to undertake.

4 USE OF CONTROLLED REST ON THE FLIGHT DECK

4.1 Controlled rest on the flight deck is a fatigue mitigation strategy for flight crews. It shall not be used as a scheduling tool. It is not a substitute for proper pre-flight sleep or for augmented crew and associated inflight rest, but is intended as a response to unexpected fatigue experienced during flight operations. The recommendations on the procedures for controlled rest on the flight deck are at Attachment 1 to this Appendix.

4.2 The operator shall monitor the use of controlled rest on the flight deck to evaluate whether existing mitigation strategies are adequate.

4.3 The pilot-in-command shall report to the operator when controlled rest on the flight deck has been availed. A report on all such occurrences shall be provided by the operator to the Authority on a regular basis.

4.4 Controlled rest shall only be used on flights of sufficient length such that it does not interfere with required operational duties.

4.5 Controlled rest shall only be used during low workload phases of flight (e.g., during cruise flight).

4.6 Controlled rest shall not be used as a method for extending crew duty periods.

4.7 Procedures for controlled rest on the flight deck shall be published and included in the Operations Manual.
DEFINITIONS

The following definitions shall be applicable to ULR operations:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>The designated place from where a crew member starts and ends a ULR RDA.</td>
</tr>
<tr>
<td>Duty Flight Crew</td>
<td>Those members of the flight crew who are on duty in the cockpit.</td>
</tr>
<tr>
<td>In-flight Rest Period</td>
<td>A period of time within a flight duty period (FDP) which is to give a crew member an opportunity to rest before commencing or recommencing duty as a duty flight crew or cabin crew.</td>
</tr>
<tr>
<td>Outstation</td>
<td>The destination city away from base to which a crew member operates to as part of a ULR RDA city pair.</td>
</tr>
<tr>
<td>Rostered Duty Assignment (RDA)</td>
<td>A sequence of FDPs, off-duty periods, standby duty periods, crew positioning and rest periods for which crew are rostered when assigned to operate a ULR flight.</td>
</tr>
<tr>
<td>Ultra Long Range (ULR) flight</td>
<td>A continuous non-stop flight between the city pairs as indicated in paragraph 7 to this Section.</td>
</tr>
</tbody>
</table>

Note:-

(i) The addition of new city pair/s may be carried out provided that the new destination city is in the same geographic region or, of an equivalent sector length as the indicated city pairs. This will require the approval of the Authority.
(ii) A change in the departure window/s will require the approval of the Authority.
(iii) The use of different aircraft for ULR operations will require the approval of the Authority. Key to the approval will be the inflight rest facilities as detailed in Paragraph 1 below.

1 REST FACILITIES

Flight Crew

1.1 Designated flight crew rest facilities shall be provided on board aircraft. These rest facilities shall comprise not less than two independent rest areas with horizontal bunks and shall provide an environment that is conducive to rest/sleep. Each rest area shall be equipped with a sleeping surface (bunk or equivalent), adequate lighting, air conditioning, independent temperature controls and have noise levels which afford rest and are preferably less than 75 dBA. Humidity enhancement should preferably be provided.

Cabin Crew

1.2 Designated Cabin Crew rest facilities shall be provided on board aircraft. These rest facilities shall provide an environment that is conducive to rest/sleep. The rest area shall be equipped with bunks or horizontal sleeping facilities, adequate lighting, air conditioning, independent temperature controls and have noise levels which afford rest.

1.3 All rest facilities shall be subject to the approval of the Authority.
2 CREW COMPLEMENT AND COMPOSITION

Flight Crew

2.1 Each ULR flight is to be operated by no less than four (4) pilots of whom two (2) must be pilot-in-command qualified. The duty flight crew shall comprise at least two pilots of which one crewmember is pilot-in-command qualified.

2.2 The Operations Manual shall contain specific instructions to ensure that the ULR flight meets the following requirements:

(a) ULR Pre-flight and In-flight Rest Planning
A scheme shall be established to provide guidance to the flight crew on the expected pre-flight preparations and in-flight rest to be taken. Flight crew are to be appropriately rested for the ULR flight. The in-flight rest plan shall provide for at least two (2) rest periods, one of which shall not be less than four (4) hours.

(b) ULR Pre-flight Rostering Requirements
The flight crew shall be acclimatised at base before undertaking a ULR RDA. Immediately prior to commencing the ULR RDA, the crew should be rostered for a rest period of no less than 48 hours, which shall include two (2) local nights, free from flight duties.

(c) ULR Flight Rest Period Away from Base
In the ULR RDA, the scheduled period free of flight duties away from base shall be at least 48 hours, with at least two (2) local nights.

(d) Post ULR RDA Rest At Base Before Embarking on the Next Flight
The ULR flight crew shall be provided with four (4) consecutive local nights of rest free of duty on completion of the ULR RDA, before the crew may be rostered for another ULR flight or other flights.

(e) Travelling Time - Crew Responsibilities
Travelling time, other than time spent on positioning, shall not be counted in the computation of the FDP. Where the usual travelling time from the crew member’s home to the normal departure aerodrome is in excess of 1½ hours, the crew member concerned shall make rest arrangements nearer the departure aerodrome, so as to ensure that he has the minimum rest period for a ULR flight as specified in paragraph 2.2 (b).

