



CIVIL AVIATION PUBLICATION

CAP 34

FATIGUE MANAGEMENT FOR FLIGHT CREW MEMBERS

INDEX

This Page Intentionally Left Blank



CIVIL AVIATION PUBLICATIONS

Purpose

This CAP provides guidance on meeting the AOC holder and flight crew member (FCM) obligations in relation to fatigue risk management, required under Subpart Q of ANTR OPS – 1.

This CAP does not cover operational aspects specific to ultra-long range operations, which are operations involving flight times greater than 16 hours or flight duty periods greater than 18 hours, and which require special considerations within a fatigue risk management system (FRMS).



CIVIL AVIATION PUBLICATIONS

CAP 34

FATIGUE MANAGEMENT FOR FLIGHT CREW MEMBERS

INDEX

Section	Title	Page No.
1	Reference material	1-1
1.1	Acronyms	1-1
1.2	Definitions	1-2
1.3	References	1-4
2	Introduction	2-1
2.1	Operator obligations	2-2
2.2	Individual obligations	2-3
3	Operator obligations – fitness for duty	3-1
3.1	Selecting suitable sleeping accommodation for off-duty periods	3-1
3.2	Location of sleeping accommodation	3-1
3.3	Acclimatisation	3-2
3.4	Augmented crew	3-2
3.5	Fatigue occurrence reporting	3-4
4	Operator obligations	4-1
4.1	Setting limitations	4-1
4.2	Record keeping	4-1
4.3	Extensions due to unforeseen operational circumstances	4-2
4.4	Determination of home base	4-2
4.5	Meals	4-3
4.6	Publishing of rosters	4-3
4.7	Delayed reporting time	4-4
5	Additional obligations relating to FCMs – Commercial Air Transport – Multi Pilot Operation	5-1
5.1	Tier 2 operators	5-1
5.2	Hazard identification (including use of biomathematical models)	5-1
5.3	Setting limitations taking into account hazards	5-3
5.4	Continuous improvement of policies and practices	5-4
5.5	Fatigue Training	5-5

CIVIL AVIATION PUBLICATIONS

6	Individual obligations – fitness for duty – individual cognitive and physical fitness	6-1
6.1	Individual alertness measurement	6-1
6.2	Fatigue occurrence reporting	6-2
6.3	Health and well-being	6-3
6.4	Workload	6-3
6.5	Fatigue mitigating strategies	6-4
6.6	Sleep	6-6
6.7	Time zones and acclimatisation	6-6
6.8	Augmented crew	6-7
7	Individual obligations – disclosure to an operator	7-1
7.1	Living arrangements – distance from base	7-1
7.2	External employment and other tasks	7-1
7.3	Private flying	7-2
7.4	Open and fair reporting culture	7-2
8	Fatigue Risk Management System (FRMS)	8-1
8.1	General	8-1
8.2	FRMS Policy and documentation	8-2
8.3	FRMS Practical operating procedures	8-3
8.4	FRMS Hazard identification, Risk assessment and Mitigation	8-4
8.5	FRMS Safety Assurance Procedures	8-5
8.6	FRMS Safety Promotion Procedures	8-6
8.7	FRMS Change Management Procedures	8-7
8.8	Trial FRMS implementation approval	8-8
8.9	Full FRMS implementation approval	8-9
8.10	Expiry, suspension, revocation, surrender of FRMS implementation approval	8-9
Appendix A	Development of operations manual limits and procedures	APP A-1
Appendix B	Limits and requirements	APP B-1
Appendix C	Example Fatigue Occurrence Report	APP C-1
Appendix D	Hazard identification and associated procedures (Tier 2)	APP D-1
Appendix E	Alertness consideration table	APP E-1



CIVIL AVIATION PUBLICATIONS

1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this CAP are listed in the table below.

Acronym	Description
AOC	Air Operator's Certificate
CAP	Civil Aviation Publication
FCM	Flight Crew Member
FDP	Flight Duty Period
FRMS	Fatigue Risk Management System
FTL	Flight and Duty Time Limits
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
LNO	Late night operation
ODP	Off-duty period / Rest Period
PIC	Pilot-in-Command
PVT	Psychomotor Vigilance Test
REM	Rapid Eye Movement
SMS	Safety Management System
WOCL	Window of Circadian Low

CIVIL AVIATION PUBLICATIONS

1.2 Definitions

Terms that have specific meaning within this CAP are defined in the table below.

Definitions addition to those referred in ANTR OPS -1, Subpart-Q; FTL are defined here to aid the understanding.

Term	Definition
Adaptation period	A continuous off-duty period (ODP) for an FCM to become acclimatised to a particular location.
Augmented crew operation	An aircraft operation in which one or more FCMs, additional to the minimum required number of FCMs, are engaged in a flight to allow one or more FCMs to be relieved of duty during flight time.
Complex operation	An operation that involves 1 or more of the following: <ol style="list-style-type: none"> a. a flight duty period (FDP) with a displacement time of 2 hours or more b. an augmented crew operation c. an FDP that commences when the FCM is: <ol style="list-style-type: none"> i in an unknown state of acclimatisation, or ii acclimatised to a location other than the location where the FDP commences.
Displacement time	The difference in local time between: <ol style="list-style-type: none"> a. the place where an FCM commenced an FDP b. the place where the FCM undertakes an off-duty period following the FDP.
Fit for purpose	For a crew rest facility, or suitable sleeping accommodation, means that it has ergonomic characteristics that make it suitable for an FCM to obtain sleep.
Flight duty period (FDP)	A period of time that: <ol style="list-style-type: none"> a. starts when a person is required, by an AOC holder, to report for a duty period in which they undertake one or more flights as part of an operating crew b. ends at the later of: <ol style="list-style-type: none"> i the person's completion of all duties associated with the flight, or the last of the flights; or ii 15 minutes after the end of the person's flight, or the last of the flights.
Off-duty period (ODP)	A period of time during which an FCM is free of all duties and standby associated with their employment.
Reporting time	The time assigned to an FCM to commence an FDP.
Single pilot operation	Any operation other than a multi-pilot operation.
Sleep opportunity	A period of time during an ODP / Rest Period when an FCM: <ol style="list-style-type: none"> a. is not meeting the reasonable requirements of bodily functioning, such as: <ol style="list-style-type: none"> i eating



CIVIL AVIATION PUBLICATIONS

- ii drinking
 - iii toileting
 - iv washing
 - v dressing; and
- b. has access to suitable sleeping accommodation without, under normal circumstances, being interrupted by any requirement of the AOC holder.

Note: Normal circumstances refer to those situations where the operator wishes to preserve the prior sleep opportunity. Abnormal circumstances refer to the case where the operator needs to contact the FCM and it is understood that this will mean that the prior sleep opportunity has been interrupted.

Split-duty rest period

A predefined period of time during which an FCM:

- a. has access to suitable resting accommodation or suitable sleeping accommodation; and
- b. is relieved of all duties associated with their employment by the AOC holder.

Note: For Appendix 4B and Appendix 5, the period of time may or may not be predefined.

Standby

A period of time during which an FCM:

- a. is required by an AOC holder to hold themselves available for duties
- b. has access to suitable sleeping accommodation
- c. is free from all duties associated with their employment.

Standby-like arrangement

A period of time during which an FCM:

- a. is required by an AOC holder to hold themselves available for duties; and
- b. does not have access to suitable sleeping accommodation.

Suitable resting accommodation

A comfortable resting area that:

- a. has a comfortable temperature and minimal noise levels
- b. contains at least a comfortable chair
- c. provides access to adequate sustenance at times appropriate to the duty requirements.

Suitable sleeping accommodation

Accommodation not within an aircraft that is fit for purpose for an FCM to obtain sleep, and that includes all of the following:

- a. a comfortable room, compartment or facility
- b. a single occupancy, at the discretion of the FCM
- c. access to clean, tidy and hygienic amenities, including a toilet and hand washing basin
- d. a bed that is comfortable, flat and horizontal, allowing the occupant to sleep on their stomach, back, and either side
- e. minimum noise levels, including low occurrence of random noise
- f. the means to control light, temperature and ventilation

CIVIL AVIATION PUBLICATIONS

g. access to adequate sustenance.

Tier 1	A very simple prescriptive system, with relatively restrictive flight and duty time limits.
Tier 2	More flexible limits, but with additional operator obligations (such as hazard identification and continuous monitoring).
Time zone	A defined region of earth with a uniform local time that differs by one hour, or by part of one hour, from the uniform local time of an adjoining region of the earth.
Unforeseen operational circumstance	An unplanned exceptional event that becomes evident after the commencement of the FDP (i.e. un-forecast weather, equipment malfunction, or air traffic delay).

1.3 References

Regulations

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

Document

Title

Civil Aviation Law

Air Navigation Technical Regulation – ANTR OPS 1

Subpart-Q

Flight & Duty Time Limitations and Rest Requirements

AMC / GM for Flight and Duty Time Limitations and Rest Requirements

ICAO DOC 9966, 2nd
Edition 2016

Manual for the oversight of Fatigue Management Approaches

Advisory material

Document

Title

BCAA Fatigue Management guidance

Available at www.BCAA.gov.au/fatigue/

International Civil Aviation Organization (ICAO) Guidance

Fatigue Management resources, available at <http://www.icao.int/safety/fatiguemanagement/Pages/Resources.aspx>

FRMS Implementation Guide for Operators

<https://www.icao.int/safety/fatiguemanagement/Pages/default.aspx>

Hand Book on FRMS Implementation

Published by BCAA in <http://www.mtt.gov.bh>

FRMS Process Guide

Published by BCAA in <http://www.mtt.gov.bh>

CIVIL AVIATION PUBLICATIONS

2 Introduction

Subpart-Q; ANTR OPS 1 outlines the requirements for fatigue management for flight crew members (FCMs). Within the requirement, there are obligations that air operator certificate (AOC) holders and flight crew licence holders (individuals) must meet. This CAP provides guidance in meeting those obligations.

The requirement for fatigue management provides Commercial Air Transport Operators with the choice of which of the three- tier scheme best suits them, based on their requirements for flexibility and their capacity to manage fatigue-related risks resulting from that level of flexibility:

- Tier 1 (Basic Limit) – sets prescriptive flight and duty time limitations without the need for risk management processes; however, these limitations are relatively restrictive and not recommended for Commercial Air Transport Operators.
- Tier 2 (Prescriptive Limits with Fatigue Management) – allows greater flexibility with less restrictive flight and duty time limitations, but requires operators to have in place; risk management processes, continuous monitoring processes and a training program for FCMs. This scheme is recommended for the Commercial Air Transport Operators
- Tier 3 (Fatigue Risk Management System-FRMS) – is the most comprehensive fatigue risk management approach. An 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 that aims to ensure relevant personnel are performing at adequate levels of alertness.

Three tiers of compliance

Description	Scheme Objectives	Operator Obligations
<ul style="list-style-type: none"> ✓ Customisable ✓ Based on Science ✓ Data Driven ✓ Continuous Improvement 	FRMS	<ul style="list-style-type: none"> ✓ Policy and documentation ✓ Risk management process ✓ Safety assurance process ✓ Safety promotion process
<ul style="list-style-type: none"> ✓ Prescriptive Limits ✓ Type of Operation ✓ More Flexible ✓ Less Restrictive 	Fatigue Management	<ul style="list-style-type: none"> ✓ Hazard identification ✓ Limits reflect identified hazard ✓ Continuous monitoring ✓ Transitional procedures ✓ Training for Crew Members
<ul style="list-style-type: none"> ✓ Prescriptive ✓ Less Flexible 	Basic	<ul style="list-style-type: none"> ✓ No additional obligations

This CAP is intended to provide guidance primarily for complying with Tier 1 and Tier 2 requirements. Some of this material is also likely to be relevant to an AOC holder wishing to apply for an FRMS or operating under an FRMS.

CIVIL AVIATION PUBLICATIONS

For operators choosing to develop and implement an FRMS under Tier 3, guidance on this is contained in the Advisory Material referred above

The information in this CAP is relevant guidance to operators about generic fatigue management principles and BCAA may apply the standards mentioned in the material referred above when approving an FRMS, BCAA strongly recommend operators to consider applying the guidance in this CAP for FRMS implementation.

Operators who are unable to develop and maintain an FRMS in accordance with the ICAO guidance will be required to operate to the relevant obligations of Tier 2 scheme. Operators should ensure that their FRMS remains current with developments in the field of FRMS.

In order to provide users with guidance relevant to their interests, the body of this CAP is split into two main parts:

- AOC holder (operator) obligations
- flight crew licence holder (individual) obligations.

The following chapters may cover more specific areas of guidance, such as how to interpret the limits and requirements of ANTR OPS 1; Subpart-Q.

2.1 Operator obligations

- 2.1.1 Under ANTR OPS FTL 1.1110, 1.1120 and Section 8 of this CAP with respect to implementation requirement, operators have a series of obligations.
- 2.1.2 Above all, an operator must not require an FCM to operate an aircraft if, considering the circumstances of the flight to be undertaken, the holder has reason to believe that the Flight Crew Member (FCM) is suffering from, or is likely to suffer from, fatigue that may so impair the FCM's performance that the safety of the operation may be affected.
- 2.1.3 The operator also has obligations in relation to:
- documenting flight and duty time limitations in their operations manual
 - documenting the responsibilities of their employees in their operations manual
 - providing opportunities for FCMs to consume meals
 - record keeping and reporting
 - determination of home bases for its FCMs
 - publishing rosters.
- 2.1.4 Tier 2 scheme operators have additional obligations. These operators must have the following documented within their operations manual:
- procedures for hazard identification, including the foreseeable hazard that may compromise FCMs alertness
 - procedures for determining limitations that take into account potential hazards and to ensure that each minimum & maximum limit must not be exceeded;
 - procedures for the continuous monitoring and evaluation of policies, limitations and practices
 - transition procedures (when operations under multiple appendices are conducted).

CIVIL AVIATION PUBLICATIONS

- 2.1.5 Tier 2 scheme operators are also required to have initial and recurrent fatigue training programs for their FCMs including
- Assessment of FCMs knowledge
 - Conducting initial training within the period of six months from joining service
 - Conducting recurrent training at the appropriate interval.

2.2 Individual obligations

- 2.2.1 Under ANTR OPS FTL 1.1115, it is a requirement that each flight crew licence holder must not operate an aircraft if, considering the circumstances of the flight to be undertaken, a reasonable person in the FCM's position would consider that he or she is suffering from, or is likely to suffer from, fatigue which may so impair performance that the safety of the operation may be affected.
- 2.2.2 An FCM employed by an operator must, before any flight duty period (FDP), disclose to the operator any matter that a reasonable person in the FCM's position would consider likely to adversely affect his or her ability to meet the operator's fatigue risk management policies; or the limits and requirements of the appendix or appendices that the holder has chosen to apply to the FCM.

CIVIL AVIATION PUBLICATIONS

3 Operator obligations – fitness for duty

3.1 Selecting suitable sleeping accommodation for off-duty periods

- 3.1.1 Operators should be mindful of the requirement for FCMs to have prior sleep opportunity before undertaking a FDP or standby. This sleep opportunity must be at suitable sleeping accommodation. This may be at home or at another sleeping facility (e.g. a hotel).
- 3.1.2 Sleep quality (its restorative value) depends on going through unbroken sleep [non- rapid eye movement [NON-REM] / REM] cycles. The more sleep is fragmented by waking up; the less restorative value sleep has in terms of how people feel and function when they wake up the next day. Operators should consider procedures that minimise interruptions to FCMs' sleep. Off-duty periods (ODPs) / Rest Period should include defined blocks of time (sleep opportunities), during which FCMs are not contacted. All relevant personnel (e.g. crew rostering personnel) should be aware of these protected sleep opportunities. Operators should also develop procedures to protect FCMs' sleep at layover facilities.
- 3.1.3 The physical ergonomics of sleeping and resting facilities should be taken into account, in order to ensure the staff can obtain suitable recovery (from fatigue) and be fit for the next duty. It is suggested that operators consider the work ergonomic factors, as well as the facilities available in the rest/sleep area, when managing fatigue in operations.

3.2 Location of sleeping accommodation

- 3.2.1 Operators should carefully consider and manage how the location of sleeping accommodation may affect sleep quality. When considering a location for suitability, operators should consider the following factors:
- travel distance to and from the facility
 - transport options
 - potential interruptions/disruptions
 - phone calls
 - cleaning
 - room service
 - maintenance work
 - temperature control
 - crew sharing options
 - lighting control
 - social cues (e.g. local meal times, arrival/departure times of other guests)
 - security at each location.
- 3.2.2 Operators should also consider how the resting / sleeping facility location may interact with time zones and time zone changes from where the last duty ended to where the next duty will commence. For example, having layover accommodation an hour away from the sign-on base could:
- place it in a different time zone
 - impact on social cues around meal times and sleep/awakening times
 - require FCMs to adjust accordingly to the local time.

CIVIL AVIATION PUBLICATIONS

- 3.2.3 The difference between needing to wake at 0500 hours or 0600 hours may be the difference between the effects of the window of circadian low (WOCL) impacting on performance throughout the day or not.

3.3 Acclimatisation

- 3.3.1 ‘Acclimatisation’ is a complex issue. While ANTR OPS 1; Subpart-Q defines acclimatisation, specifically when an FCM is considered to be in an unknown state of acclimatisation and the method to become reacclimatised, it is important that operators understand how the impact of crossing time zones and how time-zone adaptation can be individualised.

- 3.3.2 For the purpose of the requirement pertaining to fatigue management for FCMs, ‘acclimatisation’ is a formal term applicable to Commercial Air Transport operators. Whether an FCM is in a known state of acclimatisation, or an unknown state of acclimatisation, determines the maximum FDP and minimum ODPs / Rest Period for an FCM.

- 3.3.3 Generally, the responsibility for managing the effects of time zone changes and acclimatisation may be shared between the operator and the FCM. The operator should provide adequate fatigue training, as well as tools for staff to use when assessing their own alertness.

Note: The operator must not require an FCM to commence a duty when they are not fit for that duty.

- 3.3.4 The FCM has an obligation to apply this training to their situation when deciding their fitness for duty. FCMs should report to their operator when they feel unfit for duty after crossing time zones. The operator can then use these reports to assess whether their limitations and fatigue policies are adequate. Even though the applicable limitations and policies may be in accordance with ANTR OPS 1; Subpart-Q, the operator must consider the particular operational characteristics in order to ensure, as far as possible, FCMs are fit for duty.

- 3.3.5 Appendix D to this CAP provides various examples for determining an FCM’s state of acclimatisation for the purposes of ANTR OPS 1; Subpart-Q. These scenarios should be considered as guidance only, and may not guarantee that an FCM is actually acclimatised, or in an unknown state of acclimatisation, as described.

3.4 Augmented crew

- 3.4.1 Augmented crew refers to a flight crew comprising more than the minimum number of FCMs required to operate the aircraft as per the Flight Manual and to allow 1 or more FCMs to be relieved of duties during flight time.

