Australian Government
Civil Aviation Safety Authority

CAO 48.1 Instrument 2019 - Appendix 1-6 Technical Assessor Handbook

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This document contains guidance material intended to assist CASA officers, delegates and the aviation industry in understanding the operation of the aviation legislation. However, you should not rely on this document as a legal reference. Refer to the civil aviation legislation including the Civil Aviation Act 1988 (Cth), its related regulations and any other legislative instruments—to ascertain the requirements of, and the obligations imposed by or under, the law.

Preface

As a Commonwealth government authority, CASA must ensure that the decisions we make, and the processes by which we make them, are effective, efficient, fair, timely, transparent, properly documented and otherwise comply with the requirements of the law. At the same time, we are committed to ensuring that all of our actions are consistent with the principles reflected in our Regulatory Philosophy.

Most of the regulatory decisions CASA makes are such that conformity with authoritative policy and established procedures will lead to the achievement of these outcomes. Frequently, however, CASA decision-makers will encounter situations in which the strict application of policy may not be appropriate. In such cases, striking a proper balance between the need for consistency and a corresponding need for flexibility, the responsible exercise of discretion is required.

In conjunction with a clear understanding of the considerations mentioned above, and a thorough knowledge of the relevant provisions of the civil aviation legislation, adherence to the procedures described in this manual will help to guide and inform the decisions you make, with a view to better ensuring the achievement of optimal outcomes in the interest of safety and fairness alike.

Shane Carmody
Chief Executive Officer and
Director of Aviation Safety

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Glossary

Acronyms and Abbreviations

Acronym / Abbreviation	Description
ALARP	As low as reasonably practical
AOC	Air Operator Certificate
CAAP	Civil Aviation Advisory Publication
CAO	Civil Aviation Order
CAR	Civil Aviation Regulations 1988
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Regulations 1998
FCM	Flight Crew Member
FDP	Flight Duty Period
FOI	Flight Operations Inspector
FRMS	Fatigue Risk Management System
FTL	Flight and Duty Time Limits
LNO	Late night operation
ODP	Off-duty period
ICAO	International Civil Aviation Organization
IFR	Instrument flight rules
ODP	Off-duty period
SARP	Standards and Recommended Practices
SMS	Safety Management System
SSI	Safety Systems Inspector
RPT	Regular Public Transport

Definitions - as per CAO 48.1 Instrument 2019 and this Handbook

Term	Definition
Assessor	For the purposes of this handbook, the term assessor refers to a CASA Flying Operator Inspector (FOI) or Safety Systems Inspector (SSI) who is suitably qualified, trained and experienced in undertaking the referenced assessment
Assessor Worksheet	A Microsoft Excel spread sheet for recording outcomes and decisions to legislative assessment questions
Operator	Either an Air Operator Certificate (AOC) holder or in the case of a Part 141 flying training school, the certificate holder
Part 141 operator	Has the same meaning as in subregulation 141.015(3) of CASR 1998 **Note:** In subregulation 141.015(3) of CASR 1998, a Part 141 operator is defined as the holder of a Part 141 certificate. Generally, a reference in this handbook to an AOC holder, or holder, is taken to include a Part 141 operator
Part 141 training	Has the same meaning as in subregulation 141.015(1) of CASR 1998 but does not include flight training that is conducted exclusively in a flight simulation training device, flight simulator or a flight training device
Part 141 certificate	Has the same meaning as in subregulation 141.015(4) of CASR 1998 **Note:** in subregulation 141.015(4) of CASR 1998, a Part 141 certificate is defined as a certificate issued under regulation 141.060 of CASR 1998. A reference in this handbook to an AOC is taken to include a Part 141 certificate
Part 142 operator	Has the same meaning as in subregulation 142.015(4) of CASR 1998
Part 142 activity	Has the same meaning as in subregulation 142.015(1) of CASR 1998

Term	Definition
Part 142 flight training	Has the same meaning as in subregulation 142.015(2) of CASR 1998. An AOC holder who is a Part 142 operator engaged in Part 142 flight training (other than exclusively in a flight simulator or a flight training device) must comply with the limits and requirements for FCMs mentioned in one or more of the following: • the limits and requirements specified in Appendix 1 • the limits and requirements specified in Appendix 4 • the limits and requirements specified in Appendix 6 • if the Part 142 operator has a Fatigue Risk Management System (FRMS) approved for implementation by CASA in accordance with Appendix 7 — the limits and requirements specified in Appendix 7. Each FCM of the Part 142 operator must comply with the limits and requirements mentioned in the subparagraph or subparagraphs to which the operator has chosen to comply.
Part 142 activity that is not Part 142 flight training	An AOC holder who is a Part 142 operator engaged in one or more of the following (other than exclusively in a flight simulator or training device): • contracted recurrent training; • contracted checking; Must comply with the limits and requirements for FCMs mentioned in one or more of the following: • the limits and requirements specified in Appendix 1 • the limits and requirements specified in Appendix 4 • the limits and requirements specified in Appendix 5 • if the Part 142 operator has a Fatigue Risk Management System (FRMS) approved for implementation by CASA in accordance with Appendix 7 — the limits and requirements specified in Appendix 7. Each FCM of the Part 142 operator must comply with the limits and requirements mentioned in the subparagraph or subparagraphs to which the operator has chosen to comply
Public Transport Service	A Regular Public Transport (RPT)

References

Legislation and Guidance Material

Document type	Title
Instrument	Civil Aviation Order 48.1 Instrument 2019
CAAP	CAAP 48-01 - current revision from CASA website

Revision History

Revisions to this manual are recorded below in order of most recent first.

Version no.	Date	Parts/Sections	Details
2.0	September 2020	Title change All	Title change from "CAO 48.1 Tier 1 and 2 FTL Assessor Handbook" to "CAO 48.1 Instrument 2019 Appendix 1-6 Technical Assessor Handbook". Document amended to incorporate CAO 48.1 Instrument 2019 changes
1.1	October 2014	C2.2.2	Amend sentence an FCM must have 10 consecutive hours of sleep opportunity if away from home base within 10 hours immediately preceding the start of an FDP to an FCM must have 8 consecutive hours of sleep opportunity if away from home base within 10 hours immediately preceding the start of an FDP to correct error
1.0	July 2014	All	Initial issue

Part A Introduction to this Handbook

A1 Purpose of this handbook

CASA has developed this handbook and its associated Assessor Worksheet (referenced in Appendix 1 of this handbook) to provide a common and consistent assessment methodology for CASA delegates and authorised persons who exercise powers under the *Civil Aviation Regulations 1988* (CAR) or the *Civil Aviation Safety Regulations 1998* (CASR).

The information provided in this handbook and associated worksheet serves two main functions:

1. Sets a framework and describes the many factors that need to be considered for a decision maker to ensure the relevant section/s of an operations manual is compliant with Australian aviation law; and
2. Ensures a national standard and unified approach that is consistent with regulatory requirements and promotes transparency of CASA-wide policy, procedures and legislation.

Adhering to the procedures and guidance information contained in this handbook and associated worksheet ensures a standardised assessment outcome in a manner consistent with CASA legislation and policy.

A1.1 Who is this handbook for?

The persons who use this handbook include suitably qualified, trained and experienced Flying Operations Inspectors (FOIs) and Safety System Inspectors (SSIs) who are required to assess an operations manual compliance with applicable legislation. For the purposes of this handbook, such inspectors are referred to as an assessor or the assessors.

A1.2 How to use this handbook

This handbook is to be used in conjunction with the associated Assessor Worksheet (referenced in Appendix A of this handbook).

The function of this handbook and its associated worksheet is to provide the regulatory questions in the assessor worksheet that an assessor must consider, as a minimum, before making the decision to accept an operations manual. This handbook is to expand on those questions by providing an understanding of the question (through things for consideration).

This handbook is not intended to be a duplication of the worksheet questions but to provide the assessor with an understanding of what would be considered acceptable for an applicant to satisfy the assessment criteria.

This handbook has been developed in parts to improve the ease of use by the assessor. Part A includes introductory and policy information, Part B includes information on the assessment process and Part C describes the things for consideration. The things for consideration correspond to the assessment questions in the associated assessor worksheet.

The assessor worksheet is designed to facilitate the assessment process and stand as an auditable record of the assessment. The worksheet is a Microsoft Excel document with various filtering and sorting functionalities and has been created for electronic completion. The

worksheet contains a number of sheet Tabs, one of which is the User Instructions, which should be read prior to commencing an assessment.

A1.3 What this handbook covers

This handbook includes the process and assessment elements required of an operator to ensure compliance with *Civil Aviation Order 48.1 Instrument 2019* (CAO 48.1 Instrument 2019).

The assessment criteria in Part C of this handbook includes a number of things for the assessor to consider in determining if an operator has satisfied the applicable assessment questions in the assessor worksheet.

A1.4 What this handbook does not cover

This handbook does not cover how an assessor will make a decision about whether CASA should accept an operations manual. It assumes that the assessor/s are suitably qualified, trained and experienced in accurately assessing the quality of an operations manual for the purposes of ensuring satisfactory compliance.

This handbook does not provide the administrative entry control processes for application for a new AOC. Processes such as application management, cost recovery, allocation of tasks are detailed on the CASA website and Air Operator Certificate Manual.

Although this handbook provides guidance information, the ultimate decision as to whether the information presented is suitable, complies with relevant legislation and does not impose safety concerns must be made by the assessor.

A1.5 Where to go for further assistance

To obtain further assistance with any of the information contained within this handbook and associated appendices, contact the Human Performance Team via the Fatigue Management Mailbox FATIGUE.MANAGEMENT@casa.gov.au

A1.6 Associated CASA regulatory and technical documentation

This handbook supports and partners with the following CASA regulatory and technical documentation:

- Section 9A of the *Civil Aviation Act 1988* (the Act)
- Section 28BA of the Act
- Regulations 5, 5.55 ,210A and 215 of the *Civil Aviation Regulations 1988* (CAR)
- Civil Aviation Order 48.1 Instrument 2019
- Civil Aviation Advisory Publication (CAAP) 48-01 (current version)

While all efforts have been made to ensure the accuracy of this handbook and the associated Assessor Worksheet, should any discrepancy be noted, CAO 48.1 (2019) prevails in all circumstances.

A1.7 Other referenced material

The following material has been referenced during the development of, and/or is associated with, this handbook:

- International Civil Aviation Organization (ICAO) documents:
  - ICAO Annex 6 Standards and Recommended Practices
  - definitions used by ICAO, specifically in Attachment A of Annex 6, Part I to the Convention on International Civil Aviation (the Chicago Convention)
  - ICAO Manual for the Oversight of Fatigue Management Approaches (Doc 9966)
  - Appendix 8 of ICAO Annex 6, Part I to the Chicago Convention
  - ICAO Fatigue Management Guide for Airline Operators
  - ICAO Fatigue Management Guide for General Aviation Operators of Large and Turbojet Aeroplanes
- CAAP SMS-1(1.1) Safety Management Systems for Regular Public Transport Operations
- https://www.casa.gov.au/safety-management/safety-management-systems/safety-management-system-resource-kit

A2 Civil Aviation Order 48.1 Instrument 2019

A2.1 Background

Previously, CAO Part 48 (comprising CAO 48.0, CAO 48.1, CAO 48.2, CAO 48.3 and CAO 48.4) contained flight and duty time limits and related rules for Pilots, Flight Engineers, Flight Navigators and Flight Radio Operators. Exemptions from some or all of the requirements of these CAOs were issued to some operators under paragraph 4.1 of CAO 48.0. These exemptions took the form of three alternative means:

- an individual exemption specific to that Air Operator Certificate (AOC) holder
- prescriptive limits contained in Standard Industry Exemptions (SIEs), which are 'class of operation' specific
- safety case based fatigue management system (FMS).

In July 2011, the ICAO issued Standards and Recommended Practices (SARPs) requiring States to establish regulations for the purpose of managing fatigue based upon scientific principles and knowledge. The ICAO SARPs require regulations for fatigue risk management under a prescriptive rule regime and if the state wished to offer it, under FRMS.

CAO 48.1 Instrument 2013 was CASA's regulatory response to the ICAO SARPs. This instrument was amended by CASA in July 2016 to include new appendices to cover ballooning, medical transport and emergency services and daylight only aerial work operations including helicopter mustering.

In July 2017 the CASA Board directed an independent review of the new fatigue rules in response to feedback received from various sections of the aviation community. In March 2018 the independent review confirmed the need to modernise Australia's fatigue rules for air operators and pilots. CASA accepted 21 of the 24 review recommendations and consulted publicly on the recommendations and sought advice from the Aviation Safety Advisory Panel and an industry Technical Working Group.

As a result of this activity, CAO 48.1 Instrument 2019 was produced and came into effect on 2 September 2019, and was subsequently amended in June 2020.

CAO 48.1 Instrument 2019 currently addresses AOC holders and their employed flight crew members (FCMs). It repeals CAO Part 48 from 30 June 2021. Further information relevant to transition dates and the application of these to various authorisation holders is available in the legislation. The CAO 48.1 Instrument 2019 replaces the repealed CAOs and the exemptions with what is the first part of a phased approach to the comprehensive regulation of fatigue risk management in aviation operations. Other elements of the aviation industry, for example cabin crew, will be addressed in the future.

A2.2 Purpose

The purpose of CAO 48.1 Instrument 2019 is to provide operators and FCMs with a comprehensive regulatory framework for the more effective management of fatigue risk in aviation operations.

This new framework replaces the previous rules for FCMs contained in CAO Part 48. The CAO 48.1 Instrument 2019 also provides a process to allow existing AOC holders and Part 141 operator to voluntarily "opt-in" to the new management arrangements before 30 June 2021 if they so choose.

From 30 April 2013, it became a condition on a flight crew licence that the licence holder must, in-effect take into account circumstances that may create the potential for fatigue impairment that surround a proposed flight and manage the risk appropriately . This may result in a decision not to operate an aircraft if the flight crew member considers they are unfit, or likely to become so.

A2.3 Compliance

Whilst no specific approval is granted for operators wishing to be compliant with CAO 48.1 Instrument 2019 Appendices 1 to 6, section 28 (1)(b)(vi) of the Civil Aviation Act states that the delegate must be satisfied that *'the organisation has suitable procedures and practices to ensure that … operations can be conducted … safely'*. As such CASA must be satisfied each AOC holder or Part 141 operator has complied with at least one appendix that is appropriate for their operations.

The CAO 48.1 Instrument 2019 appendices are as follows:

Appendix 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 1 am and morning civil twilight/7am, whichever is earlier.

Appendix 2 is available to operators that conduct operations with multi-pilot procedures (except flight training). As well operations which involve multi-pilot certified aircraft, the appendix is also available to operators who conduct operations with 2 or more pilots in a single-pilot certified aircraft.