Note: Where long distances are involved, travelling time from home to departure aerodrome is a factor influencing subsequent onset of fatigue.

Cabin Crew

2.3 Each ULR flight is to be operated by a minimum of 12 cabin crew.

2.4 The required crew complement shall include at least two Crew-in-Charges for each ULR sector with at least one Crew-in-Charge on duty at all times.

Note: The “Crew-in-Charge” refers to a cabin crew member who has completed the Crew-in-Charge (CIC) Training requirements as spelt out in AOCR Chapter 6 paragraph 9.
2.5 The Operations Manual shall contain specific instructions to ensure that the ULR flight meets the following requirements:

(a) ULR Pre-flight and In-Flight Rest Planning

A scheme shall be established to provide guidance to the cabin crew on the expected pre-flight preparations and in-flight rest to be taken. Cabin crew are to be appropriately rested for the ULR flight. With the exception of flights originating from Singapore, when the cabin crew maximum planned FDP is longer by one hour, the cabin crew maximum planned FDP for flights originating from other stations shall be the same as the maximum planned FDP for flight crew.

For ULR FDP of 19 hours or less, cabin crew shall be provided with a minimum in-flight rest period of 4 hours. For ULR FDP greater than 19 hours, cabin crew shall be provided a minimum in-flight rest period of 5 hours.

Note:

(i) When the approved cabin crew rest facilities are not available due to unforeseen circumstances, the minimum in-flight rest may be taken in a non-sleeping rest facility. In this case the stipulated ULR FDP minimum in-flight rest period provided to the cabin crew shall be increased by two hours. The non-availability of cabin crew rest facilities shall only be allowed for one sector in a Crew Operating Pattern.

(ii) The in-flight rest period may be taken either as a single period or broken into multiple rest periods.

(b) ULR Pre-flight Rostering Requirements

Prior to commencing an ULR RDA, the operator shall ensure that the cabin crew are provided with at least a rest period of one calendar day and three (3) local nights at base.

(c) ULR Flight Rest Period Away from Base

In the ULR RDA, the scheduled period free of flying duties away from base shall be at least 48 hours inclusive of two (2) local nights.

(d) Post ULR Rest At Base Before Embarking on the Next Flight

Upon completion of a ULR RDA, the cabin crew shall be provided with a rest period of at least 48 hours inclusive of at least three (3) consecutive local nights.
3 DISCRETION TO EXTEND A ULR FDP IN EVENT OF FLIGHT DISRUPTIONS

3.1 In the event of a flight disruption, the pilot-in-command of the ULR flight, may, at his discretion and after taking into account the circumstances of the other crew members of that ULR flight, extend a flight duty period of the ULR flight for up to three (3) hours.

3.2 Whenever such discretion is exercised, a report shall be submitted to the Authority by the operator within 30 days if the normal limitations are exceeded by 2 hours from base or 1 hour from outstation. The report should include date, time, aircraft, crew, details of planned and achieved schedules and the report of the circumstances. Authorised officers may examine such reports from time to time.

4 FLIGHT DELAYS AND DISRUPTIONS

4.1 Flight delays and disruptions may occasionally cause the flight departure to be outside the permitted departure window. In such situations, the flight may be permitted to continue provided the crews and flight crew Flight Time Limits have been appropriately managed to cater to the requirements for the amended departure time.

5 STANDBY FLIGHT CREW

5.1 At base, the standby flight crew for a ULR RDA shall be rostered such that the standby flight crew meet the requirements specified in paragraph 2.2 (b) of Section B of this Appendix.

5.2 At outstation, the standby flight crew may be called to operate an ULR FDP after achieving a rest period of at least 24 hours including one local night provided the Pilot-in-command and one other crew member have met the rest requirement of paragraph 2.2 (c). The standby flight crew if activated for the ULR FDP will be deemed to have completed a ULR RDA and shall be given the rest provided in paragraph 2.2 (d).
6 DISCRETION TO REDUCE A REST PERIOD AT LAYOVER

Flight Crew

6.1 The following conditions shall apply to the exercise of discretion to reduce a rest period for a ULR flight.
(a) The exercise of discretion to reduce a rest period shall be treated as an exception. If exercised, the rest taken in the accommodation should be of at least 24 hours duration and to include one local night;
(b) Such discretion shall not be routinely exercised.

6.2 Whenever such discretion is exercised, a report shall be submitted to the Authority by the operator within 30 days if the normal limitations are exceeded by 2 hours from base or 1 hour from outstation. The report should include date, time, aircraft, crew, details of planned and achieved schedules and the report of the circumstances. Authorised officers may examine such reports from time to time.

Cabin Crew

6.3 The following conditions shall apply to the Crew-in-Charge when exercising the discretion to reduce a rest period for a ULR flight on behalf of the crew, or to an individual exercising the discretion on his own behalf:
(a) The exercise of discretion to reduce a rest period shall be treated as an exception. If exercised, the rest taken in the accommodation shall be of at least 24 hours duration and shall include one local night; and
(b) Such discretion shall not be routinely exercised.