- 3.4.2 Augmenting the crew is a strategy that operators can use to assist with managing crew alertness. With appropriate procedures in the operator’s operations manual, and appropriate on-board resting facilities, crew can rotate in-flight rest times and utilise

CIVIL AVIATION PUBLICATIONS

facilities to manage their alertness, and mitigate against the effects of fatigue. When developing procedures operators should consider:

- designating a pilot responsible for making command decisions at all times when the pilot-in-command (PIC) is utilising in-flight rest
 - a requirement for a comprehensive briefing prior to FCMs rotating through in-flight rest
 - direction to crew that the in-flight rest requirements do not take priority over the need to optimise the crew experience levels on the flight deck for managing unplanned operational threats.
- 3.4.3 Sleep inertia defines a period of transitory hypo-vigilance, confusion, disorientation of behaviour and impaired cognitive and sensory-motor performance that immediately follows awakening. There are various studies that have described the effects of sleep inertia on performance, particularly when awakening from deep sleep.¹ Operators and FCMs should be aware of, and manage, the effect of sleep inertia in flight operations.
- 3.4.4 It is important that operators are aware of, and consider, individual variability in alertness and circadian (time zone/body clock) adjustment when using augmented crews.
- 3.4.5 FCMs have different sleep needs and different performance effects from countermeasures (e.g. caffeine) each of which should be taken into consideration. Additional crew will still become fatigued even when they are not in an operational role. Operators need to ensure that FCMs receive training regarding the appropriate use of augmented crews and in-flight crew rest facilities.
- 3.4.6 ANTR OPS 1; Subpart - Q stipulates the minimum time an FCM requires the in-flight crew rest facility to be available; however, these times are only minimums and adequate alertness may require a substantially longer time be available to gain adequate in-flight rest/sleep. As a guide, the augmented crew FDP limits in ANTR OPS 1; Subpart - Q assume that the majority of the FDP is flight time and the available rest/sleep time (cruise phase) is fully utilised and is reasonably evenly distributed amongst FCMs. The number of sectors is limited so that an augmented crew operation is only undertaken in FDPs containing sufficiently long sector lengths to allow adequate time for rest/sleep.
- 3.4.7 In-flight rest facilities need careful design and consideration in order to permit adequate rest and sleep for crew. Classes of in-flight crew rest facilities are defined in ANTR OPS 1; Subpart - Q. When determining appropriate rest facility specifications, the following factors should be taken into account:
- relief from postural constraints of the work (e.g. prolonged periods strapped to a flight seat)
 - noise
 - physical configurations
 - locations
 - privacy needs
 - lighting
 - vibration

CIVIL AVIATION PUBLICATIONS

- micro-climate (air flow, ventilation, temperature, temperature gradient, humidity)
- hygiene (avoidance of pathogens, shielding)
- communications
- restraint mechanisms
- access
- evacuation procedures
- requirements for emergency equipment.

3.5 Fatigue occurrence reporting

3.5.1 The willingness of FCMs to participate in fatigue occurrence reporting will reflect their level of understanding of their roles and responsibilities in relation to fatigue risk management and their confidence that the purpose of the data collection is to improve safety. An effective fatigue reporting system requires an open and fair reporting culture. It needs to:

- use forms that are easy to access, complete and submit
- have clearly understood rules about confidentiality of reported information
- have clearly understandable voluntary reporting protections
- include regular analysis of the reports
- provide regular feedback to crew members about decisions or actions taken based on the reports and lessons learned.

3.5.2 A fatigue report form (either paper-based or electronic) should include information on:

- recent sleep
- duty history (the minimum should be the last three days)
- time of day of the event
- measurement of different aspects of fatigue-related impairment (for example, validated alertness or sleepiness scales).

3.5.3 The report should also provide space for written commentary so that the person reporting can explain the context of the event and give their view of why it happened. An example of a fatigue occurrence report form can be found in Appendix E to this CAP.

3.5.4 Management should encourage crew members to complete and submit a fatigue occurrence report in the following instances:

- Through the voluntary reporting system when an FDP has not commenced or is not completed, due to fatigue (either entirely or in part). This includes when the FDP is completed but only after some mitigating action. For example:
 - adding an extra crew member
 - reducing the workload of the duty
 - delaying the reporting time
 - creating the opportunity for a nap
 - increasing supervision/monitoring.
- Through the voluntary reporting system following an FDP, if the FCM believes (upon reflection) that the level of fatigue they, or other crew members, were suffering meant



CIVIL AVIATION PUBLICATIONS

- sufficient safety margins had not been maintained throughout the flight(s).
- Through the voluntary reporting system, when the FCM notices something in their operating environment that is likely to impact on their, or other crew members', alertness to such an extent that safety margins could be reduced to unsatisfactory levels.
 - Through the occurrence reporting system, when an incident or event has occurred where fatigue may, or may not, have been a contributing safety factor. To enable this, it is preferable for there to be a fatigue reporting facility or prompt on the operator's occurrence reporting mechanism. In these instances, it is advisable to provide a 72 hour sleep history.

CIVIL AVIATION PUBLICATIONS

4 Operator obligations

4.5 Setting limitations

- 4.1.1 An operator's operations manual needs to document the limitations applicable to all FCMs. These limitations must not exceed those contained in the requirement at ANTR OPS 1; Subpart-Q.
- 4.1.2 BCAA will not accept an operations manual that simply refers to the limitations contained in ANTR OPS 1; Subpart-Q. The operations manual must explicitly specify the limitations applicable to the operator's FCMs; these become 'hard' limits. This requirement allows all FCMs to be aware of their limitations.
- 4.1.3 Fatigue risk may not be sufficiently managed by relying entirely on limiting the hours of duty and commensurately providing for minimum length ODPs / Rest Period. After the application of these limits, there may be further need for an operator to control fatigue risk due to such things as:
- individual variability
 - operational environment
 - workload (amongst other factors).
- 4.1.4 An operator choosing to operate in Tier 2 scheme must have hazard identification processes in place that are then used to determine operator-specific limitations as well as any other controls.
- 4.1.5 For transparency, if an operator has no intention to conduct certain operations available under an applicable scheme, the operator should include a statement in their operations manual acknowledging this. For example, if an operator conducting operations under Commercial Air Transport with Multi Pilot Operation does not have any intention to conduct augmented crew operations; this should be stated in their operations manual.

4.2 Record keeping

- 4.2.1 In accordance with the operator obligations in ANTR OPS 1; Subpart-Q, an operator must maintain records in relation to FCM rosters, actual duty times and flight times (including reports of instances where an FDP is extended under an 'extension' provision).
- 4.2.2 These records and reports must be retained for five years. Operators must maintain records of the duration of all duty periods performed by an FCM, such as any task that an FCM is required, by an operator, to carry out associated with the business of the operator (this includes desk duties).
- 4.2.3 Where an extension provision is used that exceeds a 'hard' limit contained in the operator's operations manual, a report must be completed by the operator (refer to Appendix E to this CAP for an example of a fatigue occurrence report). The purpose of these reports is to facilitate identification of fatigue hazards and the improvement in an operator's fatigue management policies (i.e. limitations). There must be sufficient detail



CIVIL AVIATION PUBLICATIONS

in the report to enable it to be used effectively for this purpose.

- 4.2.4 The reports must be provided to BCAA upon request. BCAA inspectors may review these reports and may follow up on how these are being used to provide for continuous improvement of the operator's fatigue management policies.

4.3 Extensions due to unforeseen operational circumstances

- 4.3.1 For all commercial operations (excluding the, aerial work operators and in some circumstances commercial operator with single pilot operation), extensions beyond FDP limits may only be made in unforeseen operational circumstances, and should not be made on a regular basis. The intention behind the use of the term 'unforeseen circumstances' is to prevent operators continually rostering flight and duty times to their maximum limits and regularly relying on extensions to achieve their operational goals. As well as operational experience, hazard identification and risk assessments can be utilised to foresee potential disruptions or delays.
- 4.3.2 Extensions should only occur in less than 5 % in any sample of similar FDPs or similar operations. The sample of FDPs should be based on capturing a common root cause for the extension. For example, if an airport turn-around time is programmed for 45 minutes, however, it takes 1 hour and 15 minutes in one third of cases, relying on a 45 minute turnaround when rostering an FCM for a FDP that is at or close to the maximum is not appropriate.
- 4.3.3 Where an operator experiences extensions in more than 5% of the sample, the operator should consider revising its rostering practices by creating or amending documented rostering rules both for developing a roster and for day-of-operations management that provide greater assurance that the flight and duty time limits prescribed in the operator's operations manual will reliably not be exceeded.
- 4.3.4 For a Tier 2 scheme operator to meet their obligations, the reports on extensions should be fed into their hazard identification and continuous monitoring processes.

4.4 Determination of home base

- 4.4.1 An operator is required to determine and notify each of its FCMs of their 'home base'.
- 4.4.2 Details of the process for making these home base determinations must be set out in the operator's operations manual. This allows FCMs to understand the procedures associated with these determinations (i.e. time available to move locations, if necessary).
- 4.4.3 Operators must ensure that changes in home base will not adversely affect aviation safety. Careful consideration of what an FCM may need to do as a result of a change in home base and subsequent recovery is necessary.
- 4.4.4 Determinations of home base should be assigned with a degree of permanence so as to not disrupt an FCM's fatigue recovery routines between duties.



CIVIL AVIATION PUBLICATIONS

4.5 Meals

- 4.5.1 Operators are required to provide an opportunity for FCMs to consume meals throughout an FDP at intervals of not more than 5 hours. Opportunities to consume a meal—food and drink—are required in order to avoid any detriment to an FCM’s performance.
- 4.5.2 An operator should attempt to schedule meals alongside a break during the FDP. Evidence suggests that a break of 30 minutes during a duty period (during which a meal can be consumed) has a significant positive effect on an FCM’s cognitive performance for an extended period following the break.
- 4.5.3 During long sectors, it is reasonable for the FCMs to consume a meal during the cruise. Operators should consider procedures that ensure that the safety of flight is not compromised if meals are consumed during flight.

4.6 Publishing of rosters

- 4.6.1 Publishing duty rosters allows FCMs to plan adequate rest before their next assigned duty. Operators should be aware that their FCMs will require some degree of certainty in organising their work/life balance and, more importantly from a fatigue management point-of-view, organising sleep.
- 4.6.2 It is important that operators publish the roster sufficiently in advance of the flights covered by the roster to allow the FCMs to organise their work/life balance, adequate sleep, and other aspects of personal life. Rosters should also be published with a consistent lead time that is communicated to all FCMs.
- 4.6.3 As a guide, the minimum notification period should be between 14 and 30 days when an FCM is rostered for FDPs that:
- involve augmented crew operations;
 - cross two or more time zones;
 - include two or more late night operations; or
 - include split-duty rest periods.
- Include FCM reserve
- 4.6.4 For *ad hoc* operations, particularly those where FCMs are employed on a casual basis, there may be little opportunity to provide notice of an upcoming FDP. Unless the FDP is going to be quite short, an operator should have in place procedures that involve offering an available FDP to a casual FCM at least the day before it is to take place. These procedures should therefore allow the casual FCM, prior to accepting the FDP, to consider their fitness for duty and whether or not they will be able to ensure adequate rest prior to it. As a guide, for an FDP to be considered quite short it would not exceed 50% of the FDP limit for the applicable start time. In addition, if there is any increase to the FDP limit via the use of augmented crew or a split-duty rest period then the notification period need to be increased appropriately.
- 4.6.5 Whilst late changes to rosters are understandable, it is important that these changes are

CIVIL AVIATION PUBLICATIONS

kept to a minimum. It is recommended to maintain the roster stability to 80% minimum. It is necessary to have procedures in place so that any fatigue risk resulting from the effects of late roster changes is managed. This is particularly important for augmented crew operations and the subsequent in-flight rest planning.

4.7 Delayed reporting time

- 4.7.1 There are provisions in ANTR OPS 1; Subpart-Q that provide for delaying an FCM's reporting time. Delaying a reporting time can result in extended periods of wakefulness and, if not managed properly, has the potential to impact on fatigue risk. If the operator becomes aware of circumstances that necessitate a delay to the FCM's reporting time for a FDP in the time preceding the commencement of a rostered FDP, then it is reasonable that the FDP be delayed.
- 4.7.2 Depending on the length of the delay, there can be an increase in fatigue risk that may impact on the safety of a flight following that delay. Operators must have procedures that address this potential for increased fatigue risk and ensure safeguards are in place to mitigate any increased risk.
- 4.7.3 The delayed reporting time provisions divide the possible delays into three main brackets:
- less than 4 hours
 - 4 hours or more, but less than 10 hours
 - 10 hours or more.
- Specific guidance on application of the delayed reporting requirements can be found in section B.5 to Appendix B of this CAP.
- 4.7.4 For delays less than 4 hours, the assumption is that the FCM may be able to rest; however, it is unlikely they will be able to return to sleep. The maximum FDP limit that the FCM cannot exceed remains the one determined for the original reporting time, and it is not permitted for the maximum FDP limit to be increased as a result of the delay. The reasoning behind this is that the FCM did not have an opportunity to organise their awakening time to suit the later reporting time and they will likely remain awake during the period of the delay.
- 4.7.5 In contrast, if the delayed reporting time results in a lower maximum FDP limit, this becomes the limiting maximum FDP limit, as this means the delay has resulted in a start time for which the maximum FDP is beginning to encroach on the WOCL.
- 4.7.6 For delays between 4 and 10 hours, there is an additional requirement that the maximum FDP determined for the 4 hour mark is then reduced by the amount of time that the resulting total delayed reporting time exceeds 4 hours. This linear reduction reflects the expectation that the FCM has already completed 8 hours of sleep and will not be able to return to sleep during the delay, and the FCM will therefore be awake for a significant period before they commence the delayed FDP.
- 4.7.7 For delays greater than 10 hours, it is considered that the FCM will have an opportunity to rest and sleep (where possible) throughout this period, and so adequately prepare for the resulting FDP commencing at the delayed reporting time. As it is possible that a delay of 10



CIVIL AVIATION PUBLICATIONS

hours or more may lead to significant circadian disruption for some FCMs, it is advised that operations manual procedures require both operators and FCMs to carefully assess the fatigue risks associated with the new FDP.

- 4.7.8 For an operator to implement delays of less than 10 hours, it is necessary for the operations manual procedures to address the requirements. These required procedures must be familiar to FCMs and be capable of providing a consistent application of delayed reporting procedures that meet the prescriptive limits. In developing operations manual procedures, an operator should consider matters such as contact/delay notification protocols at home base and away from home base, and paying particular attention to protecting and not interrupting a FCMs' sleep opportunity.

CIVIL AVIATION PUBLICATIONS

5 Additional obligations relating to FCMs operating under Commercial Air Transport – Multi Pilot Operation

5.1 Tier 2 scheme operators

5.1.1 Operators who choose to operate under Tier 2 scheme are subject to additional obligations. These include:

- hazard identification procedures
- procedures for the establishment of limitations (taking into account hazards)
- procedures which provide for continuous monitoring and evaluation, with a view to improving the operator's limitations, policies and practices (refer to Appendix F to this CAP for an example of how continuous monitoring procedures can be used in practice to satisfy the obligations)
- training for FCMs.

5.1.2 Operators with an effective Safety Management System (SMS) will be familiar with these processes, and an SMS will most likely enable compliance with the hazard identification and continuous monitoring obligations.

5.2 Hazard identification (including use of biomathematical models)

5.2.1 As with all risk management, hazards related to human fatigue and alertness need to be identified, safety risks need to be assessed and risks need to be managed (e.g. putting in place controls and mitigation strategies). This is consistent with International Organization for Standardization (ISO) 31000:2009 – Risk management – Principles and guidelines.

5.2.2 Hazard identification needs to be done with formalised processes, which may include:

- hazard identification workshops (i.e. group brainstorming)
- risk assessments (i.e. formal risk assessments can uncover new hazards)
- hazard reporting
- hazard logging in registers (e.g. through electronic systems).

5.2.3 Hazards can combine in unforeseeable ways, so that even apparently trivial hazards can result in undesirable outcomes, which may combine with other hazards to result in a catastrophe.

5.2.4 The methods for hazard identification should be commensurate with the proposed extent of the limits in the applicable appendices. If the proposed limits in the operations manual are at or near the limits in the applicable appendices, BCAA expects that the operator would have reactive, proactive, and even predictive hazard identification processes in place to ensure fatigue risk is managed properly.

5.2.5 Hazards can be identified from a range of sources including, but not limited to:

- brain-storming using experienced operational personnel
- development of risk scenarios
- trend analysis

CIVIL AVIATION PUBLICATIONS

- fatigue reports
- feedback from training
- safety surveys and operational oversight safety audits
- monitoring of normal operations
- use of appropriately validated biomathematical models
- State investigation of accidents and serious incidents
- information exchange systems (similar operators, regulators etc.).

5.2.6 Over time, the database of reported hazards enables the organisation to:

- identify 'hot spots' of fatigue risk that need particular attention
- conduct trend analysis that can provide the basis for improvement of hazard identification.

5.2.7 FCMs have an obligation to disclose, to their operator(s), anything affecting the FCM or connected with the FDP, which they have reason to believe, may affect their ability to meet the operator's fatigue risk management policies or limitations. Examples of such factors include:

- their living arrangements
- external employment
- private flying any other factor which may compromise their alertness during duty.

5.2.8 These factors should be considered in the same light as general operational-specific hazards. For example, where certain FCMs disclose that they live a long distance away from their home base, the additional time spent commuting to work is a hazard that could adversely affect their alertness towards the end of their duty, due to their increased hours of sustained wakefulness.

5.2.9 Hazards like this need to be dealt with in two main ways:

- when determining flight and duty time limitations
- provide for continuous improvement of policies and practices.

5.2.10 Biomathematical models of fatigue can assist operators in providing predictions of human fatigue and/or sleep opportunity factors that can be utilised as one, non-essential component of a fatigue management regime. A primary role of many models is to provide a strategic rostering support tool aimed at providing an initial validation for newly developed or modified rosters.

5.2.11 While not a necessary component, biomathematical models of fatigue can incorporate aspects of fatigue science into rostering practices through providing predictions of fatigue risk levels, performance levels, and/or optimum sleep times/opportunities. Biomathematical fatigue models have limitations that must be considered. Some limitations include:

- predicting risk probabilities for a population average rather than fatigue levels of a specific individual
- not taking into account the impact of workload or personal and work-related stressors that may affect fatigue levels

CIVIL AVIATION PUBLICATIONS

- incomplete description of all fatigue physiology factors
- limited testing (validation) against aviation specific data.

5.2.12 Because each model has different strengths and limitations, BCAA's recommended approach is to consider a range of predictive processes (including biomathematical models) to identify fatigue hazards. When using a biomathematical model, BCAA suggests the operator take a cautionary approach, which takes into account the model's limitations and validity in that particular operational context (i.e. whether it has been validated against fatigue data from operations similar to those the operator is interested in). When making decisions about roster design, model predictions should not be used without reference to operational experience.

5.2.13 It is recommended that the biomathematical models are compared for the properties, strengths and limitations of various fatigue models before adopting them. It is important to be cognisant that a fatigue management regime should be designed as a comprehensive, multi-layered system, in which biomathematical models provide an optional supportive role.

5.3 Setting limitations taking into account hazards

5.3.1 When determining flight and duty time limits, operators need to consider the unique needs of their operational environment and tailor the regulatory promulgated limitations accordingly. It is also important for operators to consider that their environment is likely to change over time. Consequently, any changes need to be appropriately risk assessed. The operator also needs to continually revisit, update and modify flight time and duty limits to ensure the relevancy to operations at the current time.

5.3.2 Operators should consider the consequences of organisational or operational changes on fatigue and crew performance. Where fatigue-related issues arise associated with changing operations (e.g. different routes); or introducing new operations, operators should consider further mitigations to manage fatigue and crew performance. To assess the risk of any change, a persuasive risk assessment should be conducted, which includes looking at the likelihood and consequences of fatigue risks associated with that change.

5.3.3 Documented risk assessments will be required by BCAA during surveillance activities, to demonstrate that changes have been properly considered.

5.3.4 The limits which are determined under this obligation become new 'hard' limits for the operator. This means that any exceedance of these limits must be in accordance with the extension provisions and only in unforeseen operational circumstances. Reports of these extensions must be made and provided to BCAA upon request.

5.3.5 Operators should take into account the impact on fatigue levels of training and checking requirements when designing and setting limits. Participating in a training exercise or training other individuals can contribute to a person's fatigue levels over and above what might otherwise be expected for other duties. This needs to be taken into account.

CIVIL AVIATION PUBLICATIONS

5.3.6 Training might be delivered in any of the following ways:

- classroom-based
- during flight operations (line training)
- at a training facility
- or
- in a flight simulator.

5.3.7 All types of training (in an aircraft, class-room or elsewhere) could potentially affect the alertness of FCMs and their subsequent operational performance. From a workload perspective, it is also possible that monitoring or training another FCM could be more fatiguing than regular operations. It is highly recommended that operators make an appropriate reduction to maximum FDP limits when the FDP includes a period of training.

5.3.8 Training flights in a simulator are considered duty, and must be included in an FDP if they are conducted prior to a flight and are not separated from that flight by a prior sleep opportunity. If the simulator training is conducted after the last flight in a duty period, it does not need to be included in the FDP. When planning any FCM training, the impact of the level of FCM fatigue on the quality of training should be considered and managed accordingly.

5.4 Continuous improvement of policies and practices

5.4.1 Operators need to monitor and evaluate the effectiveness of their fatigue management controls (such as policies and practices). Where controls are found to be inadequate or ineffective, the operator must address this as part of their continuous improvement requirements.