While operations that involve contracted checking or contracted recurrent training conducted as a multi-pilot operation are permitted under Appendix 2, flight training for the grant of a licence, rating or endorsement must not be conducted under this appendix.

Appendix 3 is available to multi-pilot operations as per Appendix 2 but excludes 'complex operations and flying training'. A complex operation is one that involves augmented crew operations (carrying more than the minimum number of FCMs for the purpose of relieving one or more FCMs of duty during flight time), operations that involve a displacement time of 2 hours or more (where a time zone change from the beginning to the end of the duty period is 2 hours or more), or operations where an FCM is not acclimatised to the location where they commence an FDP.

Simple multi-pilot operations that do not cross time zones may find Appendix 3 more suitable than Appendix 2. Appendix 2 is also available to these operators and the resulting limitations would be the same, however, Appendix 3 does not have the complexity of Appendix 2.

Appendix 4 is designed for single pilot operations, however, nothing prevents an operator using this appendix for multi-pilot, aerial work or flight training operations. Use of a single appendix for all operations can significantly simplify fatigue management procedures.

Appendix 4A is available and designed specifically to operators that operate balloons.

However, nothing prevents a balloon operator from choosing either Appendix 1, 4 or 7 instead of this appendix.

Appendix 4B is designed only for medical transport and emergency service operations. For an operator to conduct an operation under Appendix 4B, the operation must be a medical transport operation, or an emergency service operation. These terms have specific meanings

in CAO 48.1 Instrument 2019. The appendix is designed around the operating characteristics in this segment of the industry with tolerance for a different fatigue risk profile due to the time-critical nature of the medical or emergency operation.

For an operation to be classified as a medical transport operation, there must be procedures in place that set out the means and considerations by which the medical transport tasker (medical personnel or an organisation whose purpose is, or whose purposes include, medical transport tasking) determines a flight is medically necessary. Such matters should include, at a minimum, a risk assessment considering the nature of the flight(s).

If an operator does not have procedures that allow an operation to be classified as a medical transport operation or emergency service operation, Appendix 4B is not available to the operator and another appendix of CAO 48.1 Instrument 2019 must be complied with.

Appendix 5 is available to all operations that are classified as aerial work under the CARs. Flight training associated with aerial work (i.e. training for the grant of certain ratings and endorsements that permit typical aerial work-type operations) may also be permitted under Appendix 5.

Appendix 5A is available to all operations that are classified as aerial work under the CARs, but it is restricted to operations that are conducted during daylight hours, for example, helicopter mustering operations. Flight training associated with aerial work (i.e. training for the grant of certain ratings and endorsements that permit typical aerial work-type operations) may also be permitted under Appendix 5A.

Appendix 6 is available to and suitable for operators who solely conduct flight training (training for the grant of a licence, rating or endorsement under Part 61 of the CASR) including multi-pilot flight training.

If an operator conducts single-pilot flight training as well as other single-pilot operations, the limitations in Appendix 4 could be chosen instead of Appendix 6 which would keep all operations under the one appendix.

Appendix 7 fatigue risk management system allows an operator to manage FCM fatigue risk under an FRMS and is available to all operators. Appendix 7 permits an operator to develop and implement their own unique set of limitations subject to CASAs approval which may differ from the prescriptive limitations. Appendix 7 is not dealt with in this document.

Part B Assessment Process

B1 Assessment overview

The intent of this assessment process is to ensure that an operator who has chosen to operate a part or all of their operations under one or more of Appendices 1-6 of CAO 48.1 Instrument 2019 complies with all the requirements of each of the applicable appendices as well as the operator obligations.

A foundation of the CAO 48.1 Instrument 2019 is based on operator, individual and additional risk management obligations required to operate under Appendices 2-6. The merits of each individual operator's approach to fatigue risk management will need to be considered by the assessor in the light of the operator's particular operating context, working environment and employees.

B1.1 Operations manual submission requirements

An operator is required to be compliant with at least one appendix of CAO 48.1 Instrument 2019. Operators are to submit an operations manual in accordance with the applicable process according to whether it is an initial application or part of a transitional process.

Note: **Operator**: Either an AOC holder or in the case of Part 141 flying training school, the certificate holder.

For existing operators transitioning to CAO 48.1 Instrument 2019 the updated operations manual is to be submitted to the CASA regional office.

For new operators the AOC application is to address all the relevant requirements under the relevant appendix and be submitted to CASA Permissions Issue team.

An operator's submission must make it clear which appendix or appendices are intended to be used. Operator obligations apply in all cases, but additional requirements are applicable for Appendices 2-6.

Operators who require multiple appendices for their activities must develop documented procedures to enable FCMs to transition between appendices without affecting aviation safety.

Note: In order to ensure the FCM complies with each appendix the operator must clearly identify which operations take place within each appendix (See subsection 13 of CAO 48.1 Instrument 2019).

B2 Assessment processes

B2.1 Assessment task

B2.1.1 Overview

The CASA assessor should make their evaluation of the acceptability of the submitted operations manual, any additional attachments and the operator's AOC or Part 141 Certificate using the Assessment Worksheet and noting the 'things for consideration' described throughout this handbook.

This sequence first requires the assessor to check that each limit does not exceed each maximum or minimum in the applicable appendix, and that each relevant procedure is satisfactory. It is intended that by making this assessment first, the assessor will gain an appreciation of the complexity of the operation and the degree of fatigue risk inherent in the operation. This understanding is essential to then proceed to the next step and determine:

- what is required by subsection 13, for transitioning between appendices (If relevant)
- by subsection 15, for risk management and training
- to assess whether the elements of the operations manual that address fatigue management meet the requirements of subsection 14.

The assessor must be satisfied that after assessing the operations manual the fatigue risk is managed to an acceptable level. **The documented limits must be within those of the relevant appendix/appendices and informed by the hazard identification and risk assessment processes of the applicant.** In addition:

- the documented procedures must be assessed as being reasonably capable of being able to achieve their intended outcome
- given the nature of the operation, the fatigue risk management procedures must be adequate to identify fatigue hazards and manage them accordingly
- where it is required, the initial and ongoing fatigue training must be appropriate given the complexity of the operation and the fatigue risk inherent in that operation
- given the operations and operating context, the limits and procedures must be appropriate for what the operator knows or can reasonably assume about each FCM and where the limits and/or procedures are identified by the operator or CASA as not appropriate, then alternative limits and procedures must be developed
- the residual risk, given the documented limits and procedures, the nature of the operation and the operational environment, must be assessed by the operator as acceptable.

B2.1.2 The major assessment tasks

The major assessment tasks in the suggested order of assessment are:

- determine allowable appendices (Section C1) – confirm what operations the operator is authorised to conduct and if they intend to use a single appendix or multiple appendices
- evaluate the limits of the relevant appendices (Section C1) – verify that the limits the operator has included in the operations manual do not exceed the limits in the relevant appendix or appendices

The limits in the operations manual cannot use a maximum which is more than any maximum stipulated in the relevant appendix and cannot use a minimum which is less than any minimum stipulated in the relevant appendix

- evaluate appendices procedures requirements (Section C2) – confirm all procedures comply with the corresponding requirements for procedures as set out in the applicable appendix or appendices
- evaluate subsection 13, multiple appendices requirements (Section C4) – if the operator has chosen to comply with more than one appendix, confirm the documented procedures for management of FCM transition between appendices meets the requirements of subsection 13 and subparagraph 15.2(d)
- evaluate subsection 15 fatigue risk management requirements (Section C5) – confirm the fatigue risk management procedures of the operator comply with that required by paragraph 15.2
- evaluate subsection 15 fatigue training requirements (Section C6) – confirm the fatigue training made available by the operator is appropriate given the nature of the operation, the operational context and environment and the limits identified
- evaluate subsection 14 requirements (Section C7) – confirm the submission complies with all the requirements set out in subsection 14 of CAO Instrument 2019. Ultimately the assessor should be satisfied that the limits and procedures in the submission are sufficient to reasonably ensure that FCMs will not exceed safe levels of fatigue while operating an aircraft
- evaluate facilities (Section C8) – Where meeting a requirement of CAO 48.1 Instrument 2019 requires adequate facilities, for example, in-flight rest facilities, suitable accommodation facilities or training facilities, the assessor will need to ensure the operator has appropriate procedures to achieve compliance with the required standards
- review worksheet to include comments – review the worksheet and add any comments in the space provided.

Once the worksheet is completed with the final version in the appropriate RMS file and the recommendation sheet signed, the assessor(s) should follow the processes for advising and/or recommending to the appropriate delegate (if required). This handbook is about the assessment and does not describe any recommendation and authorisation processes.

B2.2 relevant documents

To meaningfully conduct the assessment of a submission, the assessor will require access to the following documents/information:

- the compliance statement - signed by a person who is legally authorised to sign on behalf of the applicant.
- CAO 48.1 Instrument 2019 (as amended)
- CAAP 48-1 (current revision)
- CAO 48.1 Instrument 2019 - Technical Assessor Handbook (this document)
- CAO 48.1 Instrument 2019 Appendix 1-6 Technical Assessor Worksheet (Appendix 1 to this document)

- the operator's AOC, operations specifications, operations manual, or operations manual supplement/exposition (as relevant)

Depending on the nature of the assessment, the assessor may need to be provided other documents relevant to submission such as the operators fatigue hazard register, fatigue risk management related documents, technical specifications for in-flight rest facilities and so on. As the assessment processes are conducted , the assessor will identify what if any supporting documents will be required, and advise the operator accordingly.

B2.3 Procedure for review and subsequent assessments

Where additional assessment is required, the assessment process should involve using the same procedures used initially. The procedures should be suitably modified to focus on the difference between the existing elements and the change that drove the operations manual amendments.

Part C Assessment Criteria

C1 Determining allowable appendices

C1.1 Introduction

The operator must provide CASA with an operations manual or an exposition that clearly states which operation(s) they intend or are currently authorised to undertake and whether they intend to conduct these operations under a single appendix or multiple appendices (Appendix 1-6 of CAO 48.1 Instrument 2019).

Assessors should compare the operators' authorised activities on their AOC or in their exposition with the submission to assess its completeness.

Section 28(1)(a) of the Act requires CASA to be satisfied (verify) that an applicant has complied with, or is capable of complying with, the regulatory requirements that relate to safety.

Assessors must refer to the legal requirements of CAO 48.1 Instrument 2019 and the relevant appendix/appendices for the operations as indicated by the operator.

C1.2 Things for consideration

CASA consulted with industry to develop a number of appendices for the various industry sectors. An operator may find the most suitable appendix for their operation is not the most obvious. While any operation can be conducted under Appendix 7, the FRMS Handbook deals with Appendix 7. The application of the various appendices to different types of operations is as follows:

- an operator may operate any part of an authorised activity under Appendix 1, provided the criteria of Appendix 1 are complied with
- Multi-pilot operations which involve complex operations may be conducted under a number of appendices. Appendix 2 is designed with larger airline type operations in mind and would be suitable for operations involving trans- and inter-continental passenger transport. Appendix 2 however is not exclusive to such operations, and is also available to a variety of operators, including those who conduct operations with 2 or more pilots in a single-pilot certified aircraft
- Multi-pilot operations which do not involve complex operations can be conducted under Appendix 1, 3 or 4. Multi-pilot operations such as regional passenger and charter operators which do not cross time zones may find Appendix 3 suitable
- Single-pilot operations can be conducted under a number of appendices. Appendix 4 is designed for single pilot operations however nothing prevents an operator using this appendix for multi-pilot operations, aerial work operations, flight training, or any combination of operations
- Aerial work operations (other than flying training) can be conducted under Appendix 1, 4, 5 or 5A (with Appendix 5A available for daylight operations only)
- Balloon Operations can be conducted under Appendix 4A however a balloon operator can also operate under Appendix 1 or 4

- Appendix 4B has been designed with Medical Transport Operations and Emergency Service Operations in mind. As this sector operates a wide range of rotary and fixed wing aircraft, operator of aircraft capable of international medical/patient retrieval flights may also find Appendix 2 suitable for their type of operation
- Flying training (aerial work) can be conducted under Appendix 1, 4 or 6. Appendix 6 may be suitable for operators who solely conduct flight training (training for the grant of a licence, rating or endorsement under Part 61 of the CASR), including multi-pilot flight training. An operator which conducts single-pilot flight training as well as other single-pilot operations, may find Appendix 4 more suitable in order to keep all operations under the one appendix.

The assessor is to ensure that the applicant has identified the appropriate appendix/ appendices relevant to its operation in accordance with its authorisation/certificate and has addressed the following items:

- the operator has identified the appendix that will be applied to each authorised activity
- when a single authorised activity is to be operated under two different appendices, the operator has a means of clearly differentiating when each appendix is being applied. For example, some flying school activities may operate under Appendix 1 whilst other flying school activities may be operated under Appendix 6.

Operating to a single appendix – Appendix 1 of CAO 48.1 Instrument 2019

If an operator has decided to conduct their entire operation under Appendix 1 then the assessor needs to assess whether the operator has:

- documented limits that do not exceed the limits in Appendix 1
- documented rostering procedures to ensure the FCMs do not exceed the documented limits
- the parts of the operations manual or exposition that address fatigue management meet the requirements of subsection 14.

Operating to a single appendix – Appendix 2-6 of CAO 48.1 Instrument 2019

If an operator has decided to conduct their entire operation under one Appendices 2-6 then the assessor needs to assess whether the operations manual has:

- documented limits that do not exceed the limits in the relevant appendix (Appendix 2-6)
- documented rostering procedures that the assessor is satisfied will ensure the operator’s FCMs will not exceed the documented limits
- documented procedures that the assessor is satisfied will manage the fatigue risk evident in specific rostering practices permitted under each appendix, such as employing augmented crew operations, split-duty operations and/or the use of delayed reporting time (to allow use of notification time of less than 10 hours)
- documented procedures to address fatigue risk management and training that the assessor is satisfied meet the requirements of subsection 15 - 'Additional AOC Holder Obligations'
- documented procedures that the assessor is satisfied meet the requirements of subsection 14 - 'AOC Holder Obligations'.

Operating under multiple appendix operations – Appendices 1-6 of CAO 48.1 Instrument 2019

If an operator has decided to conduct their operation under more than one appendix then the assessor needs to assess whether, in addition to meeting the requirements for operating to a single appendix (see above) the operator has:

- documented procedures that the assessor is satisfied address the requirements of subsection 13 and subparagraph 15.2(d).

C2 Limits and requirements

C2.1 Overview

This process is to verify the operations manual has satisfactory procedures for each appendix and clause that the operator wishes to comply with (FDPs, ODPs, split duty, augmented crew operations, standby, positioning etc.) and to ensure the documented limits relevant to these clauses do not exceed those limits set out in the applicable appendix.