6.4 Whenever such discretion is exercised, a report shall be submitted to the Authority by the operator within 30 days if the normal limitations are exceeded by 2 hours from base or 1 hour from outstation. The report should include date, time, aircraft, crew, details of planned and achieved schedules and the report of the circumstances. Authorised officers may examine such reports from time to time.

7 ULTRA LONG RANGE OPERATIONS

7.1 The current approved windows/city pairs for ULR operations are as follows:

ULTRA LONG RANGE FLIGHTS BETWEEN THE CITY PAIRS

SINGAPORE AND LOS ANGELES
(a) Departing Singapore: 0800 hrs to 1200 hrs OR 1600 hrs to 2000 hrs
(b) Departing Los Angeles: 1200 hrs to 1600 hrs OR 2000 hrs to 0300 hrs

SINGAPORE AND NEW YORK
(a) Departing Singapore 1010 hrs to 1410 hrs OR 2200 hrs to 0200 hrs
(b) Departing NYC 0930 hrs to 1330 hrs OR 2300 hrs to 0300 hrs

Note:- All time are local times.
Recommended Procedures for Controlled Rest on the Flight Deck

**Note:** this list is not exhaustive, nor are all of these procedures necessarily required.

(a) Only one pilot may take controlled rest at a time in his seat. The harness should be used and the seat positioned to minimise unintentional interference with the controls.

(b) The autopilot and auto-thrust systems (if available) should be operational.

(c) Any routine system or operational intervention which would normally require a cross check, should be planned to occur outside controlled rest periods.

(d) Controlled rest on the flight deck may be used at the discretion of the captain to manage both unexpected fatigue and to reduce the risk of fatigue during higher workload periods later in the flight.

(e) It should be clearly established who will take rest, and when it will be taken. If the pilot in command requires, the rest may be terminated at any time.

(f) The pilot in command should define criteria for when his/her rest should be interrupted.

(g) Hand-over of duties and wake-up arrangements should be reviewed.

(h) Flight crews should only use controlled rest if they are familiar with the published procedures.

(i) A third crewmember (not necessarily a pilot) may be involved to monitor controlled flight deck rest. This may include a planned wake-up call, a visit to be scheduled just after the planned rest period ends, or a third crewmember on the flight deck throughout controlled rest.

(j) The controlled rest period should be no longer than 40 minutes, to minimise the risk of sleep inertia on awakening.

(k) Controlled rest should only be utilised during the cruise period from the top of climb to 20 minutes before the planned top of descent. This is to minimise the risk of sleep inertia.

(l) A short period of time should be allowed for rest preparation. This should include an operational briefing, completion of tasks in progress, and attention to any physiological needs of either crew member.

(m) During controlled rest, the non-resting pilot must perform the duties of the pilot flying and the pilot monitoring, be able to exercise control of the aircraft at all times and maintain situational awareness. The non-resting pilot cannot leave his/her seat for any reason, including physiological breaks.

(n) Aids such as eye shades, neck supports, ear plugs, etc., should be permitted for the resting pilot.
1 TYPES OF FATIGUE

1.1 Two types of fatigue shall be taken into account, namely, transient fatigue and cumulative fatigue. Transient fatigue may be described as fatigue that is dispelled by a single sufficient period of rest or sleep. Cumulative fatigue occurs after incomplete recovery from transient fatigue over a period of time.

1.2 Limitations based upon these provisions will provide safeguards against both kinds of fatigue because they will recognise:

(a) the necessity to limit flight duty periods with the aim of preventing both kinds of fatigue;
(b) the necessity to limit the duty period where additional tasks are performed immediately prior to a flight or at intermediate points during a series of flights in such a way as to prevent transient fatigue;
(c) the necessity to limit total duty time and flight time over specified periods, in order to prevent cumulative fatigue;
(d) the necessity to provide crew members with adequate rest opportunity to recover from fatigue before commencement of the next flight duty period; and provision of extended rest periods (Days Off) to recover from cumulative fatigue;
(e) the necessity of taking into account other related tasks the crew member may be required to perform in order to guard particularly against cumulative fatigue.

2 DUTY WITH TAKE-OFF/S AND/OR LANDING/S WITHIN THE WINDOW OF CIRCADIAN LOW

2.1 Prior to a planned / rostered series of flight duty periods that encompass an early start, a late finish or a take-off / landing in the window of circadian low, crew shall be provided with a rest period of 24 hours inclusive of a local night. The flight duty period that then encompasses an early start, a late finish or a take-off / landing in the window of circadian low shall earn the appropriate minimum rest period prior to the next flight duty period that encompasses an early start, a late finish or a take-off / landing in the window of circadian low. After such consecutive flight duty periods that include an early start, a late finish or a take-off / landing in the window of circadian low, crew shall have a 24 hour period free of all duties inclusive of a local night before the next flight duty period that encompasses an early start, a late finish or a take-off / landing in the window of circadian low. If the flight does not include an early start, a late finish or a take-off / landing in the window of circadian low, only the appropriate minimum rest shall apply.