5.4.2 Policies and practices to consider include:

- scheduling and rostering practices
- layover accommodation conditions
- augmented crew procedures
- training syllabi
- use of alertness and vigilance tools [i.e. a psychomotor vigilance test (PVT) prior to commencing duty].

5.4.3 Smaller operator example – an operator, operating mostly during the very early morning, should consider their operational needs when considering policies, potentially including a means for systematically shifting subsequent start times an hour later each day in order to ensure FCMs whose awakening time infringes on their morning WOCL period can recover from the lower quality of sleep as the week progresses.

5.4.4 Larger operator example – a larger operator running long-haul routes across time zones internationally should have established policies for taking into account their operational needs when selecting and booking accommodation for FCMs. These accommodation venues should be able to meet policies addressing:

- noise management

CIVIL AVIATION PUBLICATIONS

- temperature control
- light-blocking facilities.

5.4.5 Where available, an operator should make use of their SMS for this process. For operators without an SMS, Appendix D to this CAP provides further examples of the types of hazards that may need to be addressed.

5.4.6 An operator's policies and practices should be reassessed for adequacy when there are adjustments of flight and duty time limitations.

5.5 Fatigue Training

5.5.1 Operators need to conduct fatigue training and assessment. To meet their obligations, operators should:

- allocate adequate resources for fatigue training (including trainers, materials and time)
- accept that the benefits of fatigue training will not be realised without ongoing investment and effort.

5.5.2 There are three main subject areas which form the substance of a typical fatigue training program (fatigue, sleep and countermeasures). The following is a list of topics that could be included in these subject areas:

- Fatigue:
 - o types of fatigue
 - o contributors to fatigue
 - o consequences of fatigue on safety
 - o fatigue in accidents
 - o high risk situations
- Sleep:
 - o sleep physiology
 - o circadian body clock
 - o the sleep process
 - o amount of sleep required
 - o sleep debt and recovery
 - o quality of sleep
 - o sleep disorders and individual differences
 - o shift work
 - o jet lag
- Countermeasures:
 - o managing sleep habits
 - o tailoring the sleep environment
 - o napping
 - o exercise
 - o nutrition and hydration
 - o caffeine

CIVIL AVIATION PUBLICATIONS

- avoidance of alcohol before bed
 - use of sleep aids
 - avoidance of nicotine
 - keeping a sleep log.
- 5.5.3 In addition to these generic fatigue management topics, operators should tailor their training programs to include relevant topics for their own operation. For example, during training, FCMs should be made aware of the operator's operations manual procedures, limits and operator and individual obligations.
- 5.5.4 Training must be conducted on an initial and recurrent basis. The interval between training should be determined by the operator, given their operational characteristics and training needs analysis. A training interval of not more than two years is recommended; however, where an operator identifies a need for training at closer intervals, this should be acted on.
- 5.5.5 The training required by regulation may be integrated with other training conducted by an operator (i.e. human factors/non-technical skills training).
- 5.5.6 Fatigue training must be assessed with the level of training determining the level of assessment required.
- 5.5.7 A primary goal of assessment is to determine to what extent those participating in the training program are learning. Different phases of training (awareness, knowledge and skills) will entail different forms of assessment. Assessment techniques for awareness and knowledge phases of training programs are well founded.
- 5.5.8 Another goal of assessment is to act as a feedback mechanism to permit adaptive changes to training content and methods of instruction. The diagnostic use of assessment to provide feedback to instructors and students during a program of instruction is known as formative assessment.
- 5.5.9 The other main form of assessment (referred to as summative assessment) traditionally uses a behavioural test or written paper after a specified period of training to enable judgements about what level of learning has occurred.
- 5.5.10 Both formative and summative assessment can be used to make adjustments to the practise and design of training (i.e. reteaching, implementing alternative instructional approaches, and adding extra opportunities for practice).
- 5.5.11 Assessment criteria should be drawn from the initial training needs analysis. Training personnel are encouraged to use their experience to develop assessment criteria tailored to their particular operation. BCAA has published a Fatigue Management Toolkit on its website that includes material that may be useful in developing and facilitating a fatigue management training course. (Refer to the list of references in section 1.3 of this CAP).

CIVIL AVIATION PUBLICATIONS

6 Individual obligations – fitness for duty – individual cognitive and physical fitness

6.1 Individual alertness measurement

6.1.1 Determining fitness for duty has always been a complex and challenging task, both for operators who should provide training to employees in understanding how to meet their responsibilities, and for the employees themselves.

6.1.2 A multi-method approach proves particularly useful, given that substantial fatigue research has demonstrated that humans are quite poor at determining how fatigued they actually are. The most ideal approach to measure an individual's true alertness level is to combine information from a range of sources. While no one tool or method may be free of limitations in measurement, obtaining information from a variety of sources is more likely to provide the individual with more accurate picture upon which to make their decisions regarding alertness. For example, instead of relying only on their subjective assessment of how fatigued they feel, they could support this assessment by using a scale suggested in ICAO DOC 9966 (Edition 2, 2016) such as the Samn-Perelli scale (SPS) or The Karolinska Sleepiness Scale (KSS) or Visual analogue scales (VAS) and additionally, improve the accuracy of this assessment of their alertness by considering one or more of the following potential sources of information:

- their sleep history, particularly if they have kept a personal sleep diary
- monitoring behavioural/cognitive/emotional indicators (e.g. drooping eyelids, slower information processing time, negative mood)
- considering their responses to important factors relevant to fatigue (e.g. sleep length, sleep quality, sleep environment, time zones crossed)
- completing a short handheld Psychomotor Vigilance Test (PVT)
- examining scores from sleep monitoring tools.

6.1.3 Using a range of measures of varying types (i.e. both objective and subjective data) to determine an overall alertness 'picture' will assist the FCM in making informed and accurate decisions about managing their fatigue and whether they are operationally fit for work.

6.1.4 It is also important to recognise that FCMs who are fatigued will have impaired decision-making (e.g. about their alertness scores) and they will have poorer judgment in terms of how fatigued they are and whether they are actually fit for duty. This is because problem-solving and decision-making capability is reduced when suffering from fatigue. Operationally, this may mean that fatigued FCMs making an assessment about their fitness for duty may misread test scores or administer measurement tools incorrectly.

6.1.5 Communication about the extent of their fatigue impairment may also not be effective when trying to manage the situation. As creativity (along with problem-solving) is also reduced when suffering from fatigue, an FCM will also be less likely to:

- determine effective ways of managing their fatigue
- address alertness issues in general

CIVIL AVIATION PUBLICATIONS

- be able to identify potential risks and hazards.
- 6.1.6 To manage poorer judgment and decision-making, BCAA recommends involving a non-fatigued individual along with multiple methods of measuring alertness to assist the FCM in assessing fitness for flight.
- 6.1.7 Important factors that provide information when determining fitness for duty are the measurement of:
- sleep history
 - changes to circadian rhythms
 - operational risk
 - the time of proposed operation.
- 6.1.8 Appendix E to this CAP provides an example of a useful method of tool for an individual to consider factors affecting their fitness for duty. The intention of this particular example tool is that it is used in a proactive manner to assist an FCM who thinks they present a fatigue risk, but are unsure if they should start duty, or are unsure for how long a period of reasonable alertness will likely continue for them. The tool in Appendix G to this CAP has been developed to support them when making decisions of fitness for flight.
- 6.1.9 It is important for operators and employees to understand that the tool in Appendix G is not meant to provide a ‘go or no-go’ outcome. There will also be situations when FCMs need to commence operations and manage their fatigue risk through the use of other countermeasures (i.e. task rotation or napping).
- 6.1.10 It is important to understand that this tool is only one example of a decision-making aid when determining fitness for duty. Operators or FCMs themselves may utilise other methods/tools for determining fitness for duty; however, the most optimal methods will have established validity and be usable in operations. Managing fatigue needs to be specific to the operational risk context.

6.2 Fatigue occurrence reporting

- 6.2.1 Operators’ hazard identification obligations are reliant on FCMs reporting when they believe fatigue led to a reduction in safety margins, or would have led to a reduction in safety margins had some mitigating action not been taken. It should be stressed that operators must make every effort through fatigue training to highlight the importance of accurate voluntary reporting. Broadly speaking, there are four instances when fatigue reporting is essential for effective hazard identification (refer to Appendix E to this CAP for an example of a fatigue occurrence report):
- Through the operator’s fatigue reporting system, when an FDP has not commenced or is not completed due to fatigue (entirely or in part). This includes when the FDP is completed, but only after some mitigating action, for example:
 - adding an extra crew member
 - reducing the workload of the duty
 - delaying the reporting time

CIVIL AVIATION PUBLICATIONS

- creating the opportunity for a nap
- increasing supervision/monitoring.
- Through the operator's fatigue reporting system, following an FDP if the FCM believes, on reflection, that the level of fatigue they or other crew members were suffering meant sufficient safety margins had not been maintained throughout the flight(s).
- Through the operator's fatigue reporting system, when the FCM notices something in their operating environment that is likely to impact on their, or other crew members', alertness to such an extent that safety margins could be reduced to unsatisfactory levels.
- Through the operator's occurrence reporting system (if they have an SMS), when an incident or event has occurred where fatigue may, or may not, have been a contributing safety factor. To enable this, it is preferable for there to be a fatigue reporting facility or prompt on the operator's occurrence reporting mechanism. In these instances, it is advisable to provide a 72 hour sleep history.

6.3 Health and well-being

6.3.1 The FCM should monitor and seek appropriate treatment for their health and general well-being, as physical health can impact on fatigue. Health and well-being includes:

- short-term (acute) and chronic health conditions
- genetic predispositions
- nutrition
- hydration
- sleep difficulties (a wide range of sleep difficulties can affect fatigue, circadian functions, sleep quantity and sleep quality).

Note: There are a diversity of sleep disorders from a psychological perspective, which may be found in various publications in Classification of Sleep Disorders diagnostic and coding.

6.3.2 Sleep disorders range in severity from occasional and inconvenient (e.g. jet lag when on holiday) to chronic and potentially life-threatening (e.g. obstructive sleep apnoea syndrome). When managing fatigue, employees have a duty of care to monitor and manage any health concerns that may impact on their fitness for duty, which may include contacting a medical specialist. FCMs should be cognisant that sleep difficulties may exist or may develop in the future and that these should be treated accordingly, so they do not impact upon the safety of aviation operations.

6.4 Workload

6.4.1 One of the major topics when considering human factors and human performance in aviation systems is workload management. While various conceptualisations of workload exist, mental workload can be defined as a function of the environmental demands placed on the FCM and the capabilities of the FCM to meet those demands.

CIVIL AVIATION PUBLICATIONS

6.4.2 Workload management for the FCM requires consideration of:

- demands on attention
- processing capacity
- dual-tasks (multitasking)
- how mental resources are being allocated.

6.4.3 While workload management itself is important when minimising the risk of human error, it is also likely that workload and the nature of the tasks performed affect how fatigued the FCM will become. To date, few studies have considered how workload influences alertness (or vice versa); however, their interaction is likely to require consideration and management.

6.4.4 Typical techniques for managing workload while on duty include:

- task shedding
- prioritisation of tasks
- task delegation
- task rotation
- personnel rotation.

6.4.5 It is also important to be cognisant of a person's optimal level of stress or arousal necessary for optimal performance to:

- acknowledge the advantages of stress and engagement in a task
- have realistic attitudes towards stress – understanding that different people react differently to stressful situations (e.g. emergencies)
- use effective communication with colleagues
- monitor and observe any behaviours that may indicate a change to a person's workload level (e.g. gripping the controls tightly, fixation on the artificial horizon, tunnel focusing on a display screen).

6.4.6 Workload is also an increasingly important factor for biomathematical models of performance prediction. Although determining the degree to which this factor (the variance) might impact on alertness (in addition to factors such as shift length, timing or pattern) requires further research. Several fatigue biomathematical models on the market are currently investigating and incorporating the effects of workload on alertness in their suite of predictive variables.

6.4.7 Overall, existing data suggests that the relationships between workload, performance and subjective fatigue are likely to be complex and that further research is desirable. For aviation personnel, it is important to consider and manage the effects of workload and fatigue individually when managing risk, as well as the interacting relationship that may be present between them.

6.5 Fatigue mitigating strategies

6.5.1 An FCM can manage fatigue before, during and after work shifts by employing a range of



CIVIL AVIATION PUBLICATIONS

fatigue mitigation strategies that work for their personal sleep needs. It is helpful to establish effective sleep habits, such as:

- scheduling sleep
- trying a quiet activity before bed
- establishing a bedtime routine
- not eating or drinking too much
- getting out of bed if they cannot sleep
- using relaxation techniques
- having a comfortable bed
- it is also important that the sleep environment is conducive to rest, specifically that it has a cool temperature, is dark and quiet.

6.5.2 One of the most effective fatigue countermeasures is napping; however, it is important to remember that napping should not be considered as an alternative to a regular night's sleep. Napping can be useful when supplementing too little or poor quality sleep and just 15-20 minutes can increase performance and alertness temporarily. Care should be taken when planning napping, as napping for greater than periods of approximately 45 minutes can result in greater sleep inertia.

6.5.3 Exercise is also a beneficial fatigue risk mitigator, as it improves energy and stamina, improves mood, relieves stress and results in longer and more restful sleep.

6.5.4 Adequate nutrition and hydration is also important for managing and preventing fatigue. Ideally, the FCM should:

- have a balanced diet
- eat regularly
- have healthy snacks
- eat breakfast
- plan meals
- drink water regularly
- avoid late night meals (which result in slower digestion).

6.5.5 Another popular fatigue countermeasure is the use of caffeine as a stimulant. Caffeine can improve alertness temporarily, takes 15-30 minutes to take effect and can last for 5 hours; however, it is important to consider that there are individual differences in terms of the effects of caffeine, that tolerance and withdrawal can develop, and that use should be avoided before bedtime. Caffeine should be used when its affect will have the most impact (i.e. prior to flying, the descent and landing).

6.5.6 In order to increase sleep quality, alcohol should be avoided before bedtime. Sleep aids and medications should be treated with caution and used in consultation with a physician, as they can lead to drowsiness, confusion and forgetfulness. Nicotine should also be avoided, as it is a stimulant that can interfere with getting to (and remaining) asleep.

6.5.7 An ideal way for FCMs to keep track of their sleep quality or the effectiveness of used fatigue countermeasures, is to keep a sleep log or sleep diary. Research suggests that



CIVIL AVIATION PUBLICATIONS

people (including pilots) tend to overestimate the amount of sleep they are getting, so a daily log can assist with accurate recall. An example log/sleep diary could incorporate:

- time in bed
- time getting to sleep
- time of awakening
- mood upon awakening
- nutrition/alcohol consumption from the previous day
- sleep quality (e.g. number of awakenings during the night)
- the sleep environment (e.g. a comfortable bed, ventilation, lighting).

6.6 Sleep

- 6.6.1 An FCM should utilise ODPs/ Rest Period to ensure fitness for their next rostered duty period or standby time. This is both for recovery from time awake/fatigue and to ensure they are sufficiently rested for any future duty periods. If adequate sleep cannot be obtained, the FCM would need to report this to the operator before any duty periods commence.
- 6.6.2 It is likely that to meet their obligations, an FCM would be required to have suitable sleeping accommodation/conditions at home and also have access to suitable sleeping accommodation/conditions when they are away from home, due to duty requirements. CAO 48.1 also recommends sleep opportunity and the availability of suitable sleeping accommodation, at these times.
- 6.6.3 The sleep environment should allow for an adequate sleep period with defined blocks of time during which FCMs are not interrupted. The ergonomics of rest areas should be considered, as they can have a large influence on fatigue while working, and the quality and quantity of restorative rest. This includes an environment that is cool, dark and quiet and provides relief from postural constraints of the work (e.g. prolonged periods strapped to a flight seat), noise and other environmental factors.
- 6.6.4 Appropriate accommodation should consider the following factors:
- noise
 - physical configurations
 - locations
 - privacy needs
 - lighting
 - vibration
 - micro-climate (air flow, ventilation, temperature, temperature gradient, humidity)
 - hygiene.
- 6.6.5 It is also suggested that FCMs consider their personal ergonomic and environmental needs/requirements when determining suitable sleeping accommodation/conditions at home.



CIVIL AVIATION PUBLICATIONS

6.7 Time zones and acclimatisation

- 6.7.1 The responsibility for managing the effects of time zone changes and acclimatisation is shared between the operator and the FCM. The operator should provide adequate fatigue training, as well as tools for staff to use when assessing their own alertness.
- 6.7.2 The FCM has an obligation to then apply this to their situation when deciding their fitness for duty. FCMs should be cognisant of their personal time zone adaptation requirements. These may differ from what requirement specifies. Where an FCM feels that they are not fit for duty following an off-duty period after crossing time zones, this should be reported to the operator so that the operator can determine whether their limitations and fatigue policies are adequate.

6.8 Augmented crew

- 6.8.1 With appropriate in-flight resting facilities, crew can rotate rest times and share facilities to manage their fatigue. It is important that crews consider that with an augmented crew, there will be variability in terms of alertness and circadian (i.e. time zone/body clock) adjustment among FCMs. Additionally, they will all have different sleep needs and different performance effects from countermeasures (e.g. caffeine). When utilising in-flight rest facilities, an FCM should do so intelligently, rather than doing something potentially stressful (e.g. a university assignment), the FCM should make use of the time to relax and attempt to sleep.
- 6.8.2 There are various studies which look at the effects of sleep inertia on performance, particularly when awakening from deep sleep. Operators and FCMs should be aware of and manage the effect of sleep inertia in flight operations.

CIVIL AVIATION PUBLICATIONS

7 Individual obligations – disclosure to an operator

7.1 Living arrangements – distance from base

7.1.1 FCMs should consider how their living arrangements and travel time to work may affect their fatigue levels. Any potentially problematic conditions need to be disclosed to the operator if it is having, or is likely to have, an impact on operational performance.

7.1.2 As an FCM's living arrangements may change throughout their lifespan, these changes should also be considered in the context of whether it may have an impact on fatigue levels and subsequent operational performance. For example, living situations that may have a resulting impact on a person's fatigue levels include:

- having shared or alternating living locations
- long and variable commute times (e.g. due to distance and traffic congestion)
- personal and work-related relocation decisions
- noisy living environments/disruptions to home resting areas (e.g. council/road works, neighbourhood construction/renovations, care requirements for babies/children, traffic noise, non-soundproof walls)
- overly well-lit living environments/resting areas (e.g. bright city lighting, inadequate light coverings during allocated daytime rest periods).

7.1.3 FCMs may find that certain unique living situations can improve alertness and minimise the risk of fatigue. In some instances, it may be beneficial to live further away from a departure base, rather than closer. An example is where the departure base is continually noisy or overly lit during sleep/rest periods or night time. FCMs should give sufficient contextual consideration to their living arrangements and changes to their living arrangements in relation to any impact it may have on fatigue. If potentially problematic situations arise, this needs to be disclosed to the operator.

7.2 External employment and other tasks

7.2.1 FCMs have an obligation to manage any external employment activities to ensure that they do not impact on their fatigue levels during operations. External activities such as:

- home duties
- leisure duties
- family duties
- volunteering work conducted outside of work hours.

7.2.2 With external employment and other tasks, the employee should consider any potentially adverse effects on operational safety from a fatigue perspective and disclose any potentially problematic situations to the operator. Examples of external tasks which may affect fatigue levels include:

- night flying work
- shift work
- running a business
- child minding responsibilities

CIVIL AVIATION PUBLICATIONS

- physically labouring tasks
- study/education
- driving.

7.3 Private flying

7.3.1 An FCM, who undertakes private flying and acts as an FCM for an operator, may have an obligation to declare private flights. Private flying operations cover a wide range of activities. For the purposes of fatigue management these activities can be divided into two broad areas:

- recreational private operations
- non-recreational private operations.

7.3.2 A recreational private operation can be conducted by an FCM and there are no current limits (beyond personal limits) that may apply. In the normal course of events where an FCM does some recreational private flying on a day off, there may be no need for the FCM to disclose this; however, the FCM must be mindful of operators' policies to fatigue and recreational flying.

7.3.3 There are individuals who undertake private flying that is not considered recreational (i.e. paid work, ferry flights, flight testing and conversion training).