Each item of the assessment criteria had been divided up according to the clauses in each of the appendices. This means that for each clause there are general things for consideration and then there are specific things for consideration listed for each appendix (where there are differences or additional things than those in the general section).

C2.1.1 Definitions

Irrespective of which appendix is applicable, to determine whether the limits are appropriate for the circumstances, it is first necessary to establish the operator has defined all relevant terms correctly.

The assessor should initially sample the definitions in the operations manual and compare the operator's definitions with the Definitions in paragraph 6 of CAO 48.1 Instrument 2019, or with the more simplified versions of these terms as in CAAP 48.1.

The definitions of the following terms are recommended for this sampling activity:

- early start
- flight time
- late-night operation
- local night
- off duty period
- split-duty rest period
- standby
- unforeseen operational circumstances
- Window of Circadian low (WOCL)
- positioning.

Further checking should be conducted if any discrepancies are found between the definitions in the operations manual and those in the Order or the CAAP.

C2.2 Sleep opportunity before and FDP or standby

C2.2.1 Introduction

An FCM is required to have access to suitable sleeping accommodation during an ODP prior to their assigned FDP to effectively action their obligation to use the sleep opportunity to adequately prepare for the upcoming FDP. The FCM must have access to suitable sleeping accommodation without, under normal circumstances, being interrupted by any requirement of the operator for at least a period of eight consecutive hours in a set period immediately before the start of the FDP. The set period may vary depending on the appendix and whether the FCM is at home base or away from home base.

There should be mutual understanding between the FCM and the operator as to where the eight consecutive hours sleep opportunity sits within the period preceding the FDP.

> **Example**:
>
> if the commute time at a particular away base location is 30 minutes then the operator must ensure the ODP allows for commute to and from the suitable sleeping accommodation, a period sufficient for meeting the reasonable requirements of bodily functioning such as eating, drinking, toileting, washing and dressing, as well as the required minimum sleep opportunity.
>
> In this case the sleep opportunity could start nine hours before the start time of the FDP and end one hour before the start time of the FDP.

Similarly, at **home base** there should be a mutual understanding between the operator and the FCM as to when contact occurs.

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

C2.2.2 Things for consideration

General

Where there is the requirement for prior sleep opportunity, the operations manual must have the following documented:

- the operator's policy for managing the prior sleep opportunity requirement that identifies when the sleep opportunity will sit with reference the start time of the FDP for home base and for away base locations
- procedures that direct the operator's employees to not interrupt the FCM's eight consecutive hours sleep opportunity when making contact with FCMs prior to the start time of an FDP that has not been delayed
- in the case of one or more delays to an FDP start time that are each less than 10 hours, the procedures need only relate to protection of the sleep opportunity prior to the originally assigned FDP start time

- in the case of a single delay to the FDP start time that is 10 hours or more, the procedures must then apply to the sleep opportunity prior to the start of the delayed FDP and no longer applies to the originally assigned FDP
- procedures can include such aspects as requiring the use of 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

Note: These procedures should be clear and readily available to the operator's employees involved in rostering activities as well as affected FCM's.

- one component of enabling FCMs to make adequate use of sleep opportunity is providing FCMs sufficient notice and details of upcoming FDPs. The procedures should detail a requirement to roster sufficiently in advance (also required under subsection 14.11) to allow FCMs to plan adequate rest before their next assigned FDP

Note: Operators should be aware that their FCMs may require some degree of certainty in organising their work/life balance, and more importantly from a fatigue management point-of-view, in organising their sleep.

While the nature of some types of operation make planning with any degree of certainty challenging, it is important that the assessor is satisfied that the operator has procedures that have the capacity to publish the roster sufficiently in advance of flights covered by the roster, with a consistent lead time, and this period is communicated to all FCMs. While late changes to rosters are understandable, it is important that the operator is aware that these changes should be kept to a minimum and assessed for fatigue impact.

- procedures should ensure each FCM is aware that they have a responsibility to make appropriate use of the eight consecutive hours 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: The 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 upon induction to the company. All relevant staff should all be made aware that any contact other than in accordance with the operator's procedures, during the sleep opportunity period, has the potential to impact the FCMs fitness for duty for the subsequent FDP.

Appendix 1

	Clauses 1.1 and 1.2 of Appendix 1 to CAO.48.1 Instrument 2019

The submitted operations manual must have procedures to detail that:

- an FCM must have 8 consecutive hours of sleep opportunity **at home base** within the 12 hours immediately preceding the start of an FDP
- an FCM must have 8 consecutive hours of sleep opportunity if **away from home base** within 10 hours immediately preceding the start of an FDP.

This requirement only relates to FDPs as there is no provision for standby and no considerations on the impact of delayed reporting in Appendix 1.

Appendix 2, 3, 4

	Clauses 1.1 and 1.2 of Appendices 2, 3 and 4 to CAO 48.1 Instrument 2019

The requirement for sleep opportunity in Appendix 2, 3, and 4 are the same as those for Appendix 1 with the following differences. Sleep opportunity in Appendix 2, 3 and 4:

- is also required prior to standby periods
- incorporates the requirements that the sleep opportunity always relates to the original FDP start time rather than the delayed start time when the delay is less than 10 hours
- When there is a single delay of 10 or more hours the prior sleep opportunity is then required prior to the delayed start time.

Appendix 4A

	Clause 1 of Appendix 4A to CAO 48.1 Instrument 2019

The submitted operations manual must have procedures that ensure that:

- an FCM must have 8 consecutive hours sleep opportunity within the 10 hours immediately before commencing the FDP or
- 10 hours sleep opportunity of which 6 must be consecutive, within the 24 hours immediately before commencing the FDP.

Appendix 4B and 5

	Clauses 1.4 - 1.5 of Appendix 4B to CAO 48.1 Instrument 2019 Clauses 1.1 - 1.5 of Appendix 5 to CAO 48.1 Instrument 2019

Appendix 4B and Appendix 5 deal with the requirement for a sleep opportunity prior to an FDP in a different manner to the other appendices by ensuring any non-flying duties in the eight hours prior to the FDP result in a subsequent reduction to the length of the FDP.

The intent is to limit any other duties during this eight hour period to facilitate the rest/sleep of an FCM prior to the FDP, and should this rest/sleep period be interrupted by duties, to ensure any additional fatigue risk arising from such duties is managed by an appropriate reduction in the length of the FDP.

These appendices stipulates that if the operator requires the FCM to perform non-flying duties in the eight hour period immediately prior to the start of the FDP, the maximum allowable FDP is reduced by the duration of time it took to complete those non-flying duties or by 30 minutes, whichever is greater.

In assessing the procedures in the operations manual, consideration should be given to whether any time spent commuting between suitable sleep accommodation and the location where the operator requires the non-flying duties to be performed should also be included in the time it took to complete the duties.

Appendix 5A

	Clause 1 of Appendix 5A to CAO 48.1 Instrument 2019

The operations manual must have procedures to ensure that and FCM:

- has a least 8 hours of sleep opportunity in the 10 hours immediately preceding the FDP
- on each of the 3 nights immediately prior to the FDP the FCM must not have carried out any duties during the 8 hours prior to 30 minutes before civil twilight at the location.

Appendix 6

	Clause 1 of Appendix 6 to CAO 48.1 Instrument 2019

In Appendix 6 the requirement for prior sleep opportunity is 8 consecutive hours in the 12 hours immediately preceding the FDP or standby - whether at home base or away.

There is no provision for delayed reporting in Appendix 6.

C2.3 FDP and flight time limits

C2.3.1 Introduction

The operations manual must include procedures (a roster system or similar) to ensure that the FCM is not assigned an FDP longer than the number of hours specified in the operations manual.

Procedures for complex operations must also factor in limits such as:

- those applicable to acclimatised FCMs
- FCMs that are in a state of unknown acclimatisation
- FCMs that are acclimatised to a location other than the location where the FDP commenced.

When assessing the operator's manual, the assessor will need to directly review the relevant tables in the appropriate appendix of CAO 48.1 Instrument 2019, as these tables have not been individually replicated in this Handbook.

C2.3.2 Things for consideration

General

The rostering procedures must ensure the FCM is assigned FDPs, standby periods and ODPs that do not require the FCM to breach a limit in the operations manual, and each limit in the operations manual must not exceed the limits in the applicable appendix.

The rostering practice should also reflect 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:

- Flight planning, checking weather, NOTAMs etc
- passenger check-in
- passenger boarding duties
- manifest, load and balance document completion
- customs and immigration
- pre-flight aircraft inspections and serving (replenish oils etc)
- post flight duties (such as flight and duty time data entry, aircraft cleaning, compressor washing and other pilot maintenance)
- transit time from sign-on locations to the aircraft (consequently sign-on times could be base specific)

Appendix 1

	Clause 2 of Appendix 1 to CAO 48.1 Instrument 2019

For Appendix 1, the FDP cannot commence before the beginning of morning civil twilight or 0700 local time (whichever is the earliest). The FDP is to end by 0100 local time on the following day. Local time is the local time where the FDP commenced.

This requirement can be met with evidence of rostering guidelines that have maximum limits between the above times. There should also be evidence that these guidelines are clear and readily available to the operator's employees involved in rostering activities as well as affected FCMs.

When considering the acceptability of the operations manual FDP and flight time limits, the assessor should keep in mind the requirements of Paragraph 14.3(b) for setting limits.

If the FDP is scheduled between 0600 hours local time and 2200 hours local time an FDP cannot be more than 9 hours.

If the FDP commenced before 0600 hours or after 1400 hours local time an FDP cannot be more than 8 hours.

An FCM must not be assigned more than 3 FDPs to finish after 2200 hours local time in a week.

If an FCM conducts flight training during an FDP, the flight training must be conducted during the first 7 hours flight time of the FDP. The remaining FDP may be completed conducting other, non-flight training, operations.

Note: If an FDP commences after 1700 hours on a day, the FDP must be less than 8 hours because an FDP must not end later than 0100 hours on the following day.

Appendix 2

	Clause 2 and 3 of Appendix 2 to CAO 48.1 Instrument 2019

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

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 when using Table 1 as below in section C2.3.4 of this handbook.

There must be procedures for determining the required adaption period for an FCM who is in an unknown state of acclimatisation. The adaptation periods are specified in Table 7.1 of CAO 48.1 Instrument 2019. The limits in the operations manual must not exceed the FDP limits for acclimatised FCMs (CAO 48.1, Appendix 2, Table 2.1) and FCMs in an unknown state of acclimatisation (CAO 48.1, Appendix 2, Table 3.1).

An FCM must not be assigned flight time of greater than 10.5 hours during a single FDP.

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.

Appendix 3

	Clause 2 of Appendix 2 to CAO 48.1 Instrument 2019

The limits in the operations manual must not exceed the FDP limits in CAO 48.1, Appendix 3, Table 2.1.

An FCM must not be assigned flight time of greater than 10.5 hours during a single FDP.

Appendix 4

	Clause 2 of Appendix 4 to CAO 48.1 Instrument 2019

The limits in the operations manual must not exceed the FDP limits in CAO 48.1, Appendix 4, Table 2.1.

If an FCM conducts flight training during an FDP, the flight training must be conducted during the first 7 hours flight time of the FDP. The remaining FDP may be completed conducting other non-flight training operations.

Appendix 4A

	Clause 2 of Appendix 4A to CAO 48.1 Instrument 2019

The limits in the operations manual must not exceed the FDP limits in CAO 48.1, Appendix 4A, Table 2.1.

The operations manual must have rostering procedures to ensure that an FCM does not continue in an FDP for longer than 6 hours unless they have completed or commenced a split-duty rest period of at least 4 consecutive hours.

Appendix 4B

	Clause 2 of Appendix 4B to CAO 48.1 Instrument 2019

The limits in the operations manual must not exceed the FDP limits in CAO 48.1, Appendix 4B, Table 1.1, however, twice a week the FDP limit may be increased to 12 hours (for a single-pilot operation) or 14 hours (for a multi-pilot operation).

To take advantage of this increase, the increased FDP must be preceded by an ODP of at least 12 hours, and the following ODP must be at least 12 hours. An FDP increased under this provision must not be further increased by a split-duty rest period. Additionally, an FCM who conducts an increased FDP must have an ODP of at least 36 hours, including 2 local nights in that week.

If an FCM conducts flight training during an FDP, the flight training must be conducted during the first 7 hours flight time of the FDP. The remaining FDP may be completed conducting other non-flight training operations.

Appendix 5

	Clause 1 of Appendix 5 to CAO 48.1 Instrument 2019

The limits in the operations manual must not exceed the FDP limits in CAO 48.1, Appendix 5, Table 1.1, however, twice a week the FDP limit may be increased to 12 hours (for a single-pilot operation) or 14 hours (for a multi-pilot operation).

To take advantage of this increase, the increased FDP must be preceded by an ODP of at least 12 hours, and the following ODP must be at least 12 hours. An FDP increased under this provision must not be further increased by a split-duty rest period. Additionally, an FCM who conducts an increased FDP must have an ODP of at least 36 hours, including 2 local nights in that week.

If an FCM conducts flight training during an FDP, the flight training must be conducted during the first 7 hours flight time of the FDP. The remaining FDP may be completed in other non-flight training operations.

In any 168 consecutive hours, an FCM must not be assigned or conduct more than 4 FDPs that include any time between midnight and 0459 local time.

Appendix 5A

	Clause 2 of Appendix 5A to CAO 48.1 Instrument 2019

The operations manual must have rostering procedures to ensure that:

- FDPs are only assigned to be conducted between:
  - 30 minutes before the beginning of morning civil twilight
  - the end of evening civil twilight
- FDPs are limited to 14 hours in any 1 day.
- if an FCM conducts flight training during an FDP, the flight training must be conducted in the first 7 hours flight time of the FDP. The remaining FDP may be completed conducting other non-flight training operations.

Appendix 6

	Clause 2 of Appendix 6 to CAO 48.1 Instrument 2019

The limits in the operations manual must not exceed the FDP limits in CAO 48.1, Appendix 6, Table 2.1. An FCM must not be assigned flight time greater than 7 hours.

C2.3.3 Crossing time zones - acclimatised state /unknown state of acclimatisation

'Acclimatisation' is a complex issue and CAO 48.1 Instrument 2019 attempts to address the issue by ensuring the impact on alertness of not having the FCM's body clock or circadian rhythm aligned with the local time at a location is considered in the limits. Paragraph 7.1 of CAO 48.1 states an FCM must be considered to be acclimatised at the start of an FDP or an ODP at a particular location, when:

- the location differs by less than 2 hours from the location where the FCM was last acclimatised; and
- the FCM has remained in an acclimatised state since he or she was last acclimatised.

CAO 48.1 Instrument 2019 also goes on to define when an FCM is considered to be in an unknown state of acclimatisation and the method to become reacclimatised.