Note: The rest period of 24 hours inclusive of a local night may be part of the crew’s day off.
3 FLIGHT DUTY PERIOD (FDP)

3.1 A flight duty period does not include
the period of travelling time from home to the point of reporting for duty. It is the responsibility of the crew
member to report for duty in an adequately rested condition.

3.2 Where the usual travelling time from the crew member's home to the normal departure aerodrome
is in excess of 1 ½ hours, the crew member concerned should consider making arrangements nearer the
departure aerodrome, so that he has a minimum of 24 hours inclusive of a local night at this rest facility
prior to reporting for a flight duty period.

3.3 The time spent on positioning at the behest of the operator
is part of a duty period but it will become part of a flight duty period when this time immediately precedes
(i.e. without an intervening rest period) a flight duty period in which that person participates as a crew
member.

3.4 In the planning of Duty periods and Flight duty periods,
the operator shall consider all relevant factors, which include:
   (a) the number and direction of time zones crossed;
   (b) the time at which a flight duty period is scheduled to begin;
   (c) the number of planned and/or actual sectors within the flight duty period;
   (d) the pattern of working and sleeping relative to the circadian rhythm, or 24- hour physiological
cycle of the crew;
   (e) the scheduling of days off;
   (f) the sequence of early reporting times and late releases from duty;
   (g) the mixing of early/late/night duties;
   (h) the flight operation characteristics;
   (i) the allocation of work patterns which avoid such undesirable practices such as alternating
day/night duties or the positioning of crew such that a serious disruption of established sleep/work
patterns occur;
   (j) the planning days off and notifying crew well in advance; and
   (k) the basic roster concepts which ensure adequate rest prior to flight.

3.5 When a flight crew member is required to report for duty in advance of the stipulated report time
for a scheduled flight, to carry out a task at the behest of the employer, then the time spent on that task shall
be part of the subsequent FDP.
4 TRAINING

4.1 Training shall be provided for Flight and Cabin crew as well as for Rostering Staff (includes any operational personnel looking after crew scheduling and activation) and shall include guidance on the effects of sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a crew member’s alertness and ability to safely operate an aircraft or perform safety-related duties and also include all relevant factors such as: the number and direction of time zones crossed; the time at which a flight duty period is scheduled to begin; the number of planned and/or actual sectors within the flight duty period; the pattern of working and sleeping relative to the circadian rhythm, or 24-hour physiological cycle of the crew; the scheduling of days off; the sequence of early reporting times and late releases from duty; mixing early/late/night duties; and flight operation characteristics.

5 REQUIREMENTS ON ACCOMMODATION

5.1 Suitable accommodation on the ground, when away from home base, shall be provided for rest in order to allow for effective recovery.

5.2 Travelling time spent by a crew member in transit between the place of rest and the place of reporting for duty is not counted as duty, even though it is a factor contributing to fatigue. Excessive travelling time undertaken immediately before commencing a flight duty period could therefore detract from a crew member’s ability to counter fatigue arising whilst on duty, and should therefore be taken into account when deciding where pre-flight rest should be taken.

5.3 Where the usual travelling time from the crew member’s home to the normal departure aerodrome is in excess of 1 1/2 hours, the crew member concerned should consider making arrangements nearer the departure aerodrome, so that he has a minimum of 24 hours inclusive of a local night at this rest facility arrangement prior to reporting for a flight duty period.
6  MINIMUM REST PERIOD

6.1 The minimum rest period subsequent to and/or prior to a scheduled flight duty period shall be:
   (a) not less than 10 hours if it includes a local night;
   (b) not less than 12 hours if it does not include a local night;
   (c) at least as long as the preceding duty rounded to the next whole hour, if this has exceeded 10
       hours and up to 16 hours;
   (d) If the preceding duty exceeded 16 hours, the rest period shall be 24 hours and shall include a
       local night.

6.2 Minimum rest periods may be reduced
   in unforeseen operational circumstances by no more than 2 hours only at the discretion of the pilot-in-
   command. In situations where a local night would have been required, this requirement shall remain.

7  DAY OFF

7.1 In a day off,
   a crew member shall have 34 hours free of all duties including a local night, commencing 1 hour after the
   crew member completes a duty period. If the crew member is away from base, the day off shall commence
   either 1 hour after the crew member are free of all duties or the time taken to reach the accommodation
   designated for the day off, whichever is lesser.

7.2 A planned minimum rest period may be included as part of a day off.

7.3 Each subsequent day off shall be a period of 24 hours and shall include a local night.

7.4 Crew members:
   (a) shall not work more than 7 consecutive days between days off;
   (b) shall be rostered to have two days off every 2 consecutive weeks. Where these two days off
       are rostered consecutively, the total time off will be 58 hours and when not rostered
       consecutively, each separate day off will be of 34 hours duration;
   (c) shall have eight days off every 4 consecutive weeks. A minimum of 6 days off in a consecutive 4
       week period is permissible provided the shortfall of the remaining days off has been / is made
       good in the preceding or following consecutive 4 week period.

7.5 When a crew member has been away from home base for any period of 7 days or more,
   a period of 82 hours, including 3 local nights shall be provided to re-acclimate the crew to home base before
   the start of the next flight duty period.
8 STANDBY DUTY

8.1 The start time and end time of standby shall be defined and the maximum length of any standby shall not exceed 18 hours for flight crew and 24 hours for cabin crew.