7.3.4 These operations are seen as more difficult to cancel or reschedule and generally involve more planning and operational complexity than traditional recreational flight. They may have an effect on a subsequent FDP for the pilot who is also employed by an operator. There are no limits, except personal ones that apply; however, once the FCM is rostered by an operator, these activities should be declared, as they will form part of cumulative flight time limits.

7.4 Open and fair reporting culture

7.4.1 In accordance with maintaining an open and fair reporting culture, FCMs need to disclose any situations, which are affecting, or may in the future affect, their alertness and compliance with Subpart-Q of ANTR OPS 1. Disclosure is also consistent with upholding best practice safety and risk management principles. FCMs have an obligation to contribute to this healthy safety culture and to maintain a strong reporting culture, which in turn enables the operator to manage risk predictively and proactively. Employees need to be able to disclose information and discuss factors with the operator that may affect fatigue and alertness in an open, communicative and confidential environment, without experiencing fear of penalty.

CIVIL AVIATION PUBLICATIONS

8 FATIGUE RISK MANAGEMENT SYSTEM (FRMS)

8.1 General

8.1.1 An AOC holder may apply to BCAA for:

- (a) a trial FRMS implementation approval, for all or part of its operations; or
- (b) a full FRMS implementation approval, for all or part of its operations.

Note An AOC holder is not eligible for a full implementation approval until the FRMS has been in effective operation for at least 6 months from the date of a trial implementation approval. See chapter 8.8.10.

8.1.2 For a trial or full FRMS implementation approval, an FRMS must include BCAA approval of each of the following elements of the FRMS:

- (a) the policy and objectives, and related documentation, in accordance with chapter 8.2;
- (b) the practical operating procedures in accordance with chapter 8.3;
- (c) the hazard identification, risk assessment and mitigation procedures in accordance with chapter 8.4;
- (d) the safety assurance procedures in accordance with chapter 8.5;
- (e) the safety promotion procedures in accordance with chapter 8.6;
- (f) the change management procedures in accordance with chapter 8.7.

Note 1 Some changes may require BCAA approval. See chapter 8.7.

Note 2 Guidance on the development and implementation of FRMS is contained in the *ICAO FRMS Implementation Guide for Operators*.

8.1.3 If the AOC holder has an SMS, a trial or full FRMS implementation approval will not be given unless BCAA is satisfied that the FRMS is integrated with the SMS.

8.1.4 Before BCAA issues a trial FRMS implementation approval, BCAA must be satisfied that the AOC holder's FRMS:

- (a) comprises all of the elements mentioned in subchapter 8.1.2; and
- (b) is a safe, integrated, data-driven, system which appears to be reasonably capable of continuously and effectively monitoring and managing fatigue-related safety risks using scientific principles and knowledge, and operational experience; and
- (c) will enable the AOC holder to safely assess the extent to which FCMs and other relevant personnel perform at levels of alertness sufficient to ensure the safety of operations.

8.1.5 Before BCAA issues a full FRMS implementation approval, BCAA must be satisfied that the AOC holder's FRMS:

- (a) comprises all of the elements mentioned in subchapter 8.1.2; and

CIVIL AVIATION PUBLICATIONS

- (b) is a safe, integrated, data-driven, system which will continuously and effectively monitor and manage fatigue-related safety risks using scientific principles and knowledge, and operational experience; and
- (c) will enable the AOC holder to ensure that FCMs and other relevant personnel perform at levels of alertness sufficient to ensure the safety of operations.

8.2 FRMS policy and documentation

8.2.1 The AOC holder must have an FRMS policy:

- (a) referring to all elements of the FRMS mentioned in subchapter 8.1.2; and
- (b) if the AOC holder has an SMS — which integrates the FRMS with the SMS.

8.2.2 The policy must require that all operations to which the FRMS applies be clearly defined in the operations manual.

8.2.3 The policy must:

- (a) make it clear that while primary responsibility for the FRMS lies with the AOC holder, its effective implementation requires shared responsibility by management, FCMs, and other relevant personnel; and
- (b) clearly indicate the safety objectives of the FRMS; and
- (c) be approved in writing by the Chief Executive Officer; and
- (d) be accessible to all relevant areas and levels of the organisation in a way that indicates the AOC holder's specific endorsement of the policy; and
- (e) declare management commitment to:
 - (i) effective safety reporting; and
 - (ii) provision of adequate resources for the FRMS; and
 - (iii) continuous improvement of the FRMS; and
- (f) require that clear lines of accountability are identified for management, FCMs, and all other relevant personnel; and
- (g) require periodic reviews to ensure the policy remains relevant, appropriate and adhered to.

8.2.4 The policy must:

- (a) be in a written statement; and
- (b) require that each other element of the FRMS mentioned in subchapter 8.1.2 be described in a written statement.

8.2.5 Each written statement of an FRMS element and its procedures must make it clear that the statement is a description of systematised practices in continuous use and implementation for all operations to which the FRMS applies.

8.2.6 In addition to the requirements under subchapters 8.2.4 and 8.2.5, and the relevant limits and procedures contained in the operations manual in accordance with this Order, the

CIVIL AVIATION PUBLICATIONS

FRMS must also be supported by the following documentation, namely, up-to-date identification, description and records of the following:

- (a) the personnel accountabilities, responsibilities and authorities for effective implementation of the FRMS, including the FRMS Manager;
- (b) the mechanisms for ongoing involvement in fatigue risk management of management, FCMs, and all other relevant personnel;
- (c) the FRMS training programs, training requirements and records of attendance at training;
- (d) the FRMS outputs, including findings from collected data, and recommendations and actions taken.

8.3 FRMS practical operating procedures

8.3.1 The FRMS practical operating procedures must, as a minimum:

- (a) incorporate scientific principles and knowledge; and
- (b) identify, on a continuous basis, fatigue-related safety hazards and the risks that result from them; and
- (c) ensure that remedial actions, necessary to effectively mitigate the risks associated with the hazards, are implemented properly and expeditiously; and
- (d) provide for continuous recording and monitoring of, and regular assessment of:
 - (i) fatigue-related safety hazards; and
 - (ii) relevant remedial actions; and
 - (iii) the extent to which mitigation of fatigue-related risks is achieved by remedial actions; and
- (e) provide for continuous improvement in the effectiveness of the FRMS.

8.3.2 The FRMS practical operating procedures must set out:

- (a) maximum values for each FCM for the following:
 - (i) flight times;
 - (ii) flight duty periods;
 - (iii) duty periods; and
- (b) minimum values for each FCM off-duty periods.
Note The terms *flight time*, *flight duty period*, *duty period* and *off-duty period* are defined in this Order.

8.3.3 Subject to subchapter 8.3.4, where an AOC holder acquires data from an FRMS which indicates that the maximum and minimum values required under paragraphs 8.3.2 (a) and 8.3.2 (b) are too high or too low, respectively, the AOC holder must amend the FRMS to ensure that these values are acceptable.

CIVIL AVIATION PUBLICATIONS

8.3.4 For subchapter 8.3.3, an amendment may only be made in accordance with chapter 8.7.

8.4 FRMS hazard identification, risk assessment and mitigation procedures

FRMS hazard identification procedures

8.4.1 FRMS hazard identification procedures must be based on the following processes for fatigue-related hazard identification:

- (a) the predictive process;
- (b) the proactive process;
- (c) the reactive process.

8.4.2 The predictive process must be capable of identifying fatigue-related hazards by examining FCM scheduling and taking into account the following:

- (a) factors known to affect sleep;
- (b) factors known to affect fatigue;
- (c) the effects of the factors mentioned in paragraphs (a) and (b) on FCM performance.

8.4.3 For subchapter 8.4.2, methods of examination may include, but are not limited to, the following:

- (a) AOC holder, or industry, operational experience and data collected on similar types of operations;
- (b) evidence-based scheduling practices;
- (c) bio-mathematical models.

8.4.4 The proactive process must be capable of identifying fatigue-related hazards within current flight operations.

8.4.5 For subchapter 8.4.4, methods of identifying may include, but are not limited to the following:

- (a) self-reporting of fatigue risks;
- (b) fatigue surveys of FCMs;
- (c) relevant FCMs performance data;
- (d) available safety databases and scientific studies;
- (e) analysis of planned versus actual time worked.

8.4.6 The reactive process must be capable of identifying the contribution of fatigue-related hazards to actual events that could have affected, or did affect, safety, with a view to determining how the effects of fatigue on each event could have been minimised.

8.4.7 For subchapter 8.4.6, actual events may include, but are not limited to, those that are the subject of, or are mentioned in, 1 or more of the following:

- (a) fatigue reports;
- (b) confidential reports;
- (c) audit reports;

CIVIL AVIATION PUBLICATIONS

- (d) aircraft incidents;
- (e) flight data analysis events.

FRMS risk assessment procedures

- 8.4.8 FRMS risk assessment procedures must be capable of determining the following:
- (a) the probability of events occurring or circumstances arising that create a fatigue-related hazard;
 - (b) the potential severity of fatigue-related hazards;
 - (c) when the safety risks associated with paragraph (a) or (b) require mitigation.
- 8.4.9 For subchapter 8.4.8, the FRMS risk assessment procedures must ensure that identified fatigue-related hazards are examined in relation to the following:
- (a) the relevant operational context and procedures in which the identified fatigue-related hazard arose;
 - (b) the probability of the fatigue-related hazard arising in those circumstances;
 - (c) the possible consequences of the fatigue-related hazard in those circumstances;
 - (d) the effectiveness of existing safety procedures and controls to prevent, or, if prevention is not possible, to mitigate:
 - (i) the risk of the fatigue-related hazard arising; and
 - (ii) the possible consequences of the fatigue-related hazard.

FRMS risk mitigation procedures

- 8.4.10 FRMS risk mitigation procedures for each fatigue-related hazards must be capable of:
- (a) selecting appropriate mitigation strategies for the hazard; and
 - (b) implementing the selected mitigation strategies; and
 - (c) monitoring the implementation and effectiveness of the strategies.

8.5 FRMS safety assurance procedures

- 8.5.1 FRMS safety assurance procedures must use the following methods to check on and validate the effectiveness of the fatigue-related risk controls used by the AOC holder:
- (a) continuous monitoring of the performance of the FRMS;
 - (b) assessment of data originating from use of the FRMS and other relevant and reliable sources, including relevant data from sources mentioned in subchapter 8.5.2;
 - (c) analysis of trends evident in the FRMS data mentioned in paragraph (b).
- 8.5.2 For paragraph 8.5.1 (b), the sources of data may include, but are not limited to:
- (a) hazard reporting and investigations; and
 - (b) audits and surveys; and
 - (c) reviews and fatigue studies.

CIVIL AVIATION PUBLICATIONS

- 8.5.3 FRMS safety assurance procedures must include a formal process for the management of changes to the FRMS arising from the following:
- (a) identification of changes in the operational environment that may affect FRMS;
 - (b) identification of changes within the AOC holder's organisation that may affect FRMS.

- 8.5.4 The FRMS safety assurance procedures must include a formal process to assess:
- (a) what impact a change mentioned in paragraph 8.5.3 (a) or 8.5.3 (b) may have on the effective performance of the FRMS; and
 - (b) for such a change — what amendment, change or modification may be needed to the FRMS to ensure its continued effective performance.

- 8.5.5 FRMS safety assurance procedures must provide for the continuous improvement of the FRMS, by means including the following:
- (a) the elimination or modification of fatigue-related risk controls that:
 - (i) have had unintended negative consequences; or
 - (ii) are no longer required because of changes in the AOC holder's operational or organisational environment;
 - (b) regular and frequent evaluation of facilities, equipment, documentation and procedures to determine their implications for fatigue-related risk management and control;
 - (c) monitoring and identification of emerging fatigue-related risks to allow timely introduction of new procedures and procedures to prevent or mitigate such risks.

8.6 FRMS safety promotion procedures

- 8.6.1 FRMS safety promotion procedures for fatigue-related hazards must include training and communication programs capable of supporting and continuously improving all elements of the FRMS in the delivery of optimum safety levels.

- 8.6.2 For subchapter 8.6.1, FRMS safety promotion procedures must include the following:
- (a) regular training programs for management, FCMs, and all other relevant personnel to ensure competency levels commensurate with the role and responsibility of the person under the FRMS;
 - (b) an effective FRMS communication plan that:
 - (i) explains all elements of the FRMS to management, FCMs, and all other relevant personnel; and
 - (ii) describes the communication channels which they must use to gather, disseminate and apply FRMS-related information.

CIVIL AVIATION PUBLICATIONS

8.7 FRMS change management procedures

8.7.1 *The FRMS change management procedures must:*

- (a) meet the requirements of this chapter; and
- (b) clearly indicate how the AOC holder will amend, change or modify any element of the FRMS consistently with the requirements of this chapter.

8.7.2 The change management procedures set out in this chapter apply to:

- (a) an AOC holder with a trial FRMS implementation approval; and
- (b) an AOC holder with a full FRMS implementation approval.

8.7.3 After issuing an FRMS implementation approval, BCAA may, in writing, direct an AOC holder to amend, change or modify the FRMS (including practices and documents), and the AOC holder must comply within the time specified by BCAA in the direction.

Note 1 A failure to comply may result in revocation of the FRMS implementation approval.

Note 2 BCAA's power to direct changes to an FRMS is an emergency power for safety purposes only. It does not relieve any approval holder of their own obligation to improve the performance of their FRMS where this is safe and practicable under subchapter 8.7.4.

8.7.4 Subject to subchapter 8.7.5, the AOC holder must obtain the written permission of BCAA before the holder amends, changes or modifies, in practice or in writing, any element of the FRMS mentioned in subchapter 8.1.2 as approved by BCAA.

8.7.5 Subchapter 8.7.4 does not apply to the following:

- (a) any decrease in the values required under paragraph 8.3.2 (a);
- (b) any increase in the values required under paragraph 8.3.2 (b);
- (c) any other change to the written statement of, or the practices associated with, any element of the FRMS (other than the FRMS change management process) which:
 - (i) is intended to deliver higher safety outcomes (including through clarification in the way any element of the FRMS is expressed); and
 - (ii) has been assessed and approved, in accordance with the procedures mentioned in paragraph 8.7.1 (b), as likely to deliver quantifiably higher safety outcomes; and
 - (iii) would be considered by a reasonable AOC holder, committed to excellence in the management and control of fatigue-related risks, as likely to result in higher safety outcomes when compared to the element as approved by BCAA;
- (d) any change in the names of individuals with roles and responsibilities under the FRMS;
- (e) the correction of minor typographical errors.

CIVIL AVIATION PUBLICATIONS

- 8.7.6 To avoid doubt, the AOC holder must not amend, change or modify any of the following:
- (a) any requirement that an FRMS must meet to comply with this Appendix;
 - (b) the FRMS change management process approved by BCAA;
 - (c) anything in an element of the FRMS as approved by BCAA which a reasonable AOC holder, committed to excellence in the management and control of fatigue-related risks, would regard as likely to result, at any time, in a lowering or diminishing of safety outcomes when compared to the element as approved by BCAA.
- 8.7.7 A change to any element of the FRMS as approved by BCAA and mentioned in paragraph 8.7.5 (a), (b) or (c) must be:
- (a) recommended in writing by the FRMS Manager; and
 - (b) endorsed in writing by the Chief Executive Officer; and
 - (c) notified in writing to BCAA within 7 days of the endorsement mentioned in paragraph (b).
- 8.7.8 A change to any element of the FRMS as approved by BCAA and mentioned in paragraph 8.7.5 (d) or (e) must be:
- (a) recommended in writing by the FRMS Manager; and
 - (b) notified in writing to BCAA within 7 days of the recommendation mentioned in paragraph (a).
- 8.8 Trial FRMS implementation approval**
- 8.8.1 BCAA may, on written application, issue an AOC holder with a trial FRMS implementation approval for up to 12 months, if BCAA is satisfied that each element of the AOC holder's FRMS:
- (a) complies with and meets the requirements, attributes and characteristics of an FRMS under this Appendix; and
 - (b) is capable of delivering:
 - (i) identified safety outcomes; and
 - (ii) fatigue-risk data and reports; and
 - (iii) continuous improvement in the delivery of safety outcomes.
- 8.8.2 If an approval was issued under subchapter 8.8.1, BCAA may, by issuing a new trial FRMS implementation approval, extend the duration of the approval:
- (a) on the written application of the AOC holder; or
 - (b) on BCAA's own initiative if BCAA considers that aviation safety requires a longer trial FRMS implementation approval period before a full FRMS implementation approval.

CIVIL AVIATION PUBLICATIONS

Note More than 1 extension is possible if BCAA considers it appropriate and trial FRMS implementation approval status could, therefore, be required to last longer than 12 months.

8.9 Full FRMS implementation approval

8.9.1 BCAA may, on written application, issue an AOC holder with a full FRMS implementation approval, if the AOC holder:

- (a) has held a trial FRMS implementation approval for at least 6 months; and
- (b) satisfies BCAA, through relevant data and reports, that the FRMS:
 - (i) is demonstrably delivering the safety outcomes expected when the trial FRMS implementation approval was given; and
 - (ii) is capable of delivering continuous improvement in the delivery of safety outcomes.

8.9.2 If, for this chapter, BCAA decides not to issue the AOC holder with a full FRMS implementation approval, the holder may apply again to BCAA for a trial FRMS implementation approval and chapters 8 and 9 will apply according to their terms.

8.10 Expiry, suspension, revocation, surrender of FRMS implementation approval

8.10.1 An FRMS implementation approval stops having effect if:

- (a) it expires, or it is suspended or revoked in writing by BCAA; or
- (b) the AOC holder tells BCAA in writing that the holder wants to surrender the approval.

8.10.2 If the approval is revoked or surrendered, the AOC holder must return the approval instrument to BCAA within 14 days.

8.10.3 BCAA may revoke or suspend an approval if:

- (a) the AOC holder does not comply with the requirements of this Order for implementation or use of an FRMS; or
- (b) BCAA considers that continued implementation or use of the FRMS would adversely affect aviation safety; or
- (c) the AOC holder refuses BCAA reasonable access to any information or records produced under or for the FRMS which BCAA requests in writing for the purpose of assessing the effectiveness and safety of the FRMS; or
- (d) for a revocation only — BCAA wishes to reissue the approval in a varied form.

8.10.4 To avoid doubt, in this chapter, reference to an FRMS implementation approval means a trial or full FRMS implementation approval, and includes the approval as varied by BCAA.



CIVIL AVIATION PUBLICATIONS

Appendix A

Development of operations manual limits and procedures

CIVIL AVIATION PUBLICATIONS

A.1 Development sequence

- A.1.1 The following development sequence is just one approach of many that an operator could take to develop limits and procedures for their operations manual.
- A.1.2 The major development tasks, in the suggested order, are:
- a. Determine allowable scheme (see section A.2 of this Appendix)—Confirm what operations the operator is authorised to conduct and therefore the available scheme.
 - b. Determine limits (see Appendix C to this CAP)—Determine limits that must not exceed the limits in the allowable scheme. The chosen limits cannot be more than any maximum stipulated in an applicable scheme and cannot be less than any minimum stipulated in an applicable scheme.
 - c. Develop procedures to meet requirements as per scheme (see Appendix C to this CAP)—These procedures must provide for compliance and fulfilment of requirements as set out in the applicable scheme (i.e. sleep opportunity provisions and delayed reporting time procedures).
 - d. Develop procedures to meet requirements for fatigue risk management (see section 5 of this CAP).
 - e. Develop an appropriate initial and recurrent fatigue training and assessment program, taking into account the nature of the operations undertaken, the operational context and environment, and the limits that have been chosen to apply. A description of the training resources must be documented in the operations manual.
 - f. Develop other procedures (see sections 4 of this CAP) The various procedures required as per section 3 of this CAP (i.e. rostering systems, provision for meals, etc.).

Note: All procedures and limits must be documented in the operator's operations manual. BCAA must be satisfied that the limits and procedures in the operations manual are sufficient to reasonably ensure that FCMs will not exceed safe levels of fatigue while operating an aircraft.

A.2 Availability of the scheme

- A.2.1 The scheme of an operator will depend on what type of operations the operator conducts.