Appendix 2 includes specific requirements with respect to the limits for FCMs in relation to their state of acclimatisation. However, an operator which conducts operations in which the FCM crosses time zones of 2 hours or more needs to deal with acclimatisation to ensure compliance with at least subsection 7 to determine the state of acclimatisation of the FCM; subsection 14 re fitness for duty and the relevant limits to achieve this in relation to acclimatisation; and subsection 15 re the hazards of acclimatisation (not applicable to Appendix 1).

It is important that operators understand how time zone adaptation can be individualised. The responsibility for managing the effects of time zone changes and acclimatisation is shared between the operator and the individual. The operator should provide adequate fatigue training, as well as tools for staff to use when assessing their own alertness. The individual has an obligation to then apply this 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 limits and fatigue policies are adequate.

C2.3.4 Things for consideration

Appendix 2

	Subsection 7 and Table 7.1 of CAO 48.1 Instrument 2019 Clauses 2 and 3 of Appendix 2 to CAO 48.1 Instrument 2019 Tables 2.1 7 3.1 of Appendix 2 to CAO 48.1 Instrument 2019

For complex multi-pilot services, the operations manual must:

- include a procedure for rostering staff for FDPs that is capable of differentiating between FCMs in an acclimatised state and those in an unknown state of acclimatisation (according to the definitions in subsection 7 of CAO 48.1 Instrument 2019)
  - the documented procedure will result in determinations of acclimatised and unknown state of acclimatisation that either agree with those of subsection 7 or result in more conservative determinations than subsection 7.

Note: Conservative in this context would mean either or both of being classed as in an unknown state of acclimatisation earlier than if the requirements of subsection 7 were used, and requiring a longer adaptation period than that required by subsection 7.

- 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 when using the following table:

Table 1: Acclimatisation

Difference in local time between locations	**Time since FCM commenced an FDP or an ODP at a location where last acclimatised**	
	Less than 36 hours	**36 hours or more**
For a relevant location that has a difference in local time of less than 2 hours from a location where last acclimatised	FCM is acclimatised to the relevant location (paragraph 7.2 of CAO 48.1 Instrument 2019)	
For a relevant location that has a difference in local time of 2 hours or more from a preceding location where last acclimatised	FCM remains acclimatised to the preceding location where last acclimatised. (paragraph 7.3 of CAO 48.1 Instrument 2019)	FCM is in an unknown state of acclimatisation. (paragraph 7.5 of CAO 48.1 Instrument 2019)

- the operations manual must have procedures for assigning FDPs to FCMs that do not exceed the operations manual limits for acclimatised FCMs when the FCM is acclimatised and the unknown state of acclimatised limits for FCMs that are in an unknown state of acclimatisation
- when the FCM is acclimatised the procedures must ensure the maximum FDP limit is based on number of sectors and the acclimatised time which is the local time at the location where an FCM is acclimatised (therefore this may not be the local time at the location where the FDP is being commenced)
- there must be procedures for identifying when an FCM has transitioned from an unknown state of acclimatisation to being acclimatised following a minimum period of adaptation (See section C2.10 - ODP limits)
- The limits in the operations manual must not exceed the limits in Appendix 2 for acclimatised FCM's (Table 2.1) and FCMs in an unknown state of acclimatisation (table 3.1).

Appendix 1, 3, 4, 4B, 5, 5A and 6

For operations under Appendices 1, 3, 4, 4B, 5, 5A or 6 that require the FCMs to cross time zones of 2 hours or more in a single duty period (acting as an operating crew member or positioning) the effect on alertness of circadian disruption as well as the effect of the reduced quality of sleep in ODPs on alertness in subsequent FDPs need to be identified as potential fatigue hazards and managed accordingly.

While it is not necessary to adopt the same approach to reducing the maximum FDP and flying time limits for those in an unknown state of acclimatisation as in Appendix 2, operators

who require FCMs to cross time zones of two or more hours in a single duty period must manage any identified increase in fatigue risk due to circadian disruption in an acceptable manner.

The fatigue risk management should include the extent to which operators require FCMs to cross time zones and the number of time zones crossed in any one duty period.

For instance, risk management may be as simple as increasing minimum ODPs by a fixed amount equal with the number of time zones crossed in the preceding duty periods for operations that only cross three or less time zones in any one duty period ODP.

> An example of a simple and yet potentially effective method: an operator that requires FCMs to fly to a distant international city to perform simulator training has procedures that require the rostering staff to provide a minimum of three (3) days off-duty following return to home base before commencing an FDP. This could be achieved coincident with other off-duty requirements such as the requirement in Appendix 4 for 36 consecutive hours off duty (including two local nights) in any consecutive 168 hour period.

C2.4 Increase in FDP limits by split duty

C2.4.1 Introduction

If an operator uses split-duty operations, there must be procedures to ensure the requirement is met for a predefined split-duty rest period (for Appendix 4B and 5, the period of the split-duty rest period may or may not be predefined).

Except for under Appendix 4B and 5 given that the split-duty rest period must be predefined, a split-duty rest period cannot be assigned after the FDP has commenced, and so the split-duty provisions cannot be used to increase the FDP in these circumstances.

For operators providing rosters to FCMs, in order to meet the requirement for the split-duty rest period to be predefined the roster should show all split-duty rest periods. While an FDP may be changed in advance to include a split-duty rest period, the procedures of the operator must detail how this is managed through the fatigue hazard identification processes to ensure any increase in fatigue risk is mitigated.

The operator must demonstrate the FCMs have access to suitable resting or suitable sleeping accommodation as required by the split-duty rest period and are relieved of all work duties during this time.

C2.4.2 Things for consideration

General

Appendix 1 contains no provisions to enable split-duties. Split-duty operations are permitted in Appendices 2-6 however there are some variations in the requirements across these appendices:

- the requirements for conducting split-duty operations under Appendix 2, 3, 4 and 6 are the same with the exception of the allowable period of the FDP following the split-duty rest period is 1 hour longer for Appendix 2 and 3 than allowed under Appendix 4 and 6.

- the requirements for conducting split-duty operations under Appendix 4A, 4B and 5 differ from those of all other appendices as detailed below.
- the procedures need to manage communication to ensure FCMs are not avoidably disturbed during the split-duty rest period.

The assessor will need to confirm there are procedures for the operator to assess the suitability of the sleeping or resting accommodation provided by the operator if the FCM is not at their own home. This assessment must ensure the facilities meet the minimum standard set out in the Definitions in the order. The assessment is required to be ongoing to ensure continued achievement of the standard of the accommodation over time. See Section C8 of this handbook for further details.

Example:

- How is a change to the suitable sleeping or resting accommodation managed?
- Is there a reporting mechanism for providing feedback on the standard of the suitable sleeping or resting accommodation?
- Is there consideration of the standard of the standard of suitable sleeping or resting accommodation in a formal periodic review process?

Appendix 2, 3, 4 and 6

Clause 4 of Appendix 2 to CAO 48.1 Instrument 2019

Clause 3 of Appendices 3, 4 and 6 to CAO 48.1 Instrument 2019

The procedures should:

- reflect the requirement for split-duty FDPs to be assigned to a FCM as part of the roster/assignment, and be assigned so far in advance of the FDP as to provide the FCM with a reasonable opportunity to plan adequate rest before their duty
- clearly ensure that where an FDP contains a split-duty rest period, the FCM has enough time allocated to travel to and from the suitable sleeping or resting accommodation location in addition to having access to the suitable sleeping or resting accommodation for at least four consecutive hours
- ensure that where there is access to suitable sleeping accommodation, the maximum FDP may be increased by up to four hours, provided the maximum FDP does not then exceed 16 hours for Appendix 2 and Appendix 3. For Appendix 4 and 6, the maximum FDP must not exceed the applicable value shown in Table 2.1 of the relevant appendix plus 4 hours
- ensure that where there is access to suitable resting accommodation for at least two hours, the maximum FDP may be increased by half the duration of the split-duty rest period up to a maximum of two hours
- ensure that if a split-duty rest period includes any period between the hours of 2300 to 0529 local time the split-duty rest period is for a period of at least seven consecutive hours with access to suitable sleeping accommodation. For Appendix 2 this

requirement is based on 2300 to 0529 acclimatised time unless the FCM is in an unknown state of acclimatisation in which case local time is used. In these circumstances the procedures must ensure:

  - the maximum FDP may be increased up to 15 hours (if not already permitted) for Appendix 4 and Appendix 6; and 16 hours for Appendix 2 and Appendix 3
  - there is no allowed discount or reduction of the FDP for the purposes of determining the minimum length of the subsequent ODP or to cumulative duty time calculations.

- ensure that any remaining portion of an FDP following a split-duty rest period will be no longer than six hours for Appendix 2 and 3 and no longer than five hours for Appendix 4 and 6.

For the purposes of CAO 48.1, the time spent in the split-duty rest period is always duty (even though the FCM must be relieved of all duties) and so is included as a part of the FDP. When the split-duty rest period is at suitable sleeping accommodation, the fatigue is being reduced therefore an allowance has been made to reduce the manner in which the length of the FDP affects the subsequent minimum required ODP and cumulative duty limits. This allowance is as follows:

- for determining the required minimum ODP following an FDP and for the purposes of assessing whether an FCM is within the applicable cumulative duty limits, when an FDP contains a split-duty rest period at suitable sleeping accommodation, the FDP can be considered to be two 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 to 0529 local time. For Appendix 2 this requirement is based on 2300 to 0529 acclimatised time unless the FCM is in an unknown state of acclimatisation in which case local time is used.

Appendix 4A

	Clause 3 of Appendix 4A of CAO Instrument 2019

If an operator chooses to incorporate split duties into their operations, their operations manual must have rostering procedures that ensure:

- access to suitable sleeping accommodation for at least four consecutive hours to increase the maximum FDP by the duration of the split-duty rest period
- the maximum FDP (after applying the increase for split duty) is no more than 15 hours
- if a split-duty rest period includes any period between the hours of 2100 and 0329 (local time), the split-duty rest period is for a consecutive period of at least seven hours, with access to suitable sleeping accommodation
- any remaining portion of an FDP following a split-duty rest period will be no longer than five hours.

For the purposes of CAO 48.1, the time spent in the split-duty rest period is always duty (even though the FCM must be relieved of all duties) and so is included as a part of the FDP. When the split-duty rest period is at suitable sleeping accommodation, the fatigue is being reduced

therefore an allowance has been made to reduce the manner in which the length of the FDP affects the subsequent minimum required ODP and cumulative duty limits. This allowance is as follows:

- for determining the required minimum ODP following an FDP and for the purposes of assessing whether an FCM is within the applicable cumulative duty limits, when an FDP contains a split-duty rest period at suitable sleeping accommodation, the FDP can be considered to be two 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 2100 and 0329.

Appendix 4B

	Clause 2 of Appendix 4B to CAO 48.1 Instrument 2019

If an operator 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 two consecutive hours to increase the maximum FDP by the duration of the split-duty rest period
- for suitable resting accommodation, access for at least two consecutive hours to increase the maximum FDP by half the duration of the split-duty rest period up to a maximum of 2 hours
- the remaining length of an FDP after the split-duty rest period ends is no greater than what the FDP limit is at that time (as if a new FDP were to commence)
- the maximum FDP (after applying the increase for split duty) is no more than 16 hours.

For the purposes of CAO 48.1, the time spent in the split-duty rest period is always duty (even though the FCM must be relieved of all duties) and so is included as a part of the FDP. When the split-duty rest period is at suitable sleeping accommodation, the fatigue is being reduced therefore an allowance has been made to reduce the manner in which the length of the FDP affects the subsequent minimum required ODP and cumulative duty limits. This allowance is as follows:

- for determining the required minimum ODP following an FDP and for the purposes of assessing whether an FCM is within the applicable cumulative duty limits, when an FDP contains a split-duty rest period at suitable sleeping accommodation, 50% of the duration of the split-duty rest period may be deducted.

If an FCM achieves a split-duty rest period of at least 10 consecutive hours (plus the number of hours difference in local time between the location where the rest period is undertaken and the location where the FDP commenced) and the split-duty rest period is undertaken over a local night, then the FCM is taken to meet the ODP requirements. Therefore, the FCM may commence a new FDP (up to the maximum limit) immediately following the split-duty rest period.

Appendix 5

	Clause 2 of Appendix 5 to CAO 48.1 Instrument 2019

Procedures should ensure where possible split-duty rest periods are assigned to an FCM so far in advance of the FDP as to provide the FCM with a reasonable opportunity to plan adequate rest before their duty. However the procedures may reflect the more relaxed requirement that allow a split-duty rest period and commensurate extension to the FDP to be initiated and achieved after the FDP has already started, regardless of whether it was originally assigned to the FCM.

The quality and detail of the required procedures should reflect the likely increase in fatigue risk of taking advantage of this provision, particularly given the increased risk of not being able to achieve restorative sleep during the split-duty rest period at suitable sleeping accommodation at such short notice.

Procedures must ensure that:

- a split-duty rest period of at least three consecutive hours at suitable sleeping accommodation permits the maximum FDP operations limit to be increased by the duration of the split-duty rest period
- a split-duty rest period of at least two consecutive hours at suitable resting accommodation permits a maximum FDP operations manual limit to be increased by half the duration of the split-duty rest period up to a maximum of two hours
- (unless an extension is permitted) any remaining portion of an FDP following a split-duty rest period will be no longer than six hours.

C2.5 Increase in FDP and flight time limits in an augmented crew operation

C2.5.1 Introduction

Note: Applicable to Appendix 2 only.

This applies to 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 in augmented crew operations.

C2.5.2 Things for consideration

	Clause 5 of Appendix 2 to CAO 48.1 Instrument 2019

In order to prohibit partial crew changes, 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 that were part of the operating crew at the start of the FDP.

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

Procedures for assigning FDPs to FCMs should ensure that when determining the maximum FDP the acclimatised time is used until such time as the FCM is in an unknown state of acclimatisation. In the case of an FCM in an unknown state of acclimatisation, the maximum FDP is based on whether the ODP immediately preceding the FDP is less than 30 hours or 30 hours or more (see Tables 5.1 and 5.2 of Appendix 2).

The procedures must ensure each FCM who will be at the aircraft controls during the final landing has a minimum in-flight rest period of 2 consecutive hours. For FCMs who will not be at the aircraft controls during the final landing the minimum in-flight rest period is 1.5 consecutive hours.

The procedures must limit augmented operations to not more than 3 sectors.

If an assigned FDP is to exceed 14 hours, not more than two sectors can be assigned, and if two sectors are assigned, each FCM who will be at the aircraft controls during the final landing must have a minimum in-flight rest period of at least 2 consecutive hours within the 8 hour period immediately prior to landing; or the second sector must be at least 9 hours in length.