8.2 Where airport standby, with adequate rest facilities provided, is immediately followed by a flight duty period, the airport standby shall be taken into account to calculate the minimum rest preceding a subsequent flight duty period. Where the airport standby is without adequate rest facilities, the period of standby shall form part of the FDP.

8.3 A rest facility at an airport shall as a minimum, comprise an independent, screened off rest area with a horizontal sleeping surface and shall provide an environment that is conducive to rest/sleep.

8.4 When crew personnel are required to be on standby at an accommodation arranged by the operator, then adequate rest facilities should be provided.

8.5 If a crew member is called out from standby, the standby duty shall cease at the time when the crew member is activated for duty. The duty period shall commence when that individual reports for duty at the designated reporting point.

8.6 Time spent on standby at home or in local accommodation shall be factorised for the purpose of determining cumulative duty limits, at 20 percent of the total period of standby.

9 CREW REPORTING TIME

9.1 Crew report times shall realistically reflect the time required to complete all assigned pre-flight duties, and a minimum of 90 minutes is to be allowed for the completion of pre-flight duties and post flight checks and records. The time for completion of pre-flight requirements shall be a minimum of 1 hour. For record purposes, the pre-flight report time shall count as flight duty, and the post-flight allowance shall count as duty.

10 POSITIONING

10.1 All time spent positioning counts as duty, and positioning followed by operating without an intervening rest period also counts for computation towards flying duty period. However, positioning is not counted as an operating sector when planning or calculating a flight duty period.

11 MIXED SIMULATOR AND AIRCRAFT FLYING

11.1 When a flight crew member flies in the simulator, either undergoing or conducting a check or training flight (session), and then within the same duty period flies as a crew member on a public transport flight / training and/or test flight, all the time spent in the simulator is counted in full towards the subsequent FDP.

11.2 Simulator flying itself does not count as a sector, but the FDP allowable is calculated from the report time of the simulator detail.
12 DELAYED REPORTING TIME

12.1 When a crew member is informed of a delay to the reporting time before leaving the place of rest, the FDP shall be calculated as follows:
   (a) When the delay is less than 4 hours, the maximum allowed FDP shall be based on the original report time but the FDP shall start at the actual report time.
   (b) Where the delay is 4 hours or more, the maximum allowed FDP shall be based on the actual report time but the FDP shall start 4 hours after the original report time.
   (c) When the operator informs a crew member before leaving the place of rest of a delay in reporting time of 10 hours or more ahead and that crew member is not further disturbed by the operator until a mutually agreed hour, then that elapsed time is considered a continuation of the rest period.

13 LIMITS ON FLIGHT TIME

13.1 Pursuant to ANO Paragraph 55(1), the maximum number of flying hours a flight crew member can perform is:
   (a) 100 hours in any consecutive 28 days
   (b) 1000 hours in any consecutive 12 months

14 LIMITS ON DUTY HOURS

14.1 Flight crew duty hours shall not exceed:
   (a) 90 hours in any consecutive 14 days; and
   (b) 180 hours in any consecutive 28 days

14.2 Cabin crew duty hours shall not exceed:
   (a) 100 hours in any consecutive 14 days; and
   (b) 200 hours in any consecutive 28 days

15 LIMITS ON FLIGHT DUTY PERIOD

15.1 For Flight Duty Period limitations, the crew complement and the extent to which the various tasks to be performed can be divided among the crew members should be taken into account; In the case where additional crew members are carried and facilities in the aeroplane are such that a crew member can obtain recuperative rest, planned flight duty periods could be extended.
16 EXTENSION OF FLIGHT DUTY PERIOD

16.1 Flight Duty Periods may be extended in unforeseen operational circumstances by no more than 3 hours, only at the discretion of the pilot-in-command. Before exercising this discretion, a fatigue risk assessment shall be carried out and the pilot-in-command shall be satisfied that all members of the crew required to operate the aeroplane consider themselves fit to do so. This extension of the FDP may be carried out provided:

(a) the safety of the flight will not be prejudiced; and
(b) the extended Flight Duty Period shall not exceed by more than three hours the maximum permitted Flight Duty Period except in an emergency.

Note: An emergency in respect of an extension of a flight duty is a situation which, in the judgment of the pilot-in-command, presents a serious risk to health or safety.

16.2 The pilot-in-command shall report to the operator the use of discretion to extend duty or reduce rest by more than 2 hours from the normal limitations. The operator shall in turn report to the Authority when such discretion is exercised within 30 days. The report should include date, time, aircraft, crew, details of planned and achieved schedules and the report of the circumstances. Authorised officers may examine such reports from time to time.

16.3 If discretion has to be applied for similar reasons on more than 20 percent of occasions when a particular route or route pattern is flown, it is likely that the intention of this fatigue management requirement is not being met. Arrangements shall be made to review the schedule or the crewing management so as to reduce the frequency at which such events occur.