A.2.2 Scheme 1 - Basic limits (as per ANTR OPS FTL 1.1205, ANTR OPS FTL CS 1.1205, ANTR OPS FTL 1.1210, ANTR OPS FTL 1.1235 & applicable ANTR OPS FTLs)

- A.2.2.1 Scheme 1 is available to all operators conducting any type of operation. However, the window within which an FDP may be undertaken does not permit operations in the early hours of the morning (between 1am and morning civil twilight/7am, whichever is earlier).

A.2.3 Scheme 2 - Multi-pilot operations except flight training

- A.2.3.1 Scheme 2 is available to operators that conduct operations with multi-pilot procedures. As well operations that involve multi-pilot certified aircraft.

A.2.4 Fatigue risk management system

- A.2.4.1 ANTR OPS FTL 1.1120, allows an operator to manage FCM fatigue risk under an FRMS, is available to all operators. This permits an operator to develop and implement their own unique set of limitations which, subject to BCAA approval, may differ from the prescriptive limitations.
- A.2.4.2 An operator contemplating an FRMS should consider the guidance material referred in Section 1.3 of this CAP.



CIVIL AVIATION PUBLICATIONS

Appendix B

Limits and requirements



CIVIL AVIATION PUBLICATIONS

The guidance material in this appendix can be used to develop content for an operations manual to ensure it has satisfactory procedures and limits that an operator wishes to adopt and comply with (i.e. split duty, augmented crew operations, standby, positioning etc.).

Each section of this appendix has been divided up according to the requirements stipulated under Subpart Q of ANTR OPS 1 there is an introduction setting out the general rationale for the limits and/or requirements, as well as a section titled 'What should be in your operations manual' including specific aspects for each requirements stipulated under Subpart Q of ANTR OPS 1.

B.1 Sleep opportunity before an FDP or standby

B.1.1 Introduction

- B.1.1.1 An FCM needs to have adequate sleep prior to an assigned FDP in order to be well rested for the FDP. In general, an FCM should have the opportunity to sleep for at least 8 consecutive hours, ideally ending as close as reasonably practicable to the start of the FDP.
- B.1.1.2 There are minimum sleep opportunity requirements as per applicable portions of Subpart-Q of ANTR OPS 1.
- B.1.1.3 There should be mutual understanding between the FCM and the operator as to where the sleep opportunity sits within the period preceding the FDP.
- B.1.1.4 The FCM should not be contacted by the operator during the prior sleep opportunity, except in a manner that could reliably be expected not to interrupt the FCM if they were asleep. Normal circumstances refer to those situations where the operator wishes to preserve the prior sleep opportunity. Abnormal circumstances refer to the case where the operator needs to contact the FCM and it is understood that this will mean that the prior sleep opportunity has been interrupted. The FCM will then not be able to commence the FDP without completing a period of prior sleep opportunity commencing from the end of the interruption. An example of when this might occur is if the operator needs urgent information from the FCM such as airworthiness related information about an aircraft the FCM flew in the previous FDP and the operator has decided it cannot wait until the prior sleep opportunity is over.

Example:

If the commute time at a particular away from base location is 15 minutes, then the operator must ensure the ODP / rest period allows for:

- commute to and from the suitable sleeping accommodation (in this case 30 minutes in total)
- a period sufficient for meeting the reasonable requirements of bodily functioning (i.e. eating, drinking, toileting, washing and dressing (60 minutes might be appropriate)
- the required minimum sleep opportunity (8 hours).

As in this example, there will be many cases where the minimum ODP / rest period will cover the requirements to ensure an 8 hour prior sleep opportunity; however, when longer periods are required such as when commuting time is longer, where extended hotel check-in or check-out times are required or extended customs/quarantine clearance periods are required then the ODP / rest may need to be extended to ensure the 8 hour prior sleep opportunity.

CIVIL AVIATION PUBLICATIONS

B.1.1.5 The requirement for prior sleep opportunity may result in an increased minimum ODP / rest period at some locations if there is not sufficient time available for the prior sleep opportunity. The following table can be used to help determine the required minimum ODP / rest period to ensure the minimum sleep opportunity requirements are met.

Table 1: Calculating an off-duty period taking into account commute time and sleep opportunity

Requirement	Time required	ODP / Rest Period
Commute time to suitable sleeping accommodation	_____ hours : minutes	Determine minimum ODP / Rest Period using the limits in Section B9. and enter below:
Sufficient time for the reasonable requirements of bodily functioning such as eating, drinking, toileting, washing and dressing	_____ hours : minutes	
Prior sleep opportunity	8 hours	
Commute time from suitable sleeping accommodation to sign-on	_____ hours : minutes	
Total time	_____ hours : minutes	
Actual Minimum ODP (higher of two totals in the row above)	_____ hours : minutes	

B.1.1.6 Where an FCM is interrupted during sleep opportunity, the FCM's capacity to adequately prepare for their next FDP is affected; therefore, this may affect the FCMs fitness for duty before the start of, or during the next FDP.

B.1.2 What should be in your operations manual

B.1.2.1 Where there is the requirement for prior sleep opportunity, the operations manual should have:

- the operator's policy for managing the prior sleep opportunity requirements so that FCMs are aware when sleep should be planned with reference the start time of their assigned FDPs. This policy should be determined after consultation with FCMs.
- procedures to ensure that the minimum sleep opportunity prior to an FDP or standby can be met within rostered off-duty periods.
- procedures directing the operator's employees not to interrupt the FCM's sleep opportunity when making contact with FCMs prior to the start time of an FDP.
- procedures detailing specified contact methods and protocols that have proven to be effective at not interrupting the FCM's prior sleep opportunity, as well as identifying and communicating suitable times of contact.⁴
- procedures to ensure that, as far as reasonably practicable, each FCM is aware that they have a responsibility to make appropriate use of the sleep opportunity prior to commencing an assigned FDP (or standby period, if standby is allowed by the applicable appendix) to achieve adequate alertness for the assigned FDP.

Note: Required procedures could be as simple as ensuring FCMs, rostering personnel and all those that might have reason to contact an FCM prior to an FDP have been informed of this requirement on induction into the company. They should all be made aware that any contact (other than in accordance with the operator's procedures) during the sleep

CIVIL AVIATION PUBLICATIONS

opportunity period, has the potential to impact the FCMs fitness for duty for the subsequent FDP.

- The operations manual must have procedures to ensure that an FCM has at least:
 - 8 consecutive hours of sleep opportunity at home base within the 12 hours immediately preceding the start of an FDP
 - 8 consecutive hours of sleep opportunity if away from home base, within 10 hours immediately preceding the start of an FDP.

B.2 FDP and flight time limits

B.2.1 Introduction

- B.2.1.1 Limiting the duration of FDPs and flight time within an FDP is a key aspect of the management of fatigue. Subpart Q of ANTR OPS 1 has FDP and flight time limits. These are based on scientific principles and take into account many factors such as the time the FDP starts and the number of sectors to be flown in the FDP.
- B.2.1.2 FDP and flight time limits for complex, multi-pilot operations, also take into account the acclimatised state of the FCM (affected by crossing time zones) and whether or not the flight crew is an augmented crew (carry additional FCMs for the purposes of relieving one or more of the flight crew during cruise).
- B.2.1.3 Subpart Q of ANTR OPS 1 has a built in requirement for hazard identification and risk management for all Tier 2 scheme. The effect of this is that the limitations specified in the ANTR OPS 1; SUBPART-Q FTL may need to be modified by an operator in order to mitigate fatigue risks to an acceptable level. (Refer to Appendix F of this CAP).

B.2.2 What should be in your operations manual

- B.2.2.1 The operations manual needs to include procedures (a roster system) to ensure that the FCM is not assigned an FDP longer than the number of hours specified in the operations manual, which themselves must not exceed the limits in the applicable appendix.
- B.2.2.2 Documented limits should be communicated to staff and the rostering practices should ensure that FDPs are assigned in such a manner that they provide sufficient allowance for the intended flight(s); as well as a sufficient period for pre- and post-flight duties that reasonably takes into account unavoidable requirements such as:
 - passenger check-in
 - passenger boarding duties
 - manifest, load and balance document completion
 - customs and immigration
 - pre-flight aircraft inspections and pilot maintenance (replenish oils etc.)
 - post-flight duties (i.e. flight and duty time data entry, aircraft cleaning, compressor washing, and other pilot maintenance).
- B.2.2.3 Training flights in a simulator are considered duty, and like all duty, must be included in an FDP if they are conducted prior to a flight and are not separated from that flight by at least a prior sleep opportunity. If the simulator training is conducted after the last flight in a duty period it does not need to be included in the FDP. When planning any FCM training, the impact of the level of FCM fatigue on the quality of training should be considered and managed accordingly.
- B.2.2.4 Operators should not take advantage of an FCM engaging in voluntary activities prior to an FDP that would otherwise be considered required duties. An operator must not schedule FDPs in such a manner that there is so little time available prior to the flight that meeting the flight commencement time is only achievable if the FCM accomplishes the required activities prior to the FDP commencing. In this case the activities can no longer be considered voluntary.

CIVIL AVIATION PUBLICATIONS

Example: Not allowing sufficient time in the FDP for such activities as flight planning, weight and balance calculation, etc. because the FCM has on previous occasions completed these tasks voluntarily before the FDP commenced as a means of managing anxiety prior to the FDP.

- B.2.2.5 If an operator records flight time from 'push-back' or 'off blocks', rather than from the moment the aircraft first moves under its own power (as per the definition of flight time), BCAA deems this as acceptable.
- B.2.2.6 Likewise, for a rotorcraft operator, recording flight time from the moment the rotor blades start turning until they stop turning is also acceptable.

With respect to Tire 1 scheme

The operations manual must have rostering procedures to ensure that:

- FDPs are only assigned and are limited to be conducted in accordance with the ANTR OPS FTL 1.1205

With respect to Tire 2 scheme

Complex multi-pilot operations are typically subject to crossing time zones, and therefore resulting in circadian disruption for FCMs. Therefore, FDP and flight time limits are calculated based on the location at which the FCMs 'body clock' is considered to be.

The operations manual must have procedures capable of determining whether the FCM is in an acclimatised state and if so, where they are acclimatised to, and conversely, when they are in an unknown state of acclimatisation. These procedures must achieve the same outcome as that mentioned in the definition to "acclimatisation" under the Subpart-Q of ANTR OPS 1

There must be procedures for determining the required adaption period for an FCM who is in an unknown state of acclimatisation.

The limits in the operations manual must not exceed the limits for acclimatised FCMs and FCMs in an unknown state of acclimatisation as per Subpart-Q of ANTR OPS 1

An FCM must not undertake more than 4 consecutive FDPs in an unknown state of acclimatisation. Once 4 consecutive FDPs are undertaken in an unknown state of acclimatisation, an adaptation period must then be undertaken before the FCM can undertake another FDP.

B.3 Increase in FDP limits by split duty

B.3.1 Introduction

- B.3.1.1 For many operators, providing FCMs with a split-duty rest period during the FDP is a useful way of addressing potential fatigue risk and therefore allowing an increase to the FDP limit. It involves providing the FCM with an environment that is conducive to sleep or rest during an FDP, and relieving the FCM of all duties while they are there.
- B.3.1.2 Making provision for split duty is not mandatory; however, if an operator's operations manual does not include procedures for split duty, this practice is not permitted.

Note: Split duty is not permitted under tier 1 scheme.



CIVIL AVIATION PUBLICATIONS

B.3.2 What should be in your operations manual

B.3.2.1 If an operator chooses to incorporate split duties into their operations, their operations manual must have procedures to ensure:

- the suitability of the accommodation is assessed and meets the minimum standard:
 - there is a different standard for sleeping accommodation and for resting accommodation. The standard for each can be found in Subpart – Q of ANTR OPS 1
 - an FCM's home is considered suitable
 - assessments should be ongoing to ensure continued achievement of the standard over subsequent uses of the accommodation. This means re-assessing the standard periodically or when you have reason to believe there may be an issue with the standard provided.
- where an FDP contains a split-duty rest period, there is enough time allocated in the roster for the FCM to travel to and from the suitable sleeping or resting accommodation and still have enough time at the accommodation to meet the minimum requirements.
- FCMs are not disturbed during the split-duty rest period. This means having specific policies and procedures that address possible sources of disturbance. Examples are a procedure for renting rooms that requires that the hotel management agree not to try to clean the room or even the rooms nearby the one being used for a split-duty rest period or a communication protocol for managing how the FCM is contacted and how the FCM sets their mobile phone to protect against inadvertent disturbance from incoming calls.
- split-duty FDPs are assigned to an FCM as part of the roster, and are assigned so far in advance of the FDP as to provide the FCM to whom it applies to with a reasonable opportunity to plan adequate rest before their duty.
- the time spent in the split-duty rest period is always considered as duty and is included as a part of the FDP (although, for the purposes of calculating minimum off-duty periods and cumulative duty time, the duration of the FDP may be reduced).
- the entire minimum period of access to suitable sleeping accommodation or suitable resting accommodation must be achieved prior to the end of the maximum FDP before an increase in the FDP limit is permitted.

Note: Verification of an operator's facilities for suitable resting and suitable sleeping accommodation may be required.

Things for the operator to consider:

- the management of change to the suitable sleeping or resting accommodation
- a reporting mechanism for providing feedback on the standard of the suitable sleeping or resting accommodation
- consideration of the standard of suitable sleeping or resting accommodation in a formal periodic review process.

If a Commercial Air Transport operator (Multi Pilot operations) chooses to incorporate split duties into their operations, their operations manual must have rostering procedures that ensure:

- for suitable sleeping accommodation, access for at least 4 consecutive hours in order to increase the maximum FDP by up to 4 hours.
- for suitable resting accommodation, access for at least 2 consecutive hours in order to increase the maximum FDP by half the duration of the split-duty rest period up to a maximum of 2 hours.
- the increase for split duty the maximum FDP can be no more than 16 hours
- if a split-duty rest period includes any period between the hours of 2300 and 0529 (local time) the split-duty



CIVIL AVIATION PUBLICATIONS

rest period must be a consecutive period of at least 7 hours, with access to suitable sleeping accommodation. In these circumstances:

- the maximum FDP may be increased, if not already permitted, by up to 16 hours
- there is no allowed discount or reduction of the length of the resulting FDP for the purposes of determining the minimum length of the subsequent ODP / rest period or to cumulative duty time calculations. [This requirement is based on 2300 and 0529 (acclimatised time) unless the FCM is in an unknown state of acclimatisation, in which case, local time is used].
- any remaining portion of an FDP following a split-duty rest period will be no longer than 6 hours

A split-duty rest period spent at suitable sleeping accommodation is a period where fatigue is being reduced; therefore, an allowance has been made to reduce the impact of the increased length of the FDP on the subsequent minimum required ODP / rest period and cumulative duty assessments.

This allowance is as follows:

- for determining the required minimum ODP / rest period following an FDP, when that FDP contains a split-duty rest period at suitable sleeping accommodation, the FDP can be considered to be 2 hours shorter than it actually was.
- for calculating cumulative duty, an FDP that contains a split-duty rest period at suitable sleeping accommodation can be taken to be 2 hours shorter than it actually was.

Note: This allowance is not available when the split-duty rest period includes any period between the hours of 2300 and 0529.



CIVIL AVIATION PUBLICATIONS

B.4 Increase in FDP and flight time limits in an augmented crew operation

B.4.1 Introduction

B.4.1.1 Operations with more than the minimum required FCMs, to allow for one or more FCMs to be relieved of duty during flight time, can increase the maximum FDP and flight time limits in a multi-pilot operation. This is known as an augmented crew operation.

B.4.1.2 Augmented crew limits are in part determined by the class of crew rest facility available. Crew rest facilities need careful design and consideration in order to permit adequate in-flight rest and sleep requirements for crew. Classes of crew rest facilities are defined in ANTR OPS FTL CS 1.1205. In addition, when determining the acceptability of in-flight rest facility specifications, the factors discussed in section 3.4 of this CAP should be taken into account. BCAA may conduct a physical assessment of the adequacy of in-flight rest facilities that may include consideration of the dynamic issues in-flight.

B.4.2 What should be in your operations manual

B.4.2.1 If an operator chooses to incorporate augmented crew operations and take advantage of an increase in FDP, the limits in the operations manual must not exceed the limits for acclimatised FCMs.

B.4.2.2 The procedures must ensure that the minimum time an FCM requires the in-flight crew rest facility, in accordance with limits prescribed in Subpart Q of ANTR OPS 1. These times are only minimums and substantially longer times in in-flight rest may be required to maintain or restore adequate alertness. As a guide, these minimums assume that the majority of the FDP is flight time, and the available rest/sleep time (cruise phase) is fully utilised and is reasonably evenly distributed amongst FCMs. Therefore, the procedures in the operations manual should reflect this goal of fully utilising available in-flight periods for gaining in-flight rest. It is for this reason that the number of sectors is limited for an augmented crew operation, to ensure FDPs contain longer sector lengths that allow adequate time for rest/sleep.

B.4.2.3 Procedures for assigning FCMs to an augmented crew FDP must ensure that the FCMs that are part of the operating crew at the end of the FDP are the same FCMs who commenced the first sector of the FDP.

For safety reasons, this is a critical condition. If, for example, a medical emergency required the disembarkation of an FCM during the FDP, for the flight to continue all of the FCMs must be replaced with a new crew, commencing a new FDP.

It is considered that managing differing FDP limits and lengths of duty and flight time, as well as allocation of in-flight rest, for each FCM is potentially too difficult for a crew and, in particular, the captain to manage safely. Given the likely pressure to support the crew and achieve the task, having one or more crew members with a significantly different fatigue level could create disparity (i.e. in the approach to extensions). Extensions should be a decision that considers the fatigue level of each FCM independently; however, when only one FCM needs the extension, the other crew members may not support the decision to not extend.

Additionally, one fatigue mitigator for a crew is the general extrapolation of the FCM's level of fatigue to the crew. When one crew member identifies that they feel fatigued they should bring it up with the crew for discussion and management and/or start to monitor the rest of the crew more closely. If a crew includes significantly different duty times, understanding when each is fatigued becomes far more difficult and less likely to be managed effectively. It is considered that this added level of complexity should be managed under an FRMS.

CIVIL AVIATION PUBLICATIONS

- B.4.2.4 In order to use augmented crew operations the operations manual must detail required augmented crew procedures. Appropriate augmented crew procedures should include:
- the requirement to designate a pilot responsible for making command decisions at all times that the PIC is accessing in-flight rest
 - the requirement for a comprehensive briefing prior to FCMs rotating into and out of in-flight rest
 - a means of prioritising the in-flight rest requirements so that they do not take priority over the need to optimise the crew experience levels on the flight deck for managing planned and unplanned operational threats
 - designation of a responsible person amongst the crew for scheduling in-flight crew rest and reassessing crew rest schedules (in the event of unforeseen operational circumstances, particularly in-flight diversions or air returns)
 - management of the possible effects of sleep inertia on performance when awakening from deep sleep
 - procedures that ensure other crew members are aware of the necessity to respect the in-flight rest requirement and avoid interrupting and reduce unnecessary noise that could disturb the sleep of FCMs utilising in-flight rest.

B.5 Delayed reporting time

B.5.1 Introduction

- B.5.1.1 An FCM has an obligation to use their preceding ODP / rest period and prior sleep opportunity period in order to be sufficiently rested and alert to perform their duties safely in the rostered FDP.
- B.5.1.2 If the start time of an FDP is delayed, the operator must consider that an extended delay will impact the FCM's preparation and overall risk of accruing a higher fatigue level by the end of the FDP.
- B.5.1.3 Delayed reporting requirements must be met to allow for the assigned FDP start time to be delayed for any period. As with other Subpart- Q of ANTR OPS 1 limits there must be documented procedures that explain the process by which reporting times are delayed in accordance with the limitations.
- B.5.1.4 Additionally, if the operations manual contains documented procedures that specifically address how reporting times are delayed without impacting the prior sleep opportunity, in accordance with the limits contained in the Subpart-Q of ANTR OPS 1.

B.5.2 What should be in your operations manual

Under Tier 1 scheme, there are no provisions for delaying an FCM's reporting time, or requirements to consider if delays occur. However, the requirement in ANTR OPS FTL 1.1110, 1.1120, 1.1225 regarding rosters to be published sufficiently in advance of the FDP to provide the FCM with a reasonable opportunity to plan rest before the start time, applies.