If an assigned FDP is to exceed 16 hours, only one sector can be assigned, and each FCM who will be at the aircraft controls during the final landing must have a minimum in-flight rest period of 3 consecutive hours. For FCMs who will not be at the aircraft controls during the final landing the minimum in-flight rest period must be 2 consecutive hours.

When assessing the limits and procedures to address in-flight rest during the cruise phase, the assessor should be aware that clause 5 of Appendix 2 to CAO 48.1 Instrument 2019 stipulates the minimum time an FCM requires the in-flight crew rest facility to be available. These times are only minimums and substantially longer times in in-flight rest may be required to maintain or restore adequate alertness.

Note: As a guide, the augmented crew FDP limits in clause 5 assume that the majority of the FDP is flight time and the available rest/sleep time (cruise phase) is fully utilised. The allocation of rest breaks should be focussed on ensuring the operational alertness of the FCMs for the critical phases of flight. On single sector operations, this may mean assigning a more substantive portion of available rest time to the FCMs who will conduct the single approach and landing. In operations with more than one sector, the rest breaks may reasonably be more evenly distributed amongst FCMs.

The procedures 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, ensuring FDPs contain longer sector lengths that allow adequate time for rest/sleep.

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 when the pilot in command is in 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 negatively impact on the need to optimise the crew experience levels on the flight deck for managing unplanned operational threats
- designation of a responsible person amongst the crew for scheduling and monitoring the in-flight crew rest
- 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, avoid interruptions and reduce unnecessary noise that could disturb the sleep of FCMs utilising in-flight rest.

Crew Rest Facility

Crew rest facilities need careful design and consideration in order to provide adequate in-flight rest and sleep for crew. Classes of crew rest facilities are defined in subsection 6 of CAO 48.1 Instrument 2019.

Verification may be required in the form of a physical inspection or in-flight assessment, and interview with FCMs as to whether the facilities are 'fit for purpose'. When determining the acceptability of an operator's crew rest facility specifications, the following factors should be taken into account:

- noise
- physical configurations
- locations
- privacy need
- lighting
- vibration
- micro-climate (air flow, ventilation, temperature, temperature gradient, humidity)
- hygiene (avoidance of pathogens, shielding)
- protocols for communications between flight deck and crew rest facilities
- restraint mechanisms
- access to facilities as defined in subsection 6
- evacuation and emergency equipment; and
- the design purpose of the seat and change management considerations for when crew rest facilities are changed.

An in-service assessment of the dynamic issues may be required for the assessor to be satisfied by the adequacy of in-flight rest facilities for new AOC applicants or for existing AOC authorisation holders planning to operate new aircraft types.

C2.6 Delayed reporting time

C2.6.1 Introduction

The FCM has an obligation to use their preceding ODP and prior sleep opportunity period in order to be sufficiently rested and alert to perform their duties safely in the rostered FDP.

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.

Delayed reporting requirements are those requirements that must be met to allow for the assigned FDP start time to be delayed for any period.

Additionally, under Appendix 2, 3 & 4 where the operations manual contains documented procedures that specifically address how delays are communicated without impacting the prior sleep opportunity, in accordance with the limits contained in the applicable appendix/appendices, then the operator is permitted to make the decision to delay the FDP:

- up until 2 hours before the start time when the FCM is at home base
- up until 1 hour before the time the FCM would normally have to leave their accommodation to report for duty when they are not at home base.

As with other CAO 48.1 Instrument 2019 limits, there must be documented procedures, that explain the way reporting times are delayed in accordance with those limits. Delayed reporting times are specifically mentioned in Appendix 2, Appendix 3 and Appendix 4.

Appendix 1, Appendix 4B Appendix 5 and Appendix 6 do not prohibit delayed reporting times however the operations manual should contain documented procedures that explain how reporting times are delayed without impacting the prior sleep opportunity in accordance with the limits contained in the applicable appendix/appendices to permit the operator to delay the FDP.

C2.6.2 Things for consideration

Appendix 1

	Paragraph 14.11 of CAO 48.1 Instrument 2019 Clause 1 of Appendix 1 to CAO 48.1 Instrument 2019

Under Appendix 1, there are no provisions for delaying or reassigning an FCM's reporting time, or requirements to consider if delays occur. However, operators are required to assign FDPs sufficiently in advance to provide the FCM with a reasonable opportunity to plan rest before the start time.

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.

Appendix 2, 3 and 4

	Clause 6 of Appendix 2 to CAO 48.1 Instrument 2019 Clause 4 of Appendices 3 and 4 to CAO 48.1 Instrument 2019

Delays of less than 10 hours - without operations manual procedures

If an operator is operating under Appendices 2, 3 or 4, and does not have operations manual procedures that specifically address delays, that operator can only delay an FDP start time if the FCM is notified at least 10 hours before the original reporting time. In these circumstances, the period of the delay is deemed to be an ODP and an FDP can be assigned after the ODP concludes.

When the FCM is notified of a delay less than 10 hours before the original reporting time, the FDP is deemed to have started at the original reporting time even if the FCM is given a later reporting time. In this case, the normal limit for the FDP duration applies i.e. the maximum FDP is based on original reporting time and can only be reassigned to the extent of the maximum reassignment limits. (See Section C2.7.2).

When informing an FCM that they can report at a later time than the original FDP reporting time the operator must meet the requirements for sleep opportunity before an FDP. The operator needs to take this into consideration when deciding on the time and manner of notifying the FCM of any delay.

It is unacceptable to continually delay an FDP by short periods while the FDP is still 10 or more hours in the future. To continue to delay the FDP in this manner does not provide the FCM with a reasonable opportunity to plan or achieve adequate rest before the resulting FDP.

If the operator delays an FDP without providing 10 or more hours' notice before the original reporting time and then cancels the flight, then the minimum ODP requirements apply before they can be assigned another FDP. The required ODP starts at the later of either the original FDP start time or the time the FCM actually ceases any non-flying duty. The minimum ODP need only be based on the length of the actual duty achieved however it can be no less than the minimum ODP required following an FDP.

Delays of less than 10 hours – with operations manual procedures

If an operator is operating under Appendices 2, 3 or 4, with operation manual procedures for delayed reporting, delaying a reporting time within 10 hours of the FDP start time is permitted. There are only minor differences in the requirements of Appendices 2, 3 and 4 as noted below. The rationale behind the limits to FDPs in circumstances of delays include:

- for delays of less than four hours the assumption is that while the FCM may well be able to rest, it is unlikely that they will be able to achieve 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 than if they were on duty by managing their activities
- for delays of between four and ten hours the operator, while the same principles apply, it must be assumed the FCM has been awake for an increased period of time and so has accrued a commensurately higher level of fatigue.

The procedures should reflect the following requirements:

- if the new reporting time is within 4 hours of the original reporting time, the maximum FDP cannot exceed the maximum based on the original reporting time. However, if a reporting time following a delay requires a lower maximum than that of the original FDP, then this now becomes the maximum FDP i.e. the most restrictive of the two FDP limits applies. This is because maximum FDP limits based on start times after 1100 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 used from that point the FCM will finish their FDP in or just before the window of circadian low (WOCL)

- if the new reporting time is at least 4 hours after the original reporting time, the FDP is deemed to have commenced 4 hours after the original reporting time. The maximum FDP is the most restrictive of the maximum FDP available at the original reporting time, of the maximum FDP available at the new reporting time

Note: In determining the length of a delay for calculating the FDPs, the total delay is the pivotal factor. For example. an operator may initially require a delay of two hours and then make a further delay of three hours. For the purposes of determining the maximum FDP, this represents a total delay of 5 hours and must be dealt with as a 5 hour delay not as two delays of less than 4 hours (i.e. a 2 hour delay followed by a 3 hour delay).

- the combined duration of any delays and the following FDP must not exceed 16 hours unless the FDP contains a split-duty rest period (or is an augmented crew operation - Appendix 2 only)
- the manner in which the FCM will be notified of the delay, bearing in mind 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; or
  - in the 10 hours before the original start time if the FCM is away from home base.

Example:

Rather than phoning 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 FCMs room.

- Include informing the FCM of the delay prior to the FCM leaving their sleeping accommodation, with a requirement for notification two hours or more before the original reporting when at home base, and at least one hour before the time the FCM would normally have had to leave their accommodation to travel to the reporting location when away from home base
- Include that when an FCM is informed as above, the time between the original and the final reporting time is deemed to be standby (whether the conditions for standby are met or not). If an FCM is not informed as above, the procedures sate the reporting time is deemed to commence at the later of the original reporting time, or the most recently advised reporting time (in a situation of multiple delays).

Delays of at least 10 hours – with operations manual procedures

If any single delay to an FDP is at least 10 hours, the procedures should indicate that delay is considered to be an off-duty period and following the off-duty period, the FCM can be assigned an FDP.

Cancellations - with or without procedures for delays

- The cancellation subclause in Appendix 2, 3 and 4 requires that if flights are delayed and the AOC holder to inform the FCM the flight is cancelled, then the FCM must have an ODP of at least 10 consecutive hours.

Appendix 4B, 5 and 5A

	Paragraphs 14.11 and 15.2 of CAO 48.1 Instrument 2019

There are no provisions in Appendix 4B, 5 or 5A to specifically address delayed reporting. The requirement in paragraph 14.11 of CAO 48.1 Instrument 2019 applies i.e. rosters are to be published sufficiently in advance to provide the FCM a reasonable opportunity to plan rest before the start time of the FDP. It is accepted that the nature of the activities conducted under this appendix will often result in changes to the FDP on the day of operations. While this is expected, the potential for increased fatigue risk must also be investigated and where identified the risk must be managed.

In many cases delaying an FDP start time will result in an increased fatigue hazard as the FCM is no longer able to achieve a rest period that would have been more appropriate for the delayed FDP start time. Paragraph 15.2 of CAO 48.1 Instrument 2019 requires procedures to manage identified fatigue risk to an acceptable level.

If fatigue risk is managed to an acceptable level, the operator may delay a start time under this appendix. The requirement remains to ensure in the eight hours prior to an FDP any non-flying duty performed must be deducted from the allowable maximum FDP for that start time (with a minimum reduction of 30 minutes). (See section C2.3.2).

If an operator anticipates delaying the start time of FDPs for other than relatively short delays for example, delays of more than two hours, the operations manual should contain procedures to ensure the increased risk is managed. Examples of procedures that might be used to manage increased fatigue risk due to delayed reporting are:

- managing the process of contacting FCMs to notify them of the delay
- prohibiting an increase to the FDP maximum limits when a delayed start time would otherwise allow it
- if a delayed start time requires a reduced maximum FDP period (than the start time before the delay) that reduced maximum FDP limit applies
- providing a maximum limit on extent to which a start time can be delayed in total. It is advisable to have a policy that does not allow delaying the start time by more than a total of 4-5 hours past the original start time unless specific circumstances indicate this would not result in an unacceptable fatigue risk.

Appendix 4A and 6

	Paragraph 14.11 of CAO 48.1 Instrument 2019 Clause 1 of Appendix 4A of CAO 48.1 Instrument 2019 Clause 1 of Appendix 6 to CAO 48.1 Instrument 2019

There are no provisions in Appendix 4A or Appendix 6 to specifically address delayed reporting. The requirement in paragraph 14.11 of CAO 48.1 Instrument 2019 applies i.e. rosters are to be published sufficiently in advance to provide the FCM a reasonable opportunity to plan rest before the start time of the FDP. It is accepted that the nature of the activities conducted under this appendix will often result in changes to the FDP on the day of

operations. While this is expected, the potential for increased fatigue risk must also be investigated and where identified the risk must be managed.

In many cases delaying an FDP start time will result in an increased fatigue hazard as the FCM is no longer able to achieve a rest period that would have been more appropriate for the delayed FDP start time. Paragraph 15.2 of CAO 48.1 Instrument 2019 requires procedures to manage identified fatigue risk to an acceptable level.

These appendices have the requirement for prior sleep opportunity that is always associated with the actually assigned FDP.

Appendix 4 requires 8 consecutive hours of sleep opportunity within the 10 hours immediately before the FDP, or 10 hours of sleep opportunity (at least 6 must be consecutive) within the 24 hours immediately before the FDP.

Appendix 6 requires 8 consecutive hours of sleep opportunity within the 12 hours immediately before the FDP or standby.

If a start time is delayed, the operator must have procedures to preserve these sleep opportunities and be able to demonstrate how the protection of prior sleep opportunity was achieved for any delayed start time.

Further, any interruption or disturbance initiated by the operator should not infringe on the prior sleep opportunity.

If an operator anticipates delaying the start time of FDPs for other than relatively short delays the operations manual should contain procedures that ensure the increased risk is managed. Examples of procedures that might be used to manage increased fatigue risk due to delayed reporting are:

- managing the process of contacting FCMs to notify them of the delay
- prohibiting increasing FDP maximum limits when a delayed start time would otherwise allow it
- requiring that, if a delayed start time requires a reduced maximum FDP period (than the start time before the delay), that reduced maximum FDP limit applies
- providing a maximum limit on extent to which a start time can be delayed in total. It is advisable to have a policy that does not allow delaying the start time by more than a total of 4 hours past the original start time unless specific circumstances indicate this would not result in an unacceptable fatigue risk.

C2.7 Reassignment and extension

C2.7.1 Introduction

Reassignment

Reassigning refers to modifying an assigned FDP after the FCM has commenced the FDP while remaining within the operations manual limit for that activity. There may be occasions when an FCM who has already commenced an FDP needs to be reassigned, for example, when operational disruptions require an FCM to take over another FCMs duty.

The reassignment restrictions are in place in order to mitigate any adverse fatigue risks associated with increasing the duration of the FDP in circumstances where an FCM had not

prepared for a longer FDP. The provisions set limits on the extent to which a rostered or assigned FDP can be modified for an FCM once the FDP has commenced.

The assessor should note that while the term 'reassignment' has been widely used in the past in industry to describe any form of roster change made by the AOC holder, the reassignment provisions of CAO 48.1 Instrument 2019 ONLY relate to changes to an FDP that occur after an FCM has commenced the assigned FDP.

As such, the proposed FDPs, standbys, ODPs, duties etc of an FCM can be changed in advance (subject to the relevant delayed reporting and cancellation provisions) as required and the reassignment provisions of CAO 48.1 Instrument 2019 do not apply to such changes.

Rather these changes must be handled through the operators ongoing fatigue hazard identification and risk management processes to ensure the changes to not introduce any unmitigated fatigue risk.

A reassigned FDP can subsequently be extended under the extension clause once if unforeseen operational circumstances are encountered.

Extension

Extension refers to increasing the FDP so that it exceeds the FDP limit in the operations manual.

The 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 prescriptive appendices are designed with the expectation that extensions would be rare.