17 LIMITATIONS ON FLIGHT DUTY PERIODS - FLIGHT CREW

17.1 The maximum permitted FDP (in hours) shall be in accordance with:

(a) Table A or B in the case of an aeroplane with a normal flight crew complement of 2 pilots; or
(b) Table C in the case of a single pilot aeroplane; or
(c) Table D in the case of a helicopter.
18 MAXIMUM PERMITTED FDP - AEROPLANES IN WHICH THE NORMAL CREW CONSISTS OF TWO OR MORE FLIGHT DECK CREW MEMBERS

18.1 Table A shall apply when the FDP starts at a place where the crew member is acclimated to local time, while Table B shall apply at other times.

18.2 The maximum permitted FDP may be adjusted by applying the additional limits under Paragraph 19 where applicable.

### Table A:
**Maximum Permitted FDP (Acclimated)**

<table>
<thead>
<tr>
<th>Local time of start</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>06:00-07:59</td>
<td>13:00</td>
<td>12:15</td>
<td>11:30</td>
<td>10:45</td>
<td>10:00</td>
<td>9:15</td>
<td>9:00</td>
<td>9:00</td>
</tr>
<tr>
<td>08:00-14:59</td>
<td>14:00</td>
<td>13:15</td>
<td>12:30</td>
<td>11:45</td>
<td>11:00</td>
<td>10:15</td>
<td>9:30</td>
<td>9:00</td>
</tr>
<tr>
<td>15:00-21:59</td>
<td>13:00</td>
<td>12:15</td>
<td>11:30</td>
<td>10:45</td>
<td>10:00</td>
<td>9:15</td>
<td>9:00</td>
<td>9:00</td>
</tr>
<tr>
<td>22:00-05:59</td>
<td>11:00</td>
<td>10:15</td>
<td>9:30</td>
<td>9:00</td>
<td>9:00</td>
<td>9:00</td>
<td>9:00</td>
<td>9:00</td>
</tr>
</tbody>
</table>

### Table B:
**Maximum Permitted FDP (Not Acclimated)**

<table>
<thead>
<tr>
<th>Total sectors to be flown</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12:30</td>
<td>12:00</td>
<td>11:00</td>
<td>10:30</td>
<td>10:00</td>
<td>9:00</td>
</tr>
</tbody>
</table>

### Table C:
**Maximum Permitted FDP (Single Pilot Aeroplanes)**

<table>
<thead>
<tr>
<th>Local time of start</th>
<th>Total sectors to be flown</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Up to 4</td>
</tr>
<tr>
<td>06:00-07:59</td>
<td>10:00</td>
</tr>
<tr>
<td>08:00-14:59</td>
<td>11:00</td>
</tr>
<tr>
<td>15:00-21:59</td>
<td>10:00</td>
</tr>
<tr>
<td>22:00-05:59</td>
<td>9:00</td>
</tr>
</tbody>
</table>

### Table D:
**Maximum Permitted FDP and Flight Time (Helicopters)**

<table>
<thead>
<tr>
<th>Local time of start</th>
<th>Single Pilot</th>
<th>Two Pilots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max FDP</td>
<td>Max FTL</td>
</tr>
<tr>
<td>06:00-07:59</td>
<td>9:00</td>
<td>6:00</td>
</tr>
<tr>
<td>08:00-14:59</td>
<td>10:00</td>
<td>7:00</td>
</tr>
<tr>
<td>15:00-21:59</td>
<td>9:00</td>
<td>6:00</td>
</tr>
<tr>
<td>22:00-05:59</td>
<td>8:00</td>
<td>5:00</td>
</tr>
</tbody>
</table>
19 ADDITIONAL LIMIT ON TWO-CREW LONG SECTORS

19.1 When an aeroplane flight crew consists only of two pilots, the FDP calculated from Table A or B will be adjusted by counting long sectors as more than one sector in the following manner:

<table>
<thead>
<tr>
<th>Sector Adjustment for 2 Pilot Long Sector Operations</th>
<th>Count as (sectors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single sector length (block time) as</td>
<td>Table A</td>
</tr>
<tr>
<td>Over 7 but not over 9 hours</td>
<td>2</td>
</tr>
<tr>
<td>Over 9 but not over 11 hours</td>
<td>3</td>
</tr>
<tr>
<td>Over 11 hours</td>
<td>4</td>
</tr>
</tbody>
</table>

20 MAXIMUM PERMITTED FLIGHT DUTY PERIOD WITH AUGMENTED FLIGHT CREW

20.1 The amount by which the basic flight duty period limitations may be extended shall be determined by the composition and number of flight crew members carried to provide in-flight relief and the quality of rest facilities provided. A sensible balance shall be kept between the division of in-flight duty and rest.

20.2 The maximum permitted Flight Duty Period may be extended when the Normal Flight Crew complement is augmented with Augmented Flight Crew according to the following:

(a) Up to a maximum FDP of 15 hours if augmented with one flight crew (each flight crew member can leave their assigned post and be replaced by another appropriately qualified flight crew member for the purpose of in-flight rest) and appropriate rest facilities are available for one pilot

(b) Up to a maximum FDP of 18 hours if augmented with two flight crew (each flight crew member can leave their assigned post and be replaced by another appropriately qualified flight crew member for the purpose of in-flight rest) and appropriate rest facilities are available for two pilots

Note: The requirements for ULR flights are in Appendix C.