Prior sleep opportunity is always associated with the actual, assigned FDP. If the operator interrupts or disturbs the sleep of an FCM in the period of the prior sleep opportunity then the FCM has not met the requirement for a prior sleep opportunity and cannot commence the FDP. The operations manual must have procedures for protecting prior sleep opportunity as outlined in section C1 above.

For the Tier 2 scheme

Delays of less than 10 hours – with operations manual procedures

Delaying a reporting time within 10 hours of the FDP start time is permitted if an operator is operating under Tier 2 scheme, and has operations manual procedures that specifically address delaying a reporting time within 10 hours of the FDP. Operations manual procedures should reflect the following consideration and requirements, which are also described in the Figure given below:

- For delays of less than 4 hours – the assumption is that, while the FCM may well be able to rest, it is

CIVIL AVIATION PUBLICATIONS

unlikely that they will be able to return to sleep. If they remain awake for this period the FCM is accruing fatigue; however, they should be able to accrue fatigue at a lower rate by managing their activities, rather than if they were on duty.

- For delays of more than 4 hours – the operator, for rostering purposes, must assume that the FCM has been awake for a reasonable period and is accruing fatigue; therefore, the maximum FDP limits are not appropriate.
- For any delay – the maximum FDP limit cannot exceed the maximum FDP limit based on the original reporting time; however, if a reporting time following a delay requires a lower maximum FDP limit than that of the original FDP, then this now becomes the maximum FDP limit. In essence, when start times are delayed and the maximum FDP limit based on that new start time increases the operator cannot take advantage of this; however, when it decreases they must abide by it. This is because maximum FDP limits based on start times after 11am reflect the greater likelihood that the FCM has been awake for an extended period prior to the start of the FDP, and if the maximum FDP limit is utilised they will finish their FDP in, or just before the WOCL.
- An operator must have procedures that set out the manner in which the FCM will be notified of the delay. That taken into account, the requirement to protect the eight hour prior sleep opportunity either:
 - in the 12 hours before the original start time if the FCM is at home base
 - in the 10 hours before the original start time if the FCM is away from home base.
- For delays of less than 10 hours that are carried out in accordance with the operations manual procedures and therefore meet the requirements of delayed reporting, the time between the original reporting time and the delayed reporting time is considered to be standby.
- Operators should have procedures that describe the way in which FCMs are notified of the delay prior to leaving their sleeping accommodation.
- Operators should also have procedures for managing when notification of the decision to delay will not meet the minimum requirements set out in the operations manual.

Rather than contacting the FCM directly, examples of procedures that manage notification and protect the prior sleep opportunity include:

- requiring that the FCM ‘checks in’ with the operator after they wake-up or organising a system whereby the hotel/motel staff delay the requested wake-up call and place a message under the door of the FCM’s room.

Example procedure:

All communications between operator and an FCM during an ODP / Rest Period or that could impact on the FCM’s prior sleep opportunity must be in accordance with the following communication protocol:

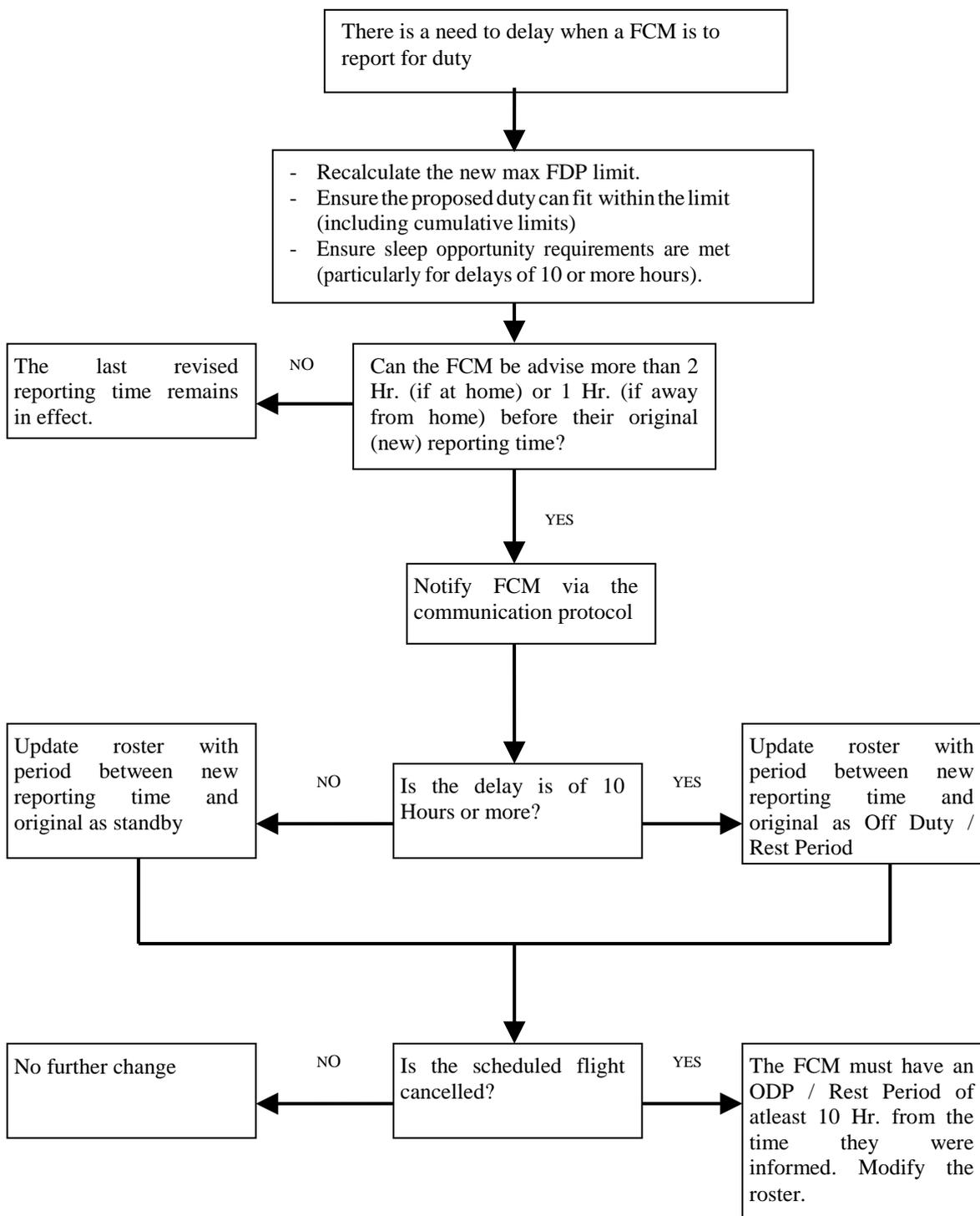
- An FCM must only be contacted during their sleep opportunity if there is to be a delay in FDP commencement time and then only by SMS.
- The FCM should ensure that their mobile is on ‘silent’ during sleep opportunity periods to, as best as possible, ensure uninterrupted restorative sleep.
- The FCM must check their SMS messages and reply to any SMS notifying the FCM of a delay, before leaving the location of the sleep opportunity.
- An SMS sent and shown as delivered is deemed to be notification however the FCM shall still reply to the SMS before leaving the location of the sleep opportunity to confirm they understand the message.
- The timing and content of SMS messages (and phone calls) regarding delays will be logged in the rostering

The following flow diagram may assist in understanding the requirements and provide an example of a procedure for inclusion in an operations manual. In the diagram ‘table FD’ refers to a maximum FDP limit table and ‘table DR’ refers to a table of limits that contains the cumulative flight and duty limits:



CIVIL AVIATION PUBLICATIONS

Delayed reporting decision flow chart



CIVIL AVIATION PUBLICATIONS

Procedures need to adequately reflect the required adjustments to maximum FDP limits when the start time is delayed. The procedures for managing maximum FDP limits should reflect the requirements listed in Table 3.

Delay	Determining maximum FDP for delayed FDP reporting time (use maximum FDP limits in table FD)	
Single or multiple delay/s that total < 4 hours	If the new maximum FDP limit is higher or the same at the original maximum FDP limit - retain original maximum FDP limit	If the new maximum FDP limit is lower than original maximum FDP limit - use the new, lower maximum FDP limit
Single or multiple delay/s that total between 4 – 10 hours	Step 1: If maximum FDP limit at 4 hour mark is higher than original maximum FDP limit (or the same) - use original maximum FDP limit	Step 1: If maximum FDP limit at 4 hour mark is lower than original maximum FDP limit - use maximum FDP limit at 4 hour mark
	Step 2: Reduce maximum FDP limit worked out at step 1 by the amount of time the new reporting time is later than the 4 hour mark	Step 2: Reduce maximum FDP limit worked out at step 1 by the amount of time the new reporting time is later than the 4 hour mark
A single delay of 10 hours or longer	Use new maximum FDP limit from the maximum FDP table for the delayed reporting time	

Table 3: Determining maximum FDP for delayed reporting time

Note: The delay column refers to the total delay, rather than any single delay. This is an important consideration, as an operator may initially require a delay of 2 hours and then make a further delay to the start time of 3 hours. For the purposes of determining the maximum FDP, this represents a total delay of 5 hours and must be dealt with as a five hour delay rather than two delays each of less than 4 hours.

Cancellations where sufficient notice is provided – with operations manual procedures

- If an operator does not have detailed delayed reporting procedures in the operations manual for delays where there is less than 10 hours' notice, the FCM must receive the cancellation notice at least 10 hours before the original reporting time.
- If an operator does have detailed delayed reporting procedures in the operations manual for delays where there is less than 10 hours' notice, the FCM must receive the cancellation notice before they leave their sleeping accommodation:
 - 1 hours' notice before FDP if the FCM is away from home base
 - 2 hours' notice if the FCM is at home base.

In both cases, the FCM must then have at least 10 consecutive hours off-duty, beginning from the time the FCM receives the cancellation notification, before they can be assigned a new FDP.

- If the notification of cancellation does not meet the notification requirements above, then for the purposes of determining the minimum ODP / rest period, the FDP is considered to have commenced at:
 - the original starting time or
 - the last delayed reporting time that was notified, in accordance with procedures in the operation manual.
- The required minimum ODP / rest period must then be taken from that time or the cessation of any duties. The FCM must complete the minimum ODP / rest period required before the FCM can be assigned another FDP even if no flight occurred.

CIVIL AVIATION PUBLICATIONS

B.6 Reassignment and extension

B.6.1 Introduction

Reassignment

- B.6.1.1 These provisions set limits on the extent to which a rostered or assigned FDP can be modified for an FCM once the FDP has commenced. Reassigning refers to increasing an FDP while remaining within the operations manual limit for that activity. This is different to an extension, which refers to increasing the FDP so that it exceeds the FDP limit in the operations manual. A re-assigned FDP can subsequently be extended under the extension clause once unforeseen operational circumstances are encountered.
- B.6.1.2 There may be occasions when an FCM who has already commenced an FDP needs to be reassigned (e.g. when operational requirements require an FCM to take over another's rostered sectors). There are restrictions over how reassignments are managed in order to mitigate any adverse fatigue risks associated with changing the FCM's duty expectations.

Extension

- B.6.1.3 An operator must have reasonable expectations based on previous experience and data, that the assigned FDP can be achieved within the operations manual limits. The maximum FDP limits in available schemes are not designed with the expectation that there would be extensions.
- B.6.1.4 On the contrary, it is expected that, should the operational need for an extension arise, it may not be possible because the FCM does not report fit for the extension. The requirements for extensions is included in order to have appropriate flexibility when operators need to extend an FDP when unforeseen operational circumstances occur, and where the FCM is fit for the extension. The decision to extend an FDP is taken prior to a flight commencing (usually the last flight of the FDP) when all crew members have a clear choice whether or not to continue, based on their assessment of their fitness for duty.
- B.6.1.5 The intention behind unforeseen circumstances (refer to definitions) and subsequent extensions is for operators to roster FDPs appropriately; and not to continually use flight and duty times to their maximum limits, resulting in over-use of extensions when previous experience is sufficient to indicate a greater time allowance is required.
- B.6.1.6 In both re-assignment and extension, it triggers a requirement that, in addition to the operator independently assessing the fatigue risk associated with the proposed extension, the operator must check with the FCM that they are fit to achieve the modified FDP. While the FCM remains the last line of defence, the reality is that they are not always best placed to properly assess or mitigate that increased fatigue risk, particularly if they themselves are experiencing high levels of fatigue or high levels of pressure to complete a task.
- B.6.1.7 There are limitations on extensions in all appendices and there must be acceptable procedures for the application and management of extensions in all submitted operations manuals.

B.6.2 What should be in your operations manual

- B.6.2.1 An operator's operations manual must contain procedures that:
- provide a tool, and training, for FCMs to assess their fitness for duty
 - does not permit a reassignment if the FCM does not consider and agree they are fit for the modified FDP
 - does not permit an extension to an FDP unless the FCM has been consulted by the PIC, and has had an opportunity to consider and agree they are fit for the extension
 - when extensions occur, the operator collects sufficient information such as an extension report, to enable further study and fine tuning of the rostering process to better protect against extensions in the future.

In the case of Tier 1 Scheme



CIVIL AVIATION PUBLICATIONS

Reassignment

There are no specific limits on re-assignment of an FDP; therefore, there is no requirement for procedures in the operations manual that specifically address reassignment of FDPs. This scheme rules, as a rule-set, are considered sufficiently restrictive to absorb changes on the day of operations in assigned FDPs that do not exceed the FDP limits, without representing an unreasonable increase in fatigue risk.

Extensions

The procedures should clearly limit the use of extensions to those circumstances where:

- the FDP has already commenced
- the decision to extend beyond the FDP and/or flight time limit is taken prior to both the last flight and FDP, or flight time being exceeded
- the circumstances that required the extension could reasonably be classed as unforeseen
- the FCM will not exceed a cumulative flight time limit during the extension
- the extension is operationally necessary to complete the planned duty.

It is not permitted for an extension to result in an FCM exceeding the limit in subclause 2.1 that requires all assigned FDPs be completed by 0100 (local time).

In the case of Tier 2 Scheme

Reassignment

Procedures should, at a minimum:

- identify that, when reassigning an FDP, 4 hours is the maximum increase to the originally assigned FDP
- identify that a reassigned FDP must not exceed maximum operations manual FDP limits (this limit is derived after consideration of the reassigned number of sectors)
- identify that a reassigned FDP must not cause the FCM to exceed longer term or cumulative limits. Examples are that the reassigned FDP cannot cause the FCM to exceed the longer term minimum ODPs / rest period (i.e. 36 consecutive hours off-duty in the 168 hour period before the projected end of the reassigned FDP, or the cumulative flight and duty limits applicable to the appendix under which the FCM is operating)
- identify that a reassigned FDP must not cause the FCM to exceed the limit on late night operations (LNOs). The procedures must require that the limit on LNOs for that appendix be considered when determining whether the modified FDP is allowed and whether the reassignment will mean subsequent rostered FDPs will then exceed the LNOs limit.

It is not prohibited for the operator to reassign an FDP to an FCM as an augmented crew member when the FCM was originally assigned to a non-augmented crew and vice versa. Because the FCM will need to utilise in-flight rest, the operator should be aware that there is potential for greater fatigue risk if the FCMs preparation was not suited to an augmented crew operation. There is also potential for greater fatigue risk if the FCM was expecting an augmented crew FDP with assigned in-flight rest opportunities and is re-assigned to a non-augmented crew FDP. This increased risk should be managed by the operator and may require limitations on the use of this practice be in place.

Extensions

The procedures should clearly limit the use of extensions to those circumstances where:

- the FDP has already commenced
- the decision to extend beyond the FDP and/or flight time limit is taken prior to both the last flight and prior to the FDP or flight time limit being exceeded
- the circumstances that required the extension could reasonably be classed as unforeseen

CIVIL AVIATION PUBLICATIONS

- the FCM will not exceed a cumulative duty or cumulative flight time limit during the extension
- the extension is necessary to complete the planned duty

The procedures should also make it clear that an extension cannot be greater than:

- for augmented crew operations—3 hours for FDP
- for non-augmented multi-pilot operations—1 hour for FDP
- for single-pilot operations and flight training—1 hour for FDP

For multi-pilot operations, the sectors for the FDP limits may be increased by 1 more than would otherwise be the case for the FDP.

If unforeseen circumstances arise after take-off on the final sector of an FDP, the flight may continue to the planned destination or an alternate, at the discretion of the PIC.

It is permitted for an extension to result in an FCM exceeding the longer term off-duty requirement of 36 consecutive hour's off-duty in a 168 hour period projected to the end of the assigned FDP.

An extension to an FDP that results in the FDP including more than 30 minutes between the hours of 2300 and 0530 does not need to be taken into account when determining whether the FCM meets the requirements of the LNOs clause as this limit only applies to what was assigned (or subsequently reassigned), not an extension to the assigned FDP.

B.7 Standby limits and standby-like arrangements

B.7.1 Introduction

- B.7.1.1 Standby may be undertaken at home or at another place where suitable sleeping accommodation conditions exist. There are both advantages and disadvantages in conducting standby at the airport, at home or another location away from the airport. For example, if standby is undertaken at the airport, then it may be more likely for an FCM to be in a state of readiness whilst undertaking no actual work, even if there is access to suitable sleeping accommodation. This heightened state of readiness can introduce stress, which may increase fatigue and decrease alertness levels faster than at home or another location away from the airport. On the other hand, standby conducted at the airport negates the need for the pilot to drive to the airport upon call-out which, depending on the time taken to travel, weather and the traffic conditions might impact negatively on fatigue levels prior to the commencement of the FDP. It is the operator's responsibilities to monitor these potential hazards and make decisions on the location of standby that manage the risk appropriately.
- B.7.1.2 Some operators may assign what they call 'airport standby'. Although no duties are assigned, typically access to suitable sleeping accommodation is not available. In these instances, this 'standby-like arrangement' must be considered as duty and not standby. This is because it is not considered possible for an FCM to use this period for genuine rest or sleep in preparation for an FDP.
- B.7.1.3 An important risk management strategy for any operator using standby periods is to maximise the effectiveness of any rest/sleep opportunities that the FCM might have while being on standby. This means reducing contact to a minimum and, where possible, not including the FCM in operational deliberations and decision-making prior to the start of the FDP.
- B.7.1.4 It is important for operators to note that for different FCMs there can be different ways to manage any additional stress, which may be present as a result of maintaining a higher level of alertness during standby. A strategy that FCMs might employ involves doing aviation-related activities while still on standby. Should an FCM decide to perform aviation-related tasks whilst on standby (entirely of their own volition), then this time is not to be considered as duty time. Operators should not take inappropriate advantage of this method of managing stress by then not allocating enough time to perform these, otherwise required duties, in the subsequent FDP.

CIVIL AVIATION PUBLICATIONS

B.7.2 What should be in your operations manual

B.7.2.1 Operations manual procedures must:

- include a means of making reliable assessments of suitable sleeping accommodation (at base and away from base) that is proposed for use in a standby period. These assessments should be ongoing to ensure the accommodation remains fit for purpose.
- ensure FCMs are not disturbed by company contact during the standby period, except to call the FCM out for an FDP or duty

Note: Stress and fatigue can be accelerated if the FCM is required to undertake duties (e.g. office duties) while on standby, and therefore any time conducting duties cannot be deemed standby.

B.7.2.2 If standby-like arrangements are employed (i.e. where an FCM is required to hold themselves available for duties, but access to suitable sleeping accommodation is not provided), this time counts as duty time.

In the case of Tier 1 Scheme

Although it is not specifically prohibited, there are no provisions that address standby. If an operator wishes to hold the FCM on standby then, in accordance with ANTR OPS FTL 1.1100, 1.1205 & 1.225 they need to be rostered for that standby period in such a way that the FCM is provided a reasonable opportunity to plan adequate rest for the possible FDP.

In addition to this, Tier 1 scheme has the requirement for prior sleep opportunity that is always associated with the actual assigned FDP. If an operator wishes to use standby, they are required to have procedures in place that are acceptable to BCAA and accurately demonstrates how the prior sleep opportunity is achieved for those FDP start times that occur during rostered standby periods.

Any interruption or disturbance during the prior sleep opportunity period initiated by the operator could infringe the prior sleep opportunity requirements.