Extensions are only permitted in unforeseen operational circumstance. The term "unforeseen operational circumstance" is defined to mean an unplanned exceptional event that becomes evident after the commencement of the FDP.

As such an extension cannot be planned, organised or contemplated prior to a FDP commencing.

Should an FDP have commenced and a genuine need for an extension is subsequently identified, the first consideration is whether all flight crew members are assessed as fit for the extended duty. This consideration can be problematic due to a reduced capability for a fatigued FCM to assess their own fitness and the fitness of other crew members.

Where unforeseen operational circumstances occur on the final sector of an FDP, the rules permit the flight to continue to its destination or alternate at the discretion of the pilot in command, even if it would cause an FCM to exceed a limit. This is to allow the safe continuation of a flight in the event of an unforeseen operational circumstance. However, the pilot in command should consider diverting to an alternate location if the crew is not fit to continue to the original destination.

On written request from CASA an operator is required to provide an extension record of an FDP or flight time limit.

Where the need for extensions is reasonably foreseeable, for example, due to customs/airport/border control delays, seasonal weather or an ATC holding, then schedules and rosters must be modified to provide sufficient allowance for delays. Operators are required to review the use of extensions to adjust schedules accordingly.

For reassignment and extension, an operator's operations manual must contain procedures that:

- ensure a reassigned FDP does not exceed the relevant FDP (or flight time) limit
- provide a tool and training for FCMs to assess their fitness for duty
- do not permit a reassignment if the FCM does not consider and agree they are fit for the modified FDP
- do not permit an extension to be considered in situations which do not meet the definition of an 'unforeseen operational circumstance'
- do not permit an extension to an FDP unless all FCMs have been consulted by the PIC and have 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.

C2.7.2 Things for consideration

Reassignment

Appendix 1, 4A and 5A

	Appendix 1, Appendix 4A & Appendix 5A of CAO 48.1 Instrument 2019

There are no specific limits on reassignment of an FDP in Appendix 1, 4A and 5A and therefore there is no requirement for procedures in the operations manual that specifically address reassignment of FDPs. The rules in these appendices were considered sufficiently restrictive to absorb changes on the day of operations in assigned FDP that do not exceed the appendix FDP limits, without representing an unreasonable increase in fatigue risk.

Appendix 2, 3, 4 and 6

	Clause 7 of Appendix 2 to CAO 48.1 Instrument 2019 Clause 5 of Appendices 3 and 4 to CAO 48.1 Instrument 2019 Clause 4 of Appendix 6 to CAO 48.1 Instrument 2019

There are limits on reassignment in Appendix 2, 3, 4 and 6 and these limits are substantially the same for each noting for Appendix 2 and 3 there is the requirement to consider the reassigned FDP in terms of the new number of sectors when establishing whether the reassigned FDP is within the maximum FDP limits.

For each of these appendices there is the requirement that the operations manual procedures addressing reassignment need to adequately reflect these provisions. Procedures should therefore, at a minimum:

- ensure that reassignment is only permitted after an FCM's assigned FDP commences

- ensure that a reassigned FDP does not exceed maximum operations manual FDP limits (for Appendix 2 or 3 operations, this limit is derived after consideration of the reassigned number of sectors)
- ensure that a reassigned FDP must not cause the FCM to exceed longer term or cumulative limits. For example 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
- ensure that a reassigned FDP must not cause the FCM to exceed the limit on infringing the WOCL. The procedures must require that the limit on infringing the WOCL be considered when determining whether the modified FDP is allowed and whether the reassignment will mean that subsequent rostered FDPs will then exceed the limit on consecutive WOCLs.

Operators are permitted 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. As the reassigned FCM will need to use in-flight rest as an augmented crew member, the operator should be aware that there is potential for greater fatigue risk if the reassigned 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 in-flight rest opportunities and is reassigned 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.

Appendix 4B

	Paragraph 14.11 of CAO 48.1 Instrument 2019

There are no provisions in Appendix 4B that address reassignment.

It is accepted that the activities conducted under this appendix will often, by their nature, result in changes to the FDP on the day of operations. While this is expected, the potential for increased fatigue risk must also be considered and, where unacceptable risk is identified, managed to acceptable levels. Depending on the nature of operations, an identified fatigue risk stemming from consistently or repetitively reassigning FDPs might require procedures to be developed that limit the use of reassignment in response to, or in anticipation of, excessive fatigue risk.

Another consideration is that there must be no more than 2 increased FDPs in any 168 consecutive hour period. A reassignment to an increased FDP may also invoke the requirement for an extended ODP.

Similarly, the limit of 4 late-night operations in any 168-hour period applies to late-night operations, regardless of whether the FDPs were assigned prior to the day of operations or modified on the day of operations. The operator should have a procedure for ensuring reassignments do not result in exceeding the limit of 4 FDPs involving late-night operations within 168 consecutive hours.

Appendix 5

	Paragraph 14.11 of CAO 48.1 Instrument 2019

There are no provisions in Appendix 5 that address reassignment.

It is accepted that the activities conducted under this appendix will often, by their nature, result in changes to the FDP on the day of operations. While this is expected, the potential for increased fatigue risk must also be considered and where unacceptable risk is identified, managed to acceptable levels. Depending on the nature of operations, an identified fatigue risk stemming from consistent or repetitive reassigning FDPs might require procedures be developed to limit the use of reassignment in response to, or in anticipation of, excessive fatigue risk.

Another consideration is that there must be no more than 2 increased FDPs in any 168 consecutive hour period. A reassignment to an increased FDP may also invoke the requirement for an extended ODP.

Appendix 5 includes a restriction of 4 FDPs assigned or conducted between midnight and 0459 in any 168 hour period. This applies to FDPs regardless of whether the FDPs were assigned prior to the day of operations or modified on the day of operations. The operator should have a procedure for ensuring reassignments do not result in exceeding the limit of four FDPs that include any time between midnight and 0459 in any consecutive 168 hour period.

Extension

There are limits on extensions in all appendices and there must be acceptable procedures for the application and management of extensions in all submitted operations manuals.

As noted above, extensions are only permitted in unforeseen operational circumstance. The term "unforeseen operational circumstance" is defined to mean an unplanned exceptional event that becomes evident after the commencement of the FDP. As such an extension cannot be planned or organised prior to an FDP commencing.

Unforeseen operational circumstances are considered to be those circumstances that are statistically unlikely, or in other words, exceptional. This means that they should not be occurring with any regularity. If the circumstances could be reasonably predicted to occur from time to time based on past operational experience, then the circumstances cannot be said to be "unforeseen" and so the extension provisions cannot be invoked.

The intention is for operators to roster FDPs appropriately and not to continually use flight and duty times to their maximum limits while relying on extensions to complete an FDP when previous experience is sufficient to indicate a greater time allowance is required.

Appendix 1

	Clause 3 to Appendix 1

For operations under Appendix 1 for the circumstances to be considered "unforeseen" in order to invoke the extension provisions, it must be apparent from records of the operator's previous operations the proposed operation could be reasonably and/or regularly completed in the proposed time allocated.

The procedures should ensure the FDP limit may only be extended by up to 1 hour if:

- the FDP has already commenced
- the circumstances 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
- the affected FCM has been consulted and has had an opportunity to consider and agree they are fit for the extension.

Similarly the procedures should ensure flight training may only be extended for up to 30 minutes after the first 7 hours of the FDP's flight time if:

- the FDP has already commenced
- the circumstances 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
- the affected FCM has been consulted and has had an opportunity to consider and agree they are fit for the extension.

If unforeseen circumstances arise after take-off of the final sector of an FDP, the flight may continue to the planned destination at discretion of the PIC, even if the FDP limit is exceeded.

Appendix 2, 3, 4 and 6

	Clause 7 to Appendix 2 of CAO 48.1 Instrument 2019 Clause 5 to Appendices 3 and 4 to CAO 48.1 Instrument 2019 Clause 4 to Appendix 6 of CAO 48.1 Instrument 2019

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

- the FDP has already commenced
- the circumstances could reasonably be classed as unforeseen
- the FCM will not exceed a cumulative duty or cumulative flight time limit during the extension
- the extension is at the discretion of the PIC who must consider themselves fit for the extension and who must consult with each FCM and be satisfied each FCM considers themselves fit for the extension.

With respect to FDPs, an operator's procedures should also make it clear that:

- the FDP limits in the operations manual may be extended by up to 1 hour; or
- the FDP limits in the operations manual may be extended by up to 2 hours for augmented crew operations (Appendix 2); and
- the number of sectors may be increased by 1 more than would otherwise be allowed for the FDP (Appendix 2 and 3).

In relation to flight time limits, an operator's procedures should make it clear that the flight time limit may be extended by not more than 30 minutes if:

- it is operationally necessary in order to complete the duty; and
- each FCM considers themselves fit for the extension.

For flight training under Appendix 4, the procedures should allow for an extension of up to a maximum of 30 minutes after the first 7 hours of the FDP's flight time if:

- unforeseen operational circumstances arise;
- it is operationally necessary in order to complete the duty; and
- each FCM considers themselves fit for the extension.

An extension may result in an FCM exceeding the longer term off-duty requirement of 36 consecutive hours off-duty in a 168-hour period projected to the end of the assigned FDP, however this is allowable on the basis the FDP was 'extended', not 'assigned'.

An FDP limit must not be extended if it would cause an FCM to exceed the cumulative flight time limits of the appendix. However, 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, even if any limit in the appendix is exceeded.

An extension to an FDP that results in the FDP infringing the WOCL must be considered when determining whether the FCM meets the limit on infringing the WOCL.

Appendix 4A

	Clause 4 to Appendix 4A of CAO 48.1 Instrument 2019

The operations manual procedures should clearly limit the use of extensions to a maximum of 1 hour where:

- the FDP has already commenced
- the circumstances that required the extension could reasonably be classed as unforeseen
- the FCM considers themselves fit for the extension; and
- the FCM will not exceed a cumulative duty or cumulative flight time limit during the extension.

If unforeseen circumstances arise after take-off on the final sector of an FDP, the flight may continue to the planned destination even if any limit in the Appendix is exceeded.

Appendix 4B

	Clause 3 to Appendix 4B of CAO 48.1 Instrument 2019

The provisions for extensions under Appendix 4B are unique. This is due to the operational flexibility necessitated by medical transport and emergency service operations. Two different extension provisions are provided under Appendix 4B:

- extensions due to unforeseen operational circumstances
- extensions for urgent operations.

For extensions in unforeseen operational circumstances, the procedures should clearly limit the use of extensions to those circumstances where:

- the FDP has already commenced
- the circumstances that required the extension could reasonably be classed as unforeseen
- the FCM will not exceed a cumulative duty or cumulative flight time limit during the extension.

The procedures should also make it clear that an extension to an FDP cannot be greater than 2 hours for a multi-pilot operation or 1 hour for a single-pilot operation beyond the FDP limit (or the FDP limit as increased by a split-duty rest period), and an extension to the flight time limit must not be greater than 30 minutes.

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, even if any limit in the appendix is exceeded.

For extensions for urgent operations, the operator must have procedures that enable the classification of an operation as urgent and with consideration given to the preservation of life, or the potential that a person’s health may critically deteriorate, as relevant factors. These procedures should identify not only how the FCM should go about deciding on the extension, but also who should be consulted as part of that decision. In these cases, an FDP may be extended by up to 4 hours beyond the FDP limit or the FDP limit as increased by a split-duty rest period. However, an extended FDP for an urgent operation must not be greater than 16 hours or exceed a cumulative duty or cumulative flight time limit.

An extension in unforeseen operational circumstances or for urgent operations is at the discretion of the PIC who must consider themselves fit for the extension and who must consult with each FCM and be satisfied each FCM considers themselves fit for the extension.

In relation to flight time limits, an operator's procedures should make it clear that the flight time limit may be extended by not more than 30 minutes if:

- it is operationally necessary in order to complete the duty; and
- each FCM considers themselves fit for the extension.

For flight training, the procedures should allow for an extension of up to a maximum of 30 minutes after the first 7 hours of the FDP if:

- unforeseen operational circumstances arise;
- it is operationally necessary in order to complete the duty; and
- each FCM considers themselves fit for the extension.

Appendix 5

	Clause 3 of Appendix 5 to CAO 48.1 Instrument 2019

Due to the nature of aerial work operations, extensions are permitted in operational circumstances where the FCM is satisfied that the safety of the flight will not be impacted by fatigue.

The operations manual procedures should clearly limit the use of extensions to a maximum of 2 hours where:

- the FCM will not exceed a cumulative flight time limit during the extension
- any extension is at the discretion of the FCM who must satisfied that the safety of the flight will not be impacted by fatigue.

For an extension in multi-pilot operations, the procedures must ensure the PIC must consider themselves fit for the extension and must consult with each FCM and be satisfied each FCM considers themselves fit for the extension.

For flight training, the procedures should allow for an extension of up to a maximum of 30 minutes after the first 7 hours of the FDP if:

- unforeseen operational circumstances arise;
- it is operationally necessary in order to complete the duty; and
- each FCM considers themselves fit for the extension.

Each 30-minute period of extension (or part thereof) requires the subsequent minimum ODP to be increased by 1 hour. An ODP of greater than 12 hours can be reduced to 12 hours if the next FDP is conducted under Appendix 5 and the ODP following the next FDP is at least 36 hours including 2 local nights.

Extensions that result in the FDP including any time between midnight and 0459 must be taken into account when considering the limit of no more than 4 FDPs that include duty during this period in any consecutive 168-hour period.

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, even if any limit in the Appendix is exceeded.

Appendix 5A

	Clause 3 of Appendix 5A to CAO 48.1 Instrument 2019

The operations manual procedures should clearly limit the use of extensions to a maximum of 1 hour provided the FCM considered themselves fit for the extension:

For flight training, the procedures should allow for an extension of up to a maximum of 30 minutes after the first 7 hours of the FDP if:

- unforeseen operational circumstances arise
- it is operationally necessary in order to complete the duty
- the FCM considers themselves fit for the extension.

An FDP may be extended beyond the end of evening civil twilight only if it is necessary to complete the duties associated with the last daylight flight.

C2.8 Standby limits

C2.8.1 Introduction

Standby is defined to mean a period of time during which an FCM is required by an AOC holder to hold himself or herself available for duties, has access to suitable sleeping accommodation and is free from all duties associated with his or her employment.

Standby may be undertaken at home or at another place where suitable sleeping accommodation is provided. If suitable sleeping accommodation is not available for an FCM who is required by an AOC holder to hold themselves available for duty, the FCM cannot be on standby.

There are 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 while undertaking no actual duty. However, 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 FCM to drive to the airport upon call-out which depending on the time taken to travel, weather and the traffic conditions which 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.