20.3 Despite paragraph 20.2 No extension of the Flight Duty Period will be permitted even with pilots, if no rest facilities for the required number of pilots are available.
21 FLIGHT DUTY PERIOD FOR CABIN CREW

21.1 The operator may require a cabin crew member
To report at a time that is earlier than his/her scheduled reporting time for pre-flight briefing provided that the earlier time is not more than 60 minutes before the reporting time for flight crew.

21.1A The maximum flight duty period for cabin crew is the same as
that applicable to the flight crew as specified in paragraph 18 or 19, as the case may be, plus the difference in reporting time provided in Paragraph 21.1.

21.2 The number of the cabin crew should be determined
taking into account the rest facilities provided and other parameters linked to the operation of the flight.

21.3 The operator shall not assign a cabin crew
a Flight Duty Period of more than 14 hours, excluding the difference in reporting time between flight crew and cabin crew as described in paragraph 21.1, provided that:
(a) Horizontal rest facilities are provided on board the flight;
(b) The cabin crew member has a minimum in–flight rest period of 3 hours for a Flight Duty Period of up to 16 hours and 4 hours for a Flight Duty Period of up to 19 hours; and
(c) The division of duty and rest is fairly distributed among all cabin crew members on the flight.

21.4 Despite paragraph 21.3,
The operator shall not assign any cabin crew member a Flight Duty Period of more than 19 hours, excluding the difference in reporting time between the flight crew and cabin crew as described in paragraph 21.1.

21.5 If horizontal rest facilities are not available
due to unforeseen circumstances, and the in-flight rest has to be taken in a suitable seat, the minimum in-flight rest period specified above shall be increased by 1 hour.

   Note: The requirements for ULR flights are in Appendix C.

22 DELAY(S) / DISRUPTION(S) IMPACTING ON ROSTERED DAY/S OFF

22.1 The operator shall plan flights in a realistic manner.
While flights are planned to be completed within the maximum Flight Duty Period, it is recognised that on occasion a planned flight will experience delay(s) and/or disruption(s) due to unforeseen circumstances, which may impact on the ensuing rostered day off. In the situation where a flight is disrupted / delayed due to unforeseen circumstances, the ensuing day off may be reduced by 4 hours provided the shortfall is made up in the next allocation of a day off and be in compliance with paragraph 7.4. The minimum rest period following a delayed or disrupted flight shall be according to the Flight Duty Period achieved including the period of delay/disruption.
23 APPROPRIATE IN-FLIGHT REST FACILITY FOR FLIGHT CREW

23.1 The composition and number of flight crew members carried to provide in-flight relief and the quality of rest facilities provided should determine the amount by which the basic flight duty period limitations may be extended.

23.2 An in-flight rest facility should preferably be a designated rest area with a horizontal rest facility. Where a horizontal rest facility (bunk) cannot be provided for in-flight rest, the operator shall seek approval of the rest facility from the Authority.

23.3 For long haul flights, operated with Augmented Flight Crew, particularly those in which the FDP (from the point of departure) includes the time span from 0100 to 0659 (local time), a horizontal rest facility shall be provided.

23.4 In the situation where flights may possibly be conducted with a Normal Flight Crew complement but the operator opt to use Augmented Flight Crew for the purpose of managing fatigue risk, a suitable reclining seat, for in-flight rest, may be used.

Note: The extension of the maximum FDP as stated in paragraph 16, when applied to paragraph 20 shall be dependent on the quality of the rest facility/ies provided.

24 RECORDS

24.1 To enable the operator to ascertain that the fatigue management scheme is functioning as intended and as approved, records of the duties performed and rest periods achieved shall be kept for at least 12 months.

24.2 The operator shall ensure that these records include, but not limited to:
(a) For each flight crew member:
(i) the start, duration and end of each flight duty period;
(ii) the start, duration and end of each duty period;
(iii) rest periods; days off and
(iv) flight time.
(b) For each cabin crew member:
(i) the start, duration and end of each flight duty period;
(ii) the start, duration and end of each duty period; and
(iii) rest periods and days off.

24.3 The operator shall also keep records of occasions when a pilot-in-command has exercised his discretion to extend a duty period or reduce a rest period.

24.4 Flight and cabin crew members shall maintain a personal record of their duty, flight duty period and rest times.
1 FATIGUE RISK MANAGEMENT SYSTEM (FRMS)

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

2 TYPES OF FATIGUE

2.1 Two types of fatigue shall be taken into account, namely, transient fatigue and cumulative fatigue. Transient fatigue may be described as fatigue that is dispelled by a single sufficient period of rest or sleep. Cumulative fatigue occurs after incomplete recovery from transient fatigue over a period of time.
3 FATIGUE RISK MANAGEMENT SYSTEM (FRMS)

3.1 The operator’s FRMS shall be approved by the Authority before it may take the place of any or all of the basic fatigue management regulations described in Appendix C and C1. An approved FRMS shall provide a level of safety equivalent to, or better than, the basic fatigue management regulations.