In the case of Tier 2 Scheme

The procedures must ensure:

- the FCM will not be held on standby for greater than a 16 hour period
- that if the FCM is called out from standby after a 6 hour period on standby, the maximum FDP limit that applies to that FCM is reduced by the length of time they are on standby in excess of 6 hours

Example:

if the FCM is called out at 8 pm, after 14 hours of standby for a 3 sector flight, the applicable maximum FDP of 9 hours must be reduced to 7 hours, as the FCM was on standby for 2 hours in excess of 12 hours.

The procedures must ensure that if the FCM is not called-out from standby, the FCM completes a minimum ODP / rest period of at least 10 hours.

B.8 Positioning

B.8.1 Introduction

B.8.1.1 The positioning clause allows for continued duty after the FDP has finished and before an ODP has started, in order to transport the FCM to a location other than the one at which the FDP finished. This means that any time spent positioning does not need to be contained within the FDP limit. This also means that, while positioning, the FCM will not be taking any further role as part of an operating crew until a required ODP



CIVIL AVIATION PUBLICATIONS

has been completed. The subsequent minimum ODP is based on the length of the FDP as well as the time spent positioning.

- B.8.1.2 When calculating displacement time for determination of acclimatisation (which can then have an impact on the minimum length of the following ODP/rest period) an operator must also take any time zones crossed during the FCM's positioning period into consideration.
- B.8.1.3 When calculating cumulative duty, any time spent positioning must be included as it is deemed a task that is required to be carried out associated with the business of the operator.

B.8.2 What should be in your operations manual

- B.8.2.1 If an operator intends to position an FCM at the completion of an FDP, there should be procedures to ensure:
- the period spent positioning, along with the impact on displacement time, is considered when determining the subsequent minimum ODP/rest period.
 - the period spent positioning is considered in the determination of cumulative duty time
 - the FCM does not participate as part of an operating crew during the period of positioning.
- B.8.2.2 Positioning before flying duties is not specifically dealt with in this document. However, positioning before a flight or series of flights as, defined in ANTR OPS FTL CS 1.1200, ANTR OPS FTL 1.1205, 1.1215 requires management by the operator. If an operator intends to position an FCM before a flight or series of flights, there should be procedures to ensure:
- the time spent positioning counts to the FDP
 - the displacement time is considered when determining the subsequent minimum ODP/rest period.
 - the period spent positioning is considered in the determination of cumulative duty time
 - the FCM does not participate as part of an operating crew during the period of positioning.
- B.8.2.3 The positioning 'sector' does not need to be considered as a 'sector' when the number of sectors is a factor in determining the maximum allowable duration of an FDP.

B.9 ODP / Rest Period limits

B.9.1 Introduction

- B.9.1.1 It is essential that an operator and FCM understand that an ODP / Rest Period is a period free of all duties and standby associated with their employment. This means the FCM cannot simply switch to other non-flying duties in their required minimum ODPs/Rest Period and they cannot be assigned another FDP until the minimum ODP requirements have been met.
- B.9.1.2 Based on the function the ODP performs, there are three broad categories of off-duty requirements:
- those that address acute fatigue (i.e. the requirement for an ODP / Rest Period following an FDP)
 - those that address cumulative fatigue (i.e. the requirement for 36 consecutive hours off-duty, including two local nights, in any 168 consecutive hour period)
 - those that are taken in order to acclimatise a FCM to the local time (an adaptation period).

Addressing acute fatigue

- B.9.1.3 An operator must keep in mind that assigned ODPs / Rest Period will be sufficiently long enough to provide for:
- the required sleep opportunity (8 hours)
 - sufficient time for the FCM's requirements of bodily functioning (i.e. eating, drinking, toileting, washing and dressing)
 - enough time to travel to and from the suitable sleeping accommodation.

CIVIL AVIATION PUBLICATIONS

B.9.1.4 In some situations, particularly when there is a long commute time, the minimum ODP, as set out in the appendices, will not be adequate to meet all these requirements and must be extended to ensure the 8 hours' sleep opportunity is still provided, as well as time for the other necessary requirements (as mentioned previously). It is primarily the responsibility of an operator to ensure that enough time is available in the ODPs / Rest Periods (both at home base and away from home base); however, it is also the responsibility of the FCM to ensure the time available is used effectively and that any issues or impediments are communicated to the operator.

B.9.1.5 It is important that an operator does not just consider the adequacy of an ODP / Rest Periods based on the time provided, but also gives due consideration to all the other factors they have control over (i.e. the location and quality of the accommodation that is provided or that is available to the FCM when they are away from home base). The location of the accommodation will impact on commuting time and also potentially the quality of sleep.

Example:

If the accommodation is next to a noisy road or work site it will reduce the quality of any sleep the FCM can achieve. The more sleep is fragmented by waking up, the less restorative value sleep has in terms of how people feel and function the next day.

B.9.1.6 When selecting accommodation, an operator must also consider the potential for interruptions/disruptions and the available control over such aspects as discussed in section 3.2 of this CAP.

Addressing cumulative fatigue

B.9.1.7 The off-duty limits that are more specific to cumulative fatigue are the requirements for 36 hours off-duty (including two local nights) in any 168 consecutive hour period as well as such longer term limits as the requirement for a number of full days off-duty in any consecutive 28 day period.

B.9.1.8 An important consideration is that, in order to start an FDP, an FCM must still meet these requirements at the projected end of the assigned FDP. This means an operator must be constantly taking into consideration the history of the FCM to determine whether the FCM can be assigned an FDP. At the end of the assigned FDP, the FCM must still have the minimum number of hours and days off-duty in the required preceding period.

Addressing trans-meridian related fatigue

B.9.1.9 For Tier 2 scheme, crossing more than two time-zones travelling east, or three time-zones travelling west increases the minimum ODP / Rest Period required following the FDP.

B.9.1.10 Once an FCM crosses two or more time-zones in an FDP from a location to which they were acclimatised, their body clock is assumed to migrate away from local time at that location, and after 36 hours have elapsed so they are no longer sufficiently aligned to be classified as acclimatised. At this point, they are considered to be in an unknown state of acclimatisation and require an adaptation period to become acclimatised to a location. While this approach is not a requirement for other appendices, in the absence of something more appropriate, this approach is advisable.

B.9.2 What should be in your operations manual

In the case of Tier 1 Scheme

An operator must have documented procedures to ensure that:

- in order to address acute fatigue—following an FDP, an FCM has at least 12 hours off- duty / rest prior to commencing another duty period
- in order to address cumulative fatigue—before commencing an FDP, an FCM has had:



CIVIL AVIATION PUBLICATIONS

- at least 36 consecutive hours off-duty, including 2 local nights, in the 168 hours before the projected end time of the assigned FDP; and
- duty not exceeding the limits given in ANTR OPS FTL 1.1210.

In the case of Tier 2 Scheme

Acute fatigue

An operator must document in their operations manual the minimum ODPs that the operator will apply to their FCMs. These periods must not be less than those required by Subpart-Q; ANTR OPS 1 and may well be greater due to the possibilities that the circumstances require a greater ODP in order to meet all obligations and still achieve an eight hour sleep opportunity.

The documented procedures must ensure that, following an FDP an FCM has an off-duty period of at least the duration as determined by the relevant calculation by which the FDP as stipulated in ANTR OPS FTL 1.1205, 1.1210, 1.1215, 1.1220, ANTR OPS FTL CS 1.1205, 1.1210, 1.1225 and Rest Period at ANTR OPS FTL 1.1235 & ANTR OPS FTL CS 1.1235 are not exceeded.

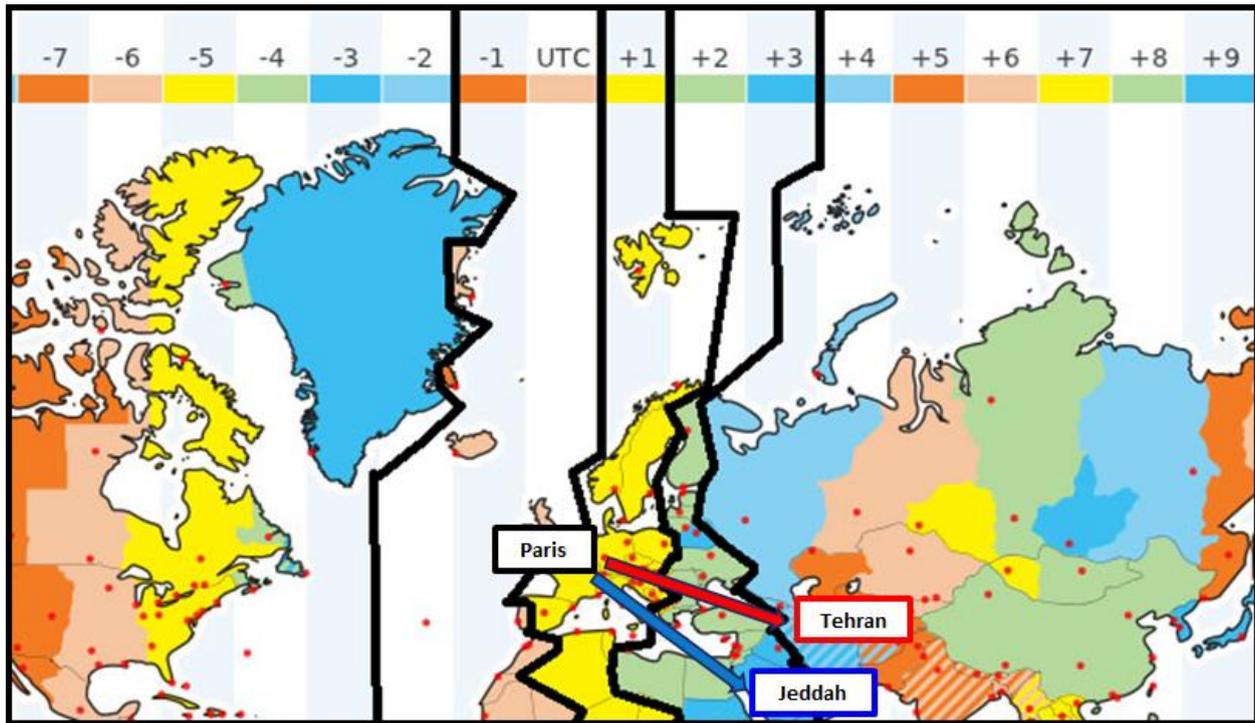
The examples are as follows:

A FCM who is in an acclimated state remains in an acclimated state as long as they remain within a zone +/-2 hours either side of the time zone in which the FCM is acclimated to.

State of Acclimatisation:

- **(D) Acclimated to Departure** – occurs when a FCM has spent sufficient time within a time zone to become acclimated to the time zone for departure.
- **(B) Acclimated to Previous Acclimated Time Zone** – occurs when a FCM has spent insufficient time within a time zone to begin the acclimatization process.
- **(X) Unknown** – when a FCM has entered a new time zone and has begun the acclimatisation process but has not spent sufficient time to adjust to the local time zone.
Example: a FCM acclimated to Paris (UTC + 1), remains acclimated as long as they remain within the following time zones: UTC -1, UTC, UTC + 1, UTC + 2, UTC + 3 at the conclusion of the duty period. Jeddah (UTC + 3) is acclimated, while Tehran (UTC + 3:30) will require the crewmember to become acclimated.

CIVIL AVIATION PUBLICATIONS



Acclimatisation process is also known as re-adaptation.

Flying across time zones exposes the circadian body clock to sudden shifts in the day/night cycle. Because of its sensitivity to light and (to a lesser extent) social time cues, the circadian body clock will eventually adapt to a new time zone.

The acclimatisation process follows **Table 1** defined in **ANTR.OPS.FTL 1.1105 Definitions**

Time difference (h) between reference time and local time where the crew member starts the next duty	Time elapsed since reporting at reference time				
	< 48	48 – 71:59	72 – 95:59	96 – 119:59	≥ 120
< 4	B	D	D	D	D
≥ 4 and ≤ 6	B	X	D	D	D
> 6 and ≤ 9	B	X	X	D	D
> 9 and ≤ 12	B	X	X	X	D

Table is to be applied when a FCM has exited the zone +/- 2 hours from the previous reference time.

Time difference between reference time zone and local time, is simply the difference between the time zone where the FCM was last acclimated to, and the time zone where a crewmember will begin the next duty.

Example: FCM is acclimated to Paris (UTC + 1) (Reference Time) and will begin the next duty period in Chicago (UTC -6), whereby the Time Difference is 7:00.

The time elapsed since reporting at reference time to the time of report of the next duty. A conversion to UTC date time will be required to calculate the elapsed time.

A Report in Paris on 15-Feb-2017 at 10:00 (Local) is 15-Feb-2017 at 09:00 (UTC), the next report in Chicago is on 16-Feb-2017 at 20:00 (Local) is 17-Feb-2017 at 02:00 (UTC), whereby the time elapsed is 40:00.

CIVIL AVIATION PUBLICATIONS

- **Case #1:** Since the elapsed time is less than 48:00 (Row 3, Column 1) the crewmember remains acclimated to Paris time (UTC + 1).
- **Case #2:** Had the departure in Chicago been postponed 24 hours, the elapsed time would be 64:00, the FCM has now moved into an unknown state of acclimatization (x) (Row 3, Column 2).
- **Case #3:** Had the departure in Chicago been postponed 60 hours, the elapsed time would be 100:00, the FCM has now moved into an acclimated state of acclimatization (Row 3, Column 4). The FCM is acclimated to Chicago Time (UTC -6).

Reference Time for the next departure is defined as follows:

1. When a FCM begins the next duty period in an **(B) Acclimated to Previous Acclimated Time Zone** state to the reference time is the time zone where that FCM was last acclimated to.
2. When a FCM begins the next duty period in an **(X) Unknown** state there is no reference time.
3. When a FCM begins the next duty period in an **(D) Acclimated to Departure** state the reference time is the local time zone where the duty period begins.
4. Should the FCM remain within the zone of acclimatisation, the reference time is the local time zone where the duty period begins.

Cumulative fatigue

An operator must have documented procedures to ensure that in order to address cumulative fatigue, before commencing an FDP or standby period, an FCM has had:

- at least 36 consecutive hours off-duty, including 2 local nights, in the 168 hours before the projected end time of the assigned FDP; and
- duty not exceeding the limits given in ANTR OPS FTL 1.1210.

Trans-meridian flight

An FCM must not undertake more than 4 consecutive FDPs in an unknown state of acclimatisation. An adaptation period must then be undertaken before the FCM can undertake another FDP. An adaptation can be undertaken at other times in order to acclimatise to the location where the adaptation period is undertaken.

As an adaptation period must be undertaken during an ODP / Rest Period, requirements for these are outlined in this section.

Table 1 in Subpart – Q of ANTR OPS 1 (ANTR.OPS.FTL 1.1105) specifies the minimum duration for an adaptation period in order to become acclimatised to the location where it is undertaken. In applying this Table to arrive at an adaptation period, the operations manual procedures should:

- determine the time zone displacement between:
 - the location where the FCM was last acclimatised (the original location)
 - each location where an FDP or ODP / rest period was commenced since last acclimatised (later locations):
- determine the time zone displacement between the original location and whichever of the later locations gives the greatest time zone displacement
- determine the time zone change in the Table that corresponds to the greatest time zone displacement
- determine the direction (east or west) in which the FCM travelled and; therefore, the greatest time zone differences as per ANTR OPS FTL 1.1235 & ANTR OPS FTL CS 1.1235
- determine the number of hours east or west (as the case requires) that corresponds to the time zone change

CIVIL AVIATION PUBLICATIONS

chosen.

The operations manual must, at a minimum, reflect the following requirements:

- an FCM is considered to remain in their state of acclimatisation (whether acclimatised to a particular location or in an unknown state of acclimatisation) until they have had:
 - an adaptation period in a location (the adaptation location) in accordance with ANTR OPS FTL CS 1.1235(b)
 - or
 - an adaptation period that is:
 - in a location other than home base
 - in accordance with ANTR OPS FTL CS 1.1235(b) except that this is reduced by 12 hours for each previous ODP that:
 - immediately preceded the adaptation period
 - was taken at an off-duty location, which differs in local time by less than 2 hours from the adaptation location
 - is an off-duty location local night.

B.10 Limit on cumulative flight time

B.10.1 Introduction

- B.10.1.1 Limiting cumulative flight time over medium and long time periods is a means of managing cumulative fatigue prescriptively by acting to reduce the capacity of an operator to assign an FCM in an intensive manner for a sustained period.
- B.10.1.2 Cumulative flight time for an FCM means the progressive total of flight time accrued by the FCM when acting as a crew member on board any aircraft, but excluding flight time accrued during recreational private operations.
- B.10.1.3 For an operator to manage cumulative flight time they must track both the flight time the FCMs record when flying in their operations over the period in question, and the flight time that FCMs accrue during non-recreational flying over the period in question.

Note: Non-recreational flying is flying conducted by an FCM in a personal capacity, and at the FCM's leisure. A flight conducted by an FCM as a private operation is not a recreational private operation if it is conducted for, or on behalf of an entity, regardless of whether or not the entity is an AOC holder.

- B.10.1.4 For this limit to be accurately applied, an operator must be recording flight time, in accordance with the definition of flight time in Subpart-Q of ANTR OPS 1 (ANTR OPS FTL 1.1105), which means:
- the total time from the moment at which the aircraft first moves under its own power for the purpose of taking-off, until the moment at which it comes to rest after landing
- B.10.1.5 Cumulative flight time limits:
- a maximum of 100 flying hours in any 28 consecutive day period
 - a maximum of 900 hours of flight time in any calendar year and
 - a maximum of 1000 flying hours in any 12 consecutive calendar month period.

Note 1: Maximum flight time of 1000 Hrs in any 12 consecutive calendar months can only be availed when full FRMS is approved for implementation.

Note 2: The flight time limit of 12 consecutive calendar month would be subject to compliance with FRMS and the flight time may be restricted between 900



CIVIL AVIATION PUBLICATIONS

& 1000 hours of flight time. The operations manual should define this scheme and approved by BCAA.

Note 3: In the case of adoption of only prescriptive type and FRMS not approved for implementation, the maximum flight time shall be limited to 900 hours in any 12 consecutive calendar months

B.10.2 What should be in your operations manual

B.10.2.1 An operator's operations manual must include:

- rostering procedures and guidelines that require tracking and consideration of each FCM's cumulative flight time
- a means of monitoring the number of hours of flight time for each FCM, thereby ensuring any FCM does not exceed the applicable limits
- guidelines that are in a form that is clear and readily available to the operator's employees who are involved in rostering activities as well as affected FCMs.

B.10.2.2 There may need to be procedures for FCMs who fly for another operator. If an FCM has flown for another operator, procedures will be required for taking these flying hours into account in assessing whether the FCM is within cumulative flight time limits.

B.10.2.3 There may need to be procedures for FCMs to include in their accumulated flying record any private flying in non-recreational activities.

An operator's operations manual must not permit an FCM to exceed the following cumulative flight time limits:

- 100 hours in any consecutive 28 day period
- 900 hours of flight time in any calendar year and
- 1000 hours in any consecutive 12 consecutive calendar month period.



CIVIL AVIATION PUBLICATIONS

B.11 Limit on cumulative duty time

B.11.1 Introduction

B.11.1.1 Limiting cumulative duty time is a means of managing the risk of excessive cumulative fatigue by limiting the total possible duty over the mid and long term.

B.11.1.2 Cumulative duty means the progressive sum of duty periods and is intended to capture any duty (including positioning) that the FCM performs for the operator.

B.11.2 What should be in your operations manual

B.11.2.1 An operator's operations manual must include:

- rostering procedures and guidelines that clearly require tracking and consideration of each FCM's cumulative duty time
- a means of monitoring the number of hours of duty time for each FCM ensuring any FCM does not exceed the applicable limits
- guidelines that are in a form that is clear and readily available to the operator's employees who are involved in rostering activities as well as affected FCMs.

B.11.2.2 There may need to be procedures for FCMs who works for another operator. If an FCM works for another operator, procedures should consider this duty time when calculating cumulative duty. If the extra duty means that the FCM would exceed the cumulative duty limits, this would represent a fatigue hazard, which must be managed accordingly.

In the case of Tier 1 Scheme

There are no limits on cumulative duty under this scheme because it was determined that other restrictions on what was possible in terms of duty were sufficient to manage cumulative fatigue.

In the case of Tier 2 Scheme

An operator's operations manual must not permit an FCM to exceed the following cumulative duty limits:

- 60 hours in any 7 consecutive day period
- 110 hours in any 14 consecutive day periods.
- 190 hours in any 28 consecutive day periods.