Some operators may assign FCMs to what has previously been called ‘airport standby’. Although no flight duties are initially assigned, typically access to suitable sleeping accommodation is not available and as such it is not considered possible for an FCM to use this period for genuine rest or sleep in preparation for an FDP In these instances, this ‘standby-like arrangement’ must be considered as duty and not standby.

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 not including the FCM in operational deliberations and decision making prior to the start of the FDP.

Operations manual procedures must:

- include a means for 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 exacerbated 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.

The operator may need to have procedures if they have any requirements for an FCM on standby to remain contactable after the FCM has been called out for an FDP. For example, an FCM may be on standby from 0600, and at 0800 the AOC holder calls out the FCM for an FDP with a reporting time of 1200. In order to determine whether the time from 0800 to 1200 is still standby the definition of standby must be considered. If the FCM is still required by the AOC holder to hold themselves available for duty (i.e. to still be contactable in case the AOC holder wants to assign a different FDP, report time, etc) then the definition for standby is met and so the FCM is still on standby for this period. However if the operator has no requirements for the FCM to hold themselves available for duty, then the definition of standby is not met, and FCM would effectively be 'between' standby and the FDP.

The operator must have procedures to ensure any period of standby and standby like arrangements is treated as a duty period and added to the FDP for which the FCM is called out in order to determine the following minimum ODP.

C2.8.2 Things for consideration

Appendix 1

There are no provisions in Appendix 1 that address standby. If an operator wishes to hold the FCM on standby then, in accordance with paragraph 14.11 of CAO 48.1, the FCM needs 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, Appendix 1 has the requirement for 8 hours consecutive sleep opportunity in either the 10 hours immediately before an FDP when away from home base or in the 12 hours immediately before an FDP when at home base.

While it is considered unlikely an operator under Appendix 1 will be able to use standby, if an operator wishes to do so, acceptable procedures must in place to demonstrate how the prior sleep opportunity is achieved for FDP start times that occur during rostered standby periods.

Appendix 2, 3, 4 and 6

	Clauses 1 and 8 of Appendix 2 to CAO 48.1 Instrument 2019 Clauses 1 and 6 of Appendices 3 and 4 to CAO 48.1 Instrument 2019 Clauses 1 and 5 of Appendix 6 to CAO 48.1 Instrument 2019:

The procedures must ensure:

- the FCM will not be held on standby for greater than a 14 hour period
- when the FCM is called out from standby after 4 hours or more on standby, the maximum FDP limit is reduced by the length of time the FCM is on standby in excess of 4 hours
- when the FCM is called out from standby, the maximum combined duration of standby plus the subsequent FDP is 16 hours - except where the subsequent FDP is an augmented crew operation (Appendix 2) or includes a split-duty rest period at suitable sleeping accommodation of at least 4 consecutive hours (Appendix 2 and 3)
- if the FCM is not called-out from standby, the standby must be followed by an ODP of at least 10 consecutive hours.

Appendix 4A

	Clause 14.11 to CAO 48.1 Instrument 2019

There are no provisions in Appendix 4A that address standby. If an operator wishes to hold the FCM on standby then, in accordance with paragraph 14.11 of CAO 48.1, the FCM needs 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, Appendix 4A has the requirement for either 8 consecutive hours sleep opportunity in the 10 hours immediately before an FDP or in the 12 hours immediately before an FDP when at home base or 10 hours sleep opportunity (of which at least 6 must be consecutive) within the 24 hours immediately before commencing the FDP.

While it is considered unlikely an operator under Appendix 4A will be able to use standby, if an operator wishes to do so, acceptable procedures must in place to accurately demonstrate how the prior sleep opportunity is achieved for FDP start times that occur during rostered standby periods.

Appendix 4B and 5

	Clause 4 of Appendix 4B to CAO 48.1 Instrument 2019 Clause 4 of Appendix 5 to CAO 48.1 Instrument 201

There is no specific limit on the length of a continuous period of standby and therefore continuous 24 hour periods of standby are theoretically possible. However the maximum FDP limits will prevent an FCM having to operate a long FDP after an extensive period of standby.

Further, the FCM must meet the required longer term ODP requirements and these will ultimately require the FCM to end a continuous period of standby.

The procedures must ensure:

- commencing an FDP marks the end of a standby period and the FCM cannot return to standby until the required minimum ODP has been undertaken following the FDP
- standby cannot be used as a means of separating FDPs. Where an FDP takes place, then a split-duty rest period must be used if a further period of flying duty is subsequently required, and the split duty limitations are invoked
- it is permissible for an FCM to return to standby after a period of duty in which no flight occurs however, the maximum FDP limits following that period of duty are to be reduced by the amount of time spent on duty (or 30 minutes, whichever is greater)
- the initial and ongoing assessment of the suitability of the sleeping accommodation or suitable resting accommodation provided by the operator
- FCMs are not disturbed during the standby period, except to call the FCM out for an FDP or duty.

C2.9 Positioning

C2.9.1 Introduction

Positioning involves transporting an FCM between locations when the FCM is a passenger.

Transport to suitable accommodation is not positioning, this is part of the off-duty period. Utilising crew rest facilities as part of augmented crew is not positioning, this is part of the FDP. Positioning after the last flight in an FDP does not pose a fatigue risk to the positioning flight and is not part of the FDP; however, it is duty and impacts subsequent ODP. Positioning prior to a subsequent flight as crew adds to fatigue and is considered part of the FDP.

When calculating displacement time for determination of acclimatisation, an operator must also take any time zones crossed during the FCM's positioning period into consideration. Section 7 of CAO 48.1 (which deals with the determination of acclimatisation) relates solely to the location where an ODP or FDP commences, regardless of the manner or role FCMs played in getting there.

Positioning is duty and so when calculating cumulative duty, any time spent positioning must be included as positioning is a task that is associated with the business of the operator.

C2.9.2 Things for consideration

Appendix 1-6

All operators are required to comply with the requirements of subclause 6.3 for positioning.

While there are no specific positioning provisions in Appendix 1, 4A, 4B, 5 and 5A, if an operator under any Appendix intends to position an FCM, there should be procedures to ensure:

- the time spent positioning before an FDP must be included in the FDP
- the positioning is duty and is part of the duty period
- positioning after the last flight in an FDP is not part of the FDP however it is duty and impacts the subsequent ODP

- any time zones crossed during the FCM's positioning are included when calculating displacement time for determination of acclimatisation
- any displacement time during positioning is considered when determining the subsequent minimum ODP
- 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
- any positioning 'sector/s' do not need to be considered a 'sector' when the number of sectors is a factor in determining the maximum allowable duration of an FDP.

Appendix 2, 3, 4 and 6

	Clause 9 to Appendix 2 of CAO 48.1 Instrument 2019 Clause 7 to Appendices 3 and 4 of CAO 48.1 Instrument 2019 Clause 6 to Appendix 6 of CAO 48.1 Instrument 2019

Further to the matters immediately above, Appendix 2, 3, 4 and 6 include that on completion of assigned flight duties in an FDP an FCM may position to a suitable location as required by the AOC holder, and so the relevant procedures must be detailed if this provision is to be invoked.

C2.10 ODP limits

C2.10.1 Introduction

It is essential that the operator and FCM understand that an ODP 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 and they cannot be assigned another FDP until the minimum ODP requirements have been met.

Based on the function the ODP performs, there are three broad categories of off-duty requirements:

- those that address acute fatigue such as the requirement for an ODP following an FDP
- those that address cumulative fatigue such as the requirement for 36 consecutive hours off-duty every 7 days and 6 days off duty every 28 days
- those that are required to acclimatise an FCM to the local time (an adaptation period).

C2.10.2 Things for consideration

General

The ODPs must not be less than those required by the relevant appendix 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 the required sleep opportunity.

The procedures must demonstrate the operator is aware of the requirement for prior sleep opportunity in an ODP before the following FDP must be met. In any ODP, the FCM must have enough time to travel to and from the suitable sleeping accommodation, meet the

reasonable requirements of bodily functioning such as eating, drinking, toileting, washing and dressing and get the minimum sleep opportunity.

Addressing Acute Fatigue

ODPs must be sufficiently long enough to provide for:

- the required sleep opportunity (generally 8 hours)
- sufficient time for the FCM's requirements of bodily functioning (i.e. eating, drinking, washing and dressing)
- enough time to travel to and from the suitable sleeping accommodation.

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 eight-hour sleep opportunity is preserved after meeting other requirements. It is primarily the responsibility of an operator to ensure that enough time is available in the ODPs (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 to achieving the required sleep opportunity are communicated to the operator.

The effectiveness of an ODP is also impacted by the location and quality of the accommodation that is provided, or that is available to the FCM when they are away from home base.

> **Example:**
>
> If the accommodation is next to a noisy road or worksite it will reduce the quality of any sleep the FCM can achieve. The more sleep is fragmented by waking up, the less restorative value the sleep has in terms of how the FCM will feel and function in their next duty period. An FCM cannot conduct duty if they reasonably consider that due to fatigue they may be unfit to perform tasks. As such, it is fundamental to the ongoing operation that any accommodation is suitable for sleep.

Addressing Cumulative Fatigue

The off-duty limits that relate to cumulative fatigue are the requirements for 36 hours off-duty (including 2 local nights) in any consecutive 168-hour period, as well as the requirement for a number of full days off-duty in any consecutive 28-day period.

Note: Appendices 4B and 5 have a variation on this requirement - see the specific information below.

The time of commencing duty following a fatigue recovery period impacts the effectiveness of the recovery period. Duty commencing at 0500 following a local night significantly reduces effectiveness of the prior sleep opportunity and so operators should consider starting duties later in the day where possible in such circumstances.

To start an FDP, an FCM must meet the off-duty requirements at the projected end of the assigned FDP. This requires an operator to calculate the requirements based on the end of the proposed duty. FDP ending after midnight should be considered for their impact on cumulative days off-duty requirements.

Addressing Time-Zone Related Fatigue

Operators are required to comply with the requirements for the determination of acclimatisation in paragraph 7 of CAO 48.1 Instrument 2019.Once an FCM crosses two or more time-zones from a location to which they were acclimatised, their body clock is assumed to migrate away from the local time of the original location.

After 36 hours have elapsed, the FCM is no longer sufficiently aligned to the original time zone and is considered to be in an unknown state of acclimatisation. FCMs require an adaptation period to become acclimatised to a location.

Appendices 2 and 4 specify that when crossing more than 2 time-zones travelling east, or 3 time-zones travelling west, increases to the minimum ODP are required following the FDP.

FCMs in an unknown state of acclimatisation have reduced maximum FDPs to account for the additional fatigue, commonly referred to as jet lag.

FCMs must not be assigned more than 4 consecutive FDPs in an unknown state of acclimatisation before being provided with an opportunity for adaptation.

For Appendices 2-6, operators are required under paragraph 15 to identify and take into account fatigue hazards. In order to appropriately manage the fatigue hazards inherent in crossing multiple time zones, a similar approach should be considered by operators implementing other appendices where time-zone changes are encountered.

C2.10.3 Off Duty Period Following an FDP

Each appendix has subtle differences in ODP requirements and as a result the operations manual requirements for each appendix are as follows.

Appendix 1

	Clause 4 of Appendix 1 to CAO 48.1 Instrument 2019

Acute and Cumulative Fatigue

Appendix 1 has a different approach to minimum ODPs that reflect the different way fatigue risk is managed in this appendix. The procedures must ensure:

- the FCM has a minimum of 12 consecutive hours off-duty in any 24 hour period
- the FCM has a minimum of 36 hours off duty including 2 local nights during any consecutive 168 hour (seven day) period
- the FCM has at least 6 days off duty in the 28 consecutive days before the FDP commences.

Appendix 2

	Clause 10 of Appendix 2 to CAO 48.1 Instrument 2019

Acute Fatigue

Generally, the minimum ODP is increased for increases in the length of FDPs and duties, and for crossing more than two time-zones east and three time-zones west.

The minimum required ODP for an acclimatised FCM whose total FDP and any duty time does not exceed 12 hours is as follows:

- at home base the ODP must not be less than 12 hours plus the amount that any displacement time exceeds 3 hours if travelling west, or 2 hours if travelling east
- away from home base the ODP must be not less than 10 hours (other than when the specific requirements are met that allow assignment of an ODP of less than 10 hours, as below) plus the amount that any displacement time exceeds 3 hours if travelling west, or 2 hours if travelling east.

The minimum 10 hour ODP at an away location may be reduced to 9 hours if certain specific conditions are met as follows:

- the previous ODP immediately prior to the first FDP was at least 12 hours including a local night
- the total time of the first FDP and any duty does not exceed 10 hours
- the FCM is acclimatised at the start of the 9 hour ODP
- the 9 hour ODP is during a local night
- the 9 hour ODP is at an away location
- the next duty which follows the 9 hour ODP is itself then followed by an ODP of at least 12 hours which includes a local night.

Note: The operator must be able to demonstrate the FCM had the minimum of 8 hours sleep opportunity in the 9 hour ODP. The FCM must still have enough time to travel to and from the suitable sleeping accommodation, meet the reasonable requirements of bodily functioning (i.e. eating, drinking, washing and dressing) and get a minimum of 8 hours sleep opportunity.

The minimum required ODP for an FCM in an unknown state of acclimatisation whose total FDP and any duty time does not exceed 12 hours is 14 hours plus the amount of any displacement time.

The minimum ODP for all FCMs increases if the preceding FDP exceeds 12 hours and/or if the FCM crosses time zones resulting in the displacement time exceeding 3 hours if travelling west, or 2 hours if travelling east, as below.

The minimum ODP for an acclimatised FCM whose total FDP and any duty time exceeds 12 hours is as follows:

- 12 hours; plus
- 1.5 times the amount that the FDP and duty exceeded 12 hours (for example a 13 hour total duty period requires 90 minutes to be added to the minimum ODP); plus
- the amount that the displacement time exceeded 3 hours if travelling west, or 2 hours if travelling east is added to the minimum.

The minimum ODP for an FCM in an unknown state of acclimatisation whose total FDP and any duty time exceeds 12 hours is as follows:

- 14 hours; plus

- 1.5 times the amount of time the FDP and any duty exceeded 12 hours; plus
- the amount of the displacement time.

Where an FCM has an ODP which is calculated to be more than 14 hours at an away location, the ODP can be reduced to 14 hours if certain specific conditions are met as follows:

- the first FDP was not extended past the FDP limit in the manual
- the 14 hour ODP is at an away location
- the FCM is acclimatised at the start of the second FDP
- the second FDP is followed by an ODP of at least 36 consecutive hours and includes 2 local nights

Cumulative Fatigue

The procedures ensure:

- at the projected end of the assigned FDP or standby the FCM has had at least 36 consecutive hours off-duty, including 2 local nights, in the previous 168 hours
- before commencing the FDP has the FCM had at least six days off-duty in the 28 consecutive days before the standby or FDP commences.