3.2 As part of this process, the operator shall:
   (a) establish maximum values for flight times and/or flight duty periods(s) and duty period(s), and minimum values for rest periods. These values shall be based upon scientific principles and knowledge, subject to safety assurance processes, and acceptable to the Authority;
   (b) be required to mandate a decrease in maximum values and an increase in minimum values in the event that the operator’s data indicates these values are too high or too low, respectively; and
   (c) request the Authority to approve any increase in maximum values or decrease in minimum values. This shall be done only after evaluating the operator’s justification for such changes, based on accumulated FRMS experience and fatigue-related data.

3.3 The operator shall, as a minimum:
   (a) incorporate scientific principles and knowledge within the FRMS;
   (b) identify fatigue-related safety hazards and the resulting risks on an ongoing basis;
   (c) ensure that remedial actions, necessary to effectively mitigate the risks associated with the hazards, are implemented promptly;
   (d) provide for continuous monitoring and regular assessment of the mitigation of fatigue risks achieved by such actions; and
   (e) provide for continuous improvement to the overall performance of the FRMS.

3.4 The operator shall maintain records for all its flight and cabin crew members of flight time, flight duty periods, duty periods, and rest periods for a period of at least 12 months.

Note: Where the operator has an FRMS, it shall be integrated with the operator’s SMS.
A Fatigue Risk Management System (FRMS) established in accordance with this Appendix shall contain, at a minimum the following:

(a) FRMS policy and documentation;
(b) Fatigue risk management processes;
(c) FRMS safety assurance processes; and
(d) FRMS promotion processes.

4.2 FRMS policy and documentation

4.2.1 FRMS policy

4.2.1.1 The operator shall define its FRMS policy, with all elements of the FRMS clearly identified.

4.2.1.2 The policy shall require that the scope of FRMS operations be clearly defined in the operations manual.

4.2.1.3 The policy shall

(a) reflect the shared responsibility of management, flight and cabin crews, and other involved personnel;
(b) clearly state the safety objectives of the FRMS;
(c) be signed by the accountable manager of the organisation;
(d) be communicated, with visible endorsement, to all the relevant areas and levels of the organisation;
(e) declare management commitment to effective safety reporting;
(f) declare management commitment to the provision of adequate resources for the FRMS;
(g) declare management commitment to continuous improvement of the FRMS;
(h) require that clear lines of accountability for management, flight and cabin crews, and all other involved personnel are identified; and
(i) require periodic reviews to ensure it remains relevant and appropriate.

4.2.2 FRMS documentation

The operator shall develop and keep current FRMS documentation that describes and records

(a) FRMS policy and objectives;
(b) FRMS processes and procedures;
(c) accountabilities, responsibilities and authorities for these processes and procedures;
(d) mechanisms for ongoing involvement of management, flight and cabin crew members, and all other involved personnel;
(e) FRMS training programmes, training requirements and attendance records;
(f) scheduled and actual flight times, duty periods and rest periods with significant deviations and reasons for deviations noted; and
(g) FRMS outputs including findings from collected data, recommendations, and actions taken.
4.3 Fatigue risk management processes

4.3.1 Identification of hazards

4.3.1.1 The operator shall develop and maintain the following three fundamental and documented processes for fatigue hazard identification:

(a) **Predictive**

A predictive process to 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 are not limited to:

(i) operator or industry operational experience and data collected on similar types of operations;
(ii) evidence-based scheduling practices; and
(iii) bio-mathematical models.

(b) **Proactive**

A proactive process to identify fatigue hazards within current flight operations. Methods of examination may include but are not limited to:

(i) self-reporting of fatigue risks;
(ii) crew fatigue surveys;
(iii) relevant flight and cabin crew performance data;
(iv) available safety databases and scientific studies; and
(v) analysis of planned versus actual time worked.

(c) **Reactive**

A reactive process to 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 minimised. At a minimum, the process shall be triggered by any of the following:

(i) fatigue reports;
(ii) confidential reports;
(iii) audit reports;
(iv) incidents; and
(v) flight data analysis events.

4.3.2 Risk assessment

4.3.2.1 The 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.

4.3.2.2 The risk assessment procedures shall include the review of 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.
4.3.3 Risk mitigation

4.3.3.1 The operator shall develop and implement risk mitigation procedures to:

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

4.3.4 FRMS safety assurance processes

4.3.4.1 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 are not limited to:
   (i) hazard reporting and investigations;
   (ii) audits and surveys; and
   (iii) reviews and fatigue studies;

(b) provide a formal process for the management of change which shall include but is not limited to:
   (i) identification of changes in the operational environment that may affect FRMS;
   (ii) identification of changes within the organisation that may affect FRMS; and
   (iii) 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:
   (i) 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;
   (ii) routine evaluations of facilities, equipment, documentation and procedures; and
   (iii) the determination of the need to introduce new processes and procedures to mitigate emerging fatigue-related risks.

4.4 FRMS promotion processes

4.4.1 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 programmes 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:
   (i) explains FRMS policies, procedures and responsibilities to all relevant stakeholders; and
   (ii) describes communication channels used to gather and disseminate FRMS-related information.