CIVIL AVIATION PUBLICATIONS

B.12 Limits on late night operations (LNOs)

B.12.1 Introduction

B.12.1.1 In all industries that have been studied, there is evidence of an increase in error rate and accidents after four late night duties or night-shifts in a week. Late night FDPs not only require the FCM to be on duty and flying when their body is predisposed to sleeping but also it means that they did not sleep during the period when their body usually achieves the most efficient sleep. Continuing to assign an FCM late-night FDPs results in increased cumulative fatigue and requires a longer recovery period than FDPs assigned during the day.

B.12.1.2 In shift work, forward rotating systems involve changing from morning shifts to afternoon shifts, and then from afternoons to nights. So-called backward rotating systems involve changes in the opposite direction (i.e. from morning shifts to night shifts etc.). Forward rotating systems are also known as delaying shift systems. They are defined this way because the change from one shift to the next involves delaying the phase of the body clock (i.e. effectively extending the day by remaining awake for longer).

B.12.1.3 There is strong evidence that, in contrast to backward rotation of duty period start times, forward rotation of duty start time results in improved sleep quality and length through quicker adaptation by the body.

B.12.1.4 If an FCM is assigned an LNO FDP, and the next FDP is also an LNO, it must not commence less than 24 hours after the start time of the first LNO FDP.

B.12.2 What should be in your operations manual Tier 1 scheme

No more than 3 FDPs that take place at a time later than 2200 hours may be undertaken in any 7 consecutive 7 Day. There is no specific 'late night operations' clause for the Tier 1 scheme

In the case of Tier 2 Scheme

An operator must develop rostering procedures and guidelines that clearly require tracking of LNO FDPs over consecutive 7 Days periods. These procedures must also identify and track those FDPs that become LNOs due to re-assignment.

Note: An extension to an FDP that results in an FCM finishing an FDP that was assigned to finish before 2330 and further being re-assigned to finish after 2330 is not considered an LNO for the purposes of this limit.

The operations manual must contain procedures and guidelines that:

- adequately manage the roster limits on LNOs
- identify within the more tactical decision making procedure (i.e. day-of-operations decisions) the potential for the LNO provision to limit further assignment of an FDP or standby LNO (must be in accordance with Table 5).

When rostering FCMs for a proposed FDP (even if the proposed FDP is not a LNO) the number of LNOs conducted within the week preceding the proposed FDP need to be considered. The following table shows the manner in which the number of LNOs needs to be considered alongside the number of other FDPs when determining whether the proposed FDP can go ahead.

CIVIL AVIATION PUBLICATIONS

LNOs limits

In any consecutive 168 hour period		Allowable FDP under LNOs Limits	
Number of LNOs	Total FDPs (including LNO FDPs)	Is a further FDP allowed in 168 hour period?	Can next FDP be a LNO FDP?
2	4 or more	Yes	No
3	3	Yes	Yes
3	4	No	N/A
4	4	No	N/A

As an FDP conducted in an unknown state of acclimatisation does not count as a late night operator (regardless of the time it is conducted), operators complying with tier 2 scheme must also consider the number of FDPs conducted in an unknown state of acclimatisation. The operations manual procedures must reflect that during any 168 consecutive hour period if 2 or more FDPs involve an LNO, and 1 or more FDPs are conducted in an unknown state of acclimatisation, a maximum of 4 FDPs may be undertaken during that period.

There must be evidence of procedures that require that the start time for a subsequent FDP after an LNO FDP is no earlier than the start time of the LNO FDP.

B.13 Reserve

B.13.1 Introduction

If an operator assigns crew members to reserve, the following requirements shall apply in accordance with the certification specifications applicable to the type of operation:

- (a) reserve shall be in the roster;
- (b) flight time specification schemes shall specify the following elements:
 - (1) the maximum duration of any single reserve period;
 - (2) the number of consecutive reserve days that may be assigned to a crew member

B.13.2 What should be in your operations manual Tier 1 scheme

The operator shall develop a procedure on assignment of duties to a crew member on reserve could comply with the provisions of **ANTR.OPS.FTL 1.1230** that:

- (a) FCMs assigned FDPs counts from the reporting time.
- (b) Reserve times do not count as duty period for the purpose of ANTR.OPS.FTL.CS 1.1210 and ANTR.OPS.FTL. 1.1235.
- (c) The maximum number of consecutive reserve days are within the limits of ANTR.OPS.FTL. 1.1235 (d).
- (d) An 8-hour sleep opportunity is protected and the rostered period of 8 hours, accounted the fatigue management principles, for each reserve day during which a crew member on reserve is not contacted by the operator.



CIVIL AVIATION PUBLICATIONS

Appendix C

Example fatigue occurrence report



CIVIL AVIATION PUBLICATIONS

If you wish to treat this contents confidential please tick here					<input type="checkbox"/>					
Name:		Position:		ID No.	Dt. Of Birth	Home Base				
This form is being completed in relation to and assessment of fatigue as part of FRMS										
<input type="checkbox"/> A lodged incident report		<input type="checkbox"/> A FDP Extension		<input type="checkbox"/> A non-reported safety event		<input type="checkbox"/> A general concern regarding fatigue				
When did the event occur?		Dt. DD / MM / YY		Time: (Local/UTC) _____ Hrs _____ Min		How long had you been on duty? _____ Hrs _____ Min				
What were you doing at the time of the event?		<input type="checkbox"/> At Home	<input type="checkbox"/> Driving to work	<input type="checkbox"/> In flight	<input type="checkbox"/> Driving home	<input type="checkbox"/> Positioning <input type="checkbox"/> Others				
If relevant, on what flight did the event occur?		Flight No.: _____		Route: _____		Sector: _____ A/C Type: _____				
Fatigue Details:										
Title:										
Description:										
Cause:										
Action & Result:										
Suggestions:										
Contributory Factors: Tick all factors that contribute to the event / your general concern			Commute		Sleep History					
<input type="checkbox"/> Commute <input type="checkbox"/> Deep night <input type="checkbox"/> Delay(s) <input type="checkbox"/> Health <input type="checkbox"/> Home issues <input type="checkbox"/> Home rest <input type="checkbox"/> Hotel rest <input type="checkbox"/> Insufficient rostered rest time <input type="checkbox"/> Early to late transition <input type="checkbox"/> Late to early transition			<input type="checkbox"/> Early start time <input type="checkbox"/> Late finish time <input type="checkbox"/> Long duty day <input type="checkbox"/> Long term fatigue <input type="checkbox"/> Positioning <input type="checkbox"/> Roster disruption <input type="checkbox"/> Illness / Medication <input type="checkbox"/> Don't know <input type="checkbox"/> Others (please add details above)		Duration of commute from home to home base: _____ Hrs. _____ Min Duration of commute on days off to home base (if living in alternative accommodation during the duty block) _____ Hrs. _____ Min		For 72 hours prior to the reported event, record the start and finish times for all sleep periods (including naps)			
									Date	Time (Local / UTC)
							Start			
							Finish			
							Start			
							Finish			
							Start			
							Finish			
							Start			
							Finish			
Tick all physical and cognitive signs of fatigue that were present in the 2 Hours leading up to the event and any counter measures used										
Physical Signs			Cognitive Signs		Counter Measures					
<input type="checkbox"/> No physical signs were noted <input type="checkbox"/> Fidgeting <input type="checkbox"/> Rubbing eyes <input type="checkbox"/> Yawning <input type="checkbox"/> Frequent blinking <input type="checkbox"/> Staring blankly <input type="checkbox"/> Long blinks <input type="checkbox"/> Difficulty in keeping eyes open <input type="checkbox"/> Head nodding <input type="checkbox"/> Others _____			<input type="checkbox"/> No cognitive signs were noted <input type="checkbox"/> Impaired attention <input type="checkbox"/> Impaired memory <input type="checkbox"/> Negative mood <input type="checkbox"/> Reduced communication <input type="checkbox"/> Impaired problem solving <input type="checkbox"/> Increased risk taking <input type="checkbox"/> Impaired situation awareness <input type="checkbox"/> Others _____		<input type="checkbox"/> No countermeasures were used <input type="checkbox"/> Advised colleague of fatigue risk <input type="checkbox"/> coordinated workload <input type="checkbox"/> Caffeine <input type="checkbox"/> Food and drink <input type="checkbox"/> Cockpit napping <input type="checkbox"/> Others _____					
How alert did you feel immediately prior to the event (tick one)	<input type="checkbox"/> 1 Fully alert, wide awake	<input type="checkbox"/> 2 Very lively, somewhat responsive not at peak	<input type="checkbox"/> 3 OK, Somewhat fresh	<input type="checkbox"/> 4 A little tired, less than fresh	<input type="checkbox"/> 5 Moderately tired, let down	<input type="checkbox"/> 6 Extremely tired, very difficult to concentrate	<input type="checkbox"/> 7 Completely exhausted			



CIVIL AVIATION PUBLICATIONS

Appendix D

Hazard identification and associated procedures (Tier 2)



CIVIL AVIATION PUBLICATIONS

- D.1.1 Operators should consider their own circumstances using prior company experience or discussions with other operators and groups so that hazard identification measures may be included within their operations manual.
- D.1.2 The following table is an illustration of what BCAA considers a reasonable approach to hazard identification for an operator without an established risk assessment process. Operators are reminded that it may be possible to reduce the identified hazard through means other than limiting flight or duty times.
- D.1.3 These are a sample of fatigue hazards which may exist for some operators. This list is not specific to any particular operation type, but is intended to inform operators who may not be experienced in SMS-type processes about how hazards may be mitigated for the purposes of complying with the Tier 2 operator obligations. If an operator has an approved SMS, the processes within the SMS could, and should, be used for the purposes of complying with those obligations.

CIVIL AVIATION PUBLICATIONS

Table : Hazard identification

Identified Hazard	Limitation Adjustment	Policies and Practices Considerations
Layover port accommodation located 1 hour from airport	Minimum ODP / Rest Period increased by 2 hours at this port.	
Layover port accommodation undergoing renovations causing sleep disruption to FCMs	Maximum FDP following an off-duty period at this accommodation reduced by 2 hours.	Flights scheduled to permit ODPs / Rest Period to be undertaken during times when renovations are not taking place.
Reports of FCMs being unable to achieve 8 hours sleep on layovers at a particular port where minimum off-duty period is provided	ODPs / Rest Period at this port increased by 1 hour.	Following minimum off-duty at this port require that all FCMs complete a survey and psychomotor vigilance test (PVT) before commencing the FDP. Only allow FCMs to be assigned one layover at this port in every 7 days.



CIVIL AVIATION PUBLICATIONS

Appendix E

Alertness consideration table

CIVIL AVIATION PUBLICATIONS

E.1 General

- E.1.1 This table presents an example method to consider the fatigue risk involved when determining fitness for duty. It is called the alertness consideration table (ACT) and instructions for how to use it are provided.
- E.1.2 The ACT involves answering three questions that relate to perceived alertness, prior sleep and duty timing. Through the duty risk section, there may need to be a reference to the operator's SMS that will have information that addresses level of workload risk.
- E.1.3 The answers to the questions are coded and combined to enable the employee to determine what the employee may need to consider when determining whether to undertake this duty in its current form. If there is a suspected fatigue risk involved, the FCM needs to measure alertness, discuss with a supervisor whether the alertness level is suitable for this duty and consider how the risk can be effectively mitigated.

E.2 Instructions for using the ACT prior to a duty

E.2.1 Question 1 – How alert are you feeling?

- E.2.1.1 Question 1 involves the FCM rating their current alertness (ideally close to their report time) using one of the seven options on the alertness scale. The result falls into one of three bands of risk – low, moderate or high.
- E.2.1.2 If high risk, the FCM must consider discussing this with team members or their supervisor and may need to address the risk through applying previously defined risk control measures (i.e. extended rest periods or task rotation). If a decision is made to continue with the duty, proceed to Question 2.

E.2.2 Question 2 – Have you had adequate sleep?

- E.2.2.1 Question 2 involves the FCM using accruing points based on their sleep in the prior 24 hours, 48 hours, and hours awake at the end of the duty. The points sum to produce a final score, which is categorised in terms of risk as low, moderate, or high.
- E.2.2.2 If the result is high risk, the FCM must consider discussing this with team members or their supervisor and may need to address the risk through applying previously defined risk control measure (i.e. extended rest periods or task rotation). If a decision is made to continue with the duty, proceed to Question 3.

Note: While 48 hours is used in this table, this is because the table focuses almost entirely on acute or transient fatigue, and the assumption is that the FCM was well rested prior to this point. If the FCM has a longer period of disrupted or restricted sleep, then they should consider this cumulative fatigue will increase the fatigue risk. An increased cumulative fatigue will increase the risk associated with subsequent shorter than required sleep periods identified in the table. FCMs should put more weight on any symptoms (response to question 1) and take a more conservative approach to any heightened risk identified by using this table.

E.2.3 Question 3 – What time does the duty occur?

- E.2.3.1 Question 3 involves the FCM classifying their duty based on the time of day that the duty occurs. The result falls into one of three bands of risk – low, moderate or high.
- E.2.3.2 They then continue to Question 4.



CIVIL AVIATION PUBLICATIONS

E.2.4 Question 4 – What level of operational risk is associated with the duty?

- E.2.4.1 Question 4 involves the FCM classifying the level of operational risk associated with the duty.
- E.2.4.2 It is understood that the accumulation of fatigue will eventually diminish performance and increase error rate, to the point where the FCM becomes ‘fatigue impaired’, or simply too tired for the job intended. Aviation systems should be able to tolerate some human error and diminished performance capability, but very often task demands can increase, due to unforeseen circumstances. Consequently, what was previously acceptable in terms of an acceptable performance/error level now becomes unacceptable.
- E.2.4.3 This CAP is about the management of fatigue risk; however, operators need to also manage workload level. Fatigue risk interacts with other areas of human performance (i.e. as workload and task complexity) and all of these risks need to be addressed. Workload risk can be addressed through general risk management processes, contained within the operator’s SMS.
- E.2.4.5 For fatigue risk, an FCM should consider what factors are associated with the tasks allocated to them prior to presenting as fit for duty. This is because it has been well researched that reduced alertness (or the accumulation of fatigue) impacts on ‘real world skills’. FCMs, teams and operators should consider fatigue risks that may be present in conjunction with other risks, such as:
- the type of task being undertaken
 - the nature of the airspace
 - weather considerations
 - airport demands
 - aircraft serviceability.
- E.2.4.6 Operators and FCMs should recognise that tasks that involve cognitive performance (e.g. decision making, memory capacity) and threat and error management can potentially be poorly measured or mismanaged by an FCM who is fatigued.
- E.2.4.7 Using ACT, the FCM continues to the final step, in order to assist their determination of whether they may have adequate alertness to undertake the duty.

E.3 Determine the fatigue risk level and what may need to be considered when determining whether to undertake this duty

- E.3.1 Based on the results for Questions 1-4, the FCM can use the table provided to gauge the degree to which fatigue risk may be present during this duty. Together with measured levels of alertness, FCMs can begin discussing how to manage possible risks with their supervisor and subsequently develop an effective risk management plan.



CIVIL AVIATION PUBLICATIONS

Sleep requirements (user customisable)

Whilst it is easy to understand that adequate sleep is a prerequisite for an alert FCM, the notion of adequate sleep is subject to individual variability. This is further complicated by the tendency to overestimate the amount, and quality, of sleep we actually get. As a general guide an individual who was previously well rested requires at least 6 hours sleep in 24 hours, and 13 hours in 48 hours to remain adequately alert.

An FCM can develop section 2 of the ACT to suit themselves. The blue highlighted numbers in section 2, can be individualised. If the FCM believes the numbers are too low because they generally need more sleep than the average person and increasing them by 1 hour would better reflect their sleep needs, then each of the numbers to the left should also be increased by 1 hour. A good place to start is for an individual understanding how much sleep is needed to feel well rested. This may be ascertained after a day or two of waking normally (to dissipate any accumulated sleep debt). Once this figure is recognised, then a basis is formed for suggesting what reduction from this figure over a 24 and 48 hour period may lead to the risk rising until the accumulated sleep debt becomes too much. As a general guide, if starting from a well-rested state, less than 13 hours sleep in the last 48 hours and 6 in the last 24 hours should be considered significant.

It must be emphasised that the figures in this section of the tool can be tailored to account for individual needs. The average sleep needed is 7-8 hours to consistently feel well rested; however, some people may require only 6 hours and some 10 hours.



CIVIL AVIATION PUBLICATIONS

Fatigue Risk Assessment

1. How alert are you feeling? (rate just prior to start of duty)		Risk Result (1)
1	Fully alert, wide awake	LOW
2	Very lively, responsive, but not at peak	
3	Okay, somewhat fresh	
4	A little tired, less than fresh	Moderate
5	Moderate tired, let down	
6	Extremely tired, very difficult to concentrate	High
7	Completely exhausted, unable to function effectively	
<p>IF "HIGH RISK" IS INDICATED CONSIDER RISK CONTROLS, SUCH AS NAPPING, TASK ROTATION OR ADVISING THE OPERATOR YOU ARE NOT FIT FOR DUTY</p>		

2. Have you had adequate sleep?		Points	
i) At start of duty how much sleep will you have had in last 24 hours? (Value 'X') X= __ _ Hours-----→ X: ≤3h 4h 5h 6+h Points: 12 8 4 0		Enter Points in Box ----- →	
ii) At start of duty how much sleep will you have had in last 48 hours? (Value 'Y') X= __ _ Hours-----→ Y: ≤8h 9h 10h 11h 12h 13+h Points: 10 8 6 4 2 0		Enter Points in Box ----- →	
iii) At end of planned duty how many hours will you have been awake, minus any time allocated for a rest period at suitable sleeping accommodation, or in-flight crew rest facility when part of an augmented crew? (Value 'Z'). Z = __ _ Hours			
iv) If $Y < Z$, subtract hours of sleep obtained in last 48 hours (Y) from hours of awake (Z). Convert resulting figure to points (1 hour = 1 point). Enter Points in Box ----- →			
ADD POINTS ABOVE TO DETERMINE YOUR SCORE -----→			
Score	RISK RESULT (2)		
0-4	Low		
5-8	Moderate		
9+	High		
<p>IF 'HIGH RISK IS INDICATED CONSIDER RISK CONTROLS, SUCH AS NAPPING, TASK ROTATION OR ADVISING THE OPERATOR YOU ARE NOT FIT FOR DUTY.</p>			



CIVIL AVIATION PUBLICATIONS

3. What time does the duty occur?	Risk Result (3)
All hours of the duty occur between 0800-2200	LOW
Other	Moderate
Part of the duty occur between 0200-0600	High
4. What level of generic risk is associated with the duty? (consider route, airports, airspace, level of crew experience, the aircraft features and serviceability and the weather conditions)	Risk Result (4)
Description	
All considerations rated low risk	Low
At least one consideration rated moderate risk	Moderate
At least other considerations rated high risk	High

5. Based on the results for (1) to (4) use the table below to determine what you may need to consider when determining whether to undertake this duty.					
Risk Results	Example				Alertness Considerations
	(1)	(2)	(3)	(4)	
High risk response to Q1 or Q2	Red	Grey	Grey	Grey	High risk: Measure of level of alertness using objective and subjective methods, discuss with your supervisor why your alertness level may not be sufficient for this duty and consider a rostering alternative to manage the risk (eg. Augmented crew, longer rest period)
All moderate with at least 1 High	Yellow	Yellow	Red	Yellow	
Any combination of Low, Mod or High	Yellow	Yellow	Green	Red	Moderate risk: Measure of level of alertness using objective and subjective methods, discuss with your supervisor whether your alertness level is suitable for this duty and consider the use of additional mitigation strategies (eg. napping, task rotation)
2 Low, 2 High	Green	Green	Red	Red	
All Moderate	Yellow	Yellow	Yellow	Yellow	
Any combination of Low or Moderate	Yellow	Yellow	Green	Green	Low Risk: Measure of level of alertness using objective and subjective methods, discuss with your supervisor whether your alertness level is suitable for this duty and consider beneficial fatigue risk controls for this duty (eg. Caffeine use, nutrition)
3 Low and 1 High	Green	Green	Green	Red	
All Low	Green	Green	Green	Green	