Time Zone Adaptation

Once an FCM has spent time in a location where the local time differs from their home base local time their body clock will almost inevitably begin to align itself with the local time.

For Appendix 2 operations that cross two or more time zones there must be procedures that address an FCM being in an unknown state of acclimatisation. This occurs when:

- the FCM commence an FDP or ODP in a location that differs in local time by two hours or more from the last location where they were acclimatised—where their body clock was aligned with local time; and
- 36 hours have elapsed since the start of the FDP that originated at the location where they were last acclimatised.

When an FCM is in an unknown state of acclimatisation they require an adaptation period to be considered acclimatised to a location.

Adaptation Period Requirements

When an FCM is in an unknown state of acclimatisation, FDPs are reduced until the FCM is acclimatised again following an adaptation period. An FCM must not undertake more than 4 consecutive FDPs in an unknown state of acclimatisation. An adaptation period must be provided before the FCM can undertake another FDP.

The procedures must show how an operator arrives at the required adaptation period required for the FCM to return to being acclimatised in accordance with Table 2 below:

- determine the time zone displacement between:
  - the location where the FCM was last acclimatised (the original location)
  - each location where an FDP or ODP was commenced since last acclimatised (later locations)
- then choose the time zone displacement between the original location and whichever of the later locations gives the greatest time zone displacement

- then choose the time zone change in Table 2 (below) that corresponds to the greatest time zone displacement
- then choose the direction (East or West) in which the FCM travelled and in which, therefore, the greatest time zone displacement
- then choose the number of hours East or West (as the case requires) that corresponds to the time zone change chosen under subparagraph (c) of the Order.

At away bases, the required adaptation period can be reduced by 12 hours for each off-duty period at a location that is less than two-hour time zone displacement for the adaptation location and includes a local night at that location.

Table 2: Adaption period to become acclimatised

Time zone change (measured in time zones)	**Adaptation period to become acclimatised to new location (hours)**	
Note: See definition of time Zone	West	East
2	24	30
3	36	45
4	48	60
5	48	60
6	48	60
7	72	90
8	72	90
9	72	90
10 or more	96	120

Note 1: Adaptation period means a continuous ODP for an FCM to become acclimatised to a particular location.

Note 2: An adaptation period may commence before the time when an FCM comes to be in an unknown state of acclimatisation.

Note 3: For guidance in determining acclimatisation, including examples of how an FCM becomes reacclimatised, AOC holders and FCMs should refer to CAAP 48-1.

Note that there is ongoing debate about whether it is preferential for FCMs to have an extended period off-duty at an overseas location after long trans-meridian flights or to commence the return to home base after a shorter ODP thereby reducing the impact of being in a location where the time zone is substantially different from that at home base.

Both options are currently available under Appendix 2 and procedures for either or both are acceptable. Where an operator seeks to minimise the time spent in a different time zone, they should try to keep FCMs on a schedule that is based on their home base sleep pattern.

Appendix 3

	Clause 8 of Appendix 3 to CAO 48.1 instrument 2019

Acute Fatigue

The procedures should ensure that the ODPs must not be less than those required by the Appendix and may well be greater due to the possibilities that the circumstances require a greater ODP in order or the FCM to meet all obligations and still achieve an eight hour sleep opportunity:

The minimum required ODP for an FCM whose total FDP and any duty time does not exceed 12 hours is:

- 12 hours at home base; or
- 10 hours when away from home base (other than when the specific requirements are met that allow assignment of an ODP of no less than 9 hours).

Where an FCM's FDP and any duty does not exceed 10 hours, their following ODP at an away location may be reduced to not less than 9 hours, provided that:

- the previous ODP immediately prior to the first FDP was at least 12 hours including a local night
- the total time of the first FDP and any duty does not exceed 10 hours
- the 9 hour ODP is during a local night
- the 9 hour ODP is at an away location
- the next duty which follows the 9 hour ODP is itself then followed by an ODP of at least 12 hours which includes a local night.

Note: The operator must be able to demonstrate the FCM had the minimum of 8 hours sleep opportunity in the 9 hour ODP. The FCM must still have enough time to travel to and from the suitable sleeping accommodation, meet the reasonable requirements of bodily functioning (i.e. eating, drinking, washing and dressing) and get a minimum of 8 hours sleep opportunity.

The minimum ODP requirement increases if the prior FDP and any duty exceeds 12 hours, as follows:

- 12 hours, plus
- 1.5 times the amount the FDP and any duty exceeded 12 hours.

If an ODP at an away location is calculated to be more than 14 hours, the ODP may be reduced to not less than 14 hours, provided that:

- the first FDP was not extended past the FDP limit in the operations manual
- the 14 hour ODP is at an away location
- the ODP following the second FDP is of at least 36 consecutive hours and includes 2 local nights.

Cumulative Fatigue

The procedures ensure:

- at the projected end of the assigned FDP or standby the FCM has had at least 36 consecutive hours off-duty, including 2 local nights, in the previous 168 hours
- before commencing the FDP has the FCM had at least six days off-duty in the 28 consecutive days before the standby or FDP commences.

Appendix 4

	Clause 8 of Appendix 4 to CAO 48.1 instrument 2019

Acute Fatigue

Generally, the minimum ODP is increased for increases in the length of FDPs and duties, and for crossing more than two time-zones east and three time-zones west.

The minimum required ODP for an FCM whose total FDP and any duty time does not exceed 12 hours is as follows:

- at home base the ODP must not be less than 12 hours plus the amount that any displacement time exceeds 3 hours if travelling west, or 2 hours if travelling east
- away from home base the ODP must be not less than 10 hours (other than when the specific requirements are met that allow assignment of an ODP of less than 10 hours, as below) plus the amount that any displacement time exceeds 3 hours if travelling west, or 2 hours if travelling east.

The minimum 10 hour ODP at an away location may be reduced to 9 hours if certain specific conditions are as follows:

- the previous ODP immediately prior to the first FDP was at least 12 hours including a local night
- the total time of the first FDP and any duty does not exceed 10 hours
- the 9 hour ODP is during a local night
- the 9 hour ODP is at an away location
- the next duty which follows the 9 hour ODP is itself then followed by an ODP of at least 12 hours which includes a local night.

Note: The operator must be able to demonstrate the FCM had the minimum of 8 hours sleep opportunity in the 9 hour ODP. The FCM must still have enough time to travel to and from the suitable sleeping accommodation, meet the reasonable requirements of bodily functioning (i.e. eating, drinking, washing and dressing) and get a minimum of 8 hours sleep opportunity.

The minimum ODP for an FCM whose total FDP and any duty time exceeds 12 hours is as follows:

- 12 hours; plus
- 1.5 times the amount that the FDP and duty exceeded 12 hours; plus

- the amount that the displacement time exceeded 3 hours if travelling west, or 2 hours if travelling east is added to the minimum.

Where an FCM has an ODP which is calculated to be more than 14 hours at an away location, the ODP can be reduced to 14 hours if certain specific conditions are met as follows:

- the first FDP was not extended past the FDP limit in the manual
- the 14 hour ODP is at an away location
- the second FDP is followed by an ODP of at least 36 consecutive hours and includes 2 local nights.

Cumulative Fatigue

The procedures ensure:

- At the projected end of the assigned FDP or standby the FCM has had at least 36 consecutive hours off-duty, including 2 local nights, in the previous 168 hours.
- Before commencing the FDP has the FCM had at least six days off-duty in the 28 consecutive days before the standby or FDP commences.

Appendix 4A

	Clause 5 of Appendix 4A to CAO 48.1 instrument 2019

The procedures must ensure that following an FDP an FCM has an ODP of at least 10 hours.

However, an FCM may take 2 ODPs of not less than 4 consecutive hours each, with an intervening duty period of not more than 2 hours, provided the total duration of the 2 ODPs is not less than 13 hours.

Procedures must ensure that before beginning an FDP or standby period the longer-term cumulative fatigue requirements will be met. These procedures must ensure that the FCM has had at least 2 full days (consecutively or otherwise) off-duty in the 14 consecutive days before the projected end time of the assigned FDP.

Appendix 4B

	Clause 5 of Appendix 4B to CAO 48.1 instrument 2019

Off Duty Period Following an FDP

The procedures must ensure that following an FDP an FCM has an ODP of at least:

- if the ODP includes the period between 2300 and 0559 hours local time - 8 hours PLUS the amount of time the duty exceeded 12 hours PLUS the number of hours of time zone displacement PLUS 1 hour for every 30 minutes (or part thereof) that the FDP is extended
- if the ODP does not include the period between 2300 and 0559 hours local time -10 hours PLUS the amount of time the duty exceeded 12 hours PLUS the number of

hours of time zone displacement PLUS 1 hour for every 30 minutes (or part thereof) that the FDP is extended.

The ODP must consist of at least 8 consecutive hours with access to suitable sleeping accommodation. As such the operator must ensure the FCM will be afforded sufficient time to get to and from the suitable sleeping accommodation, and still get 8 consecutive hours at the suitable sleeping accommodation.

If the ODP is calculated to be greater than 12 hours, the ODP may be reduced to not less than 12 hours provided the next FDP is also conducted under Appendix 4B and the subsequent ODP after the following FDP is at least 24 hours.

Off duty Periods for Cumulative Fatigue Recovery

The procedures must ensure:

- in any 168 hour period, if an FCM conducts 3 or more FDPs which are LNOs, or has an increased FDP, the FCM will have an ODP of least 36 consecutive hours, including 2 local nights during the period; AND
- before beginning an FDP or standby, the FCM must have 1 ODP of at least 36 consecutive hours including 2 local nights in the consecutive 336-hour (14 day) period before the projected end of the assigned FDP or standby; OR
- before beginning an FDP or standby, the FCM must have 1 ODP of at least 72 consecutive hours including 3 local nights in the consecutive 504-hour (21 day) period before the projected end of the assigned FDP or assigned standby.

Appendix 5

	Clause 5 of Appendix 5 to CAO 48.1 Instrument 2019

Off Duty Period Following an FDP

The procedures must ensure that following an FDP an FCM has an ODP of at least:

- if the ODP includes the period between 2300 and 0559 hours local time - 8 hours
- if the ODP does not include the period between 2300 and 0559 hours local time - 10 hours.

The procedures must ensure the ODP consists of at least 8 consecutive hours with access to suitable sleeping accommodation.

If the operator relies on the minimum ODP of 8 consecutive hours at suitable sleeping accommodation (including the hours of 2300 and 0559), the FCM must be provided sufficient time to get to and from the suitable sleeping accommodation, while still getting the eight consecutive hour period at suitable sleeping accommodation.

Any extension to an FDP results in an increase to the ODP by 1 hour for every 30 minutes (or part thereof) that the duty was extended beyond the FDP limit.

Off-duty Periods for Cumulative Fatigue Recovery

The procedures ensure that before beginning an FDP or standby period the FCM has had:

- at least one ODP of 36 consecutive hours including 2 local nights in the previous 336 hours (14 days); OR
- at least one ODP of 72 consecutive hours including 3 local nights in the previous 504 hours (21 days).

If in any 168 hour period, if an FCM conducts 1 or 2 increased FDPs, the FCM will have an ODP of least 36 consecutive hours, including 2 local nights during the period.

Appendix 5A

	Clause 4 of Appendix 5A to CAO 48.1 instrument 2019

The procedures must ensure that:

- following an FDP an FCM has an ODP of at least 10 consecutive hours
- a period of at least 2 consecutive days off-duty in any consecutive 384-hour (16 day) period.

Appendix 6

	Clause 7 of Appendix 6 to CAO 48.1 Instrument 2019

Acute Fatigue

The minimum ODP is the sum of 12 hours and 1.5 times the time that the FDP and any other duty time exceeded 12 hours. This remains the same whether at home base or away from home base.

Cumulative Fatigue

The procedures ensure that before beginning an FDP or standby period the FCM has had:

- at least one ODP of 36 consecutive hours including 2 local nights in the 168 hours (7 days) before the projected end time of the assigned FDP or assigned standby
- at least 6 days off-duty in the 28 consecutive days before the standby or FDP commences.

C2.11 Limit on cumulative flight time

C2.11.1 Introduction

Limiting cumulative flight time over the medium and long term is a means of managing cumulative fatigue by reducing the capacity of an operator to assign an FCM in an intensive manner for a sustained period of time.

Cumulative flight time for an FCM means the progressive total of flight time accrued by the FCM when acting as a crew member but excluding flight time accrued during recreational private operations.

Recreational private operation means flying conducted by an FCM in a personal capacity, and at and for 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.

For an operator to manage cumulative flight time they must track all the flight time of the FCM which is not recreational, irrespective of the organisation for which the flying is conducted.

For this limit to be accurately applied the operator must be recording flight time in accordance with the definition of flying time in the Order which implies the same meaning as that in the Regulations.

Under regulation 2 (1) of CAR 1988. Flight time means:

- In the case of a heavier-than-air aircraft - the total 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
- In the case of a lighter-than-air aircraft - the total time from the moment the aircraft first becomes airborne until it comes to rest on the ground excluding any time during which the aircraft is moored.

Most appendices (other than Appendix 4A, 5 & 5A) have the same two cumulative flight time limits:

- a maximum of 100 flying hours in any 28 consecutive day period
- a maximum of 1000 flying hours in any 365 consecutive day period.

Appendix 4A has a more tailored approach to managing fatigue for ballooning pilots and has a limit of 50 flying hours in any consecutive 28-day period.

Appendix 5 and 5A have a more complex approach with higher limits and a means for resetting the limits.

C2.11.2 Things for consideration

Appendix 1, 2, 3, 4, 4B and 6

Clause 5 of Appendix 1 to CAO 48.1 Instrument 2019

Clause 11 of Appendix 2 to CAO 48.1 Instrument 2019

Clause 9 of Appendices 3 and 4 to CAO 48.1 Instrument 2019

Clause 6 of Appendix 4B to CAO 48.1 Instrument 2019

Clause 8 of Appendix 6 to CAO 48.1 Instrument 2019

The procedures must ensure:

- rostering processes and guidelines that clearly require tracking and active consideration of each FCMs cumulative flight time
- a means of monitoring the number of hours of flight time for each FCM to ensure no FCM exceeds 100 hours in any consecutive 28 day period and 1000 hours in any consecutive 365 day period

- clear and readily available processes for the operator's employees who are involved in rostering activities to achieve outcome of limiting the flight time
- processes for reporting and taking account any other flying conducted by the FCM to determine whether such flying impacts the cumulative flight time limit.

Appendix 4A

	Clause 6 of Appendix 4A to CAO 48.1 instrument 2019

The procedures must not permit an FCM to exceed 50 hours of cumulative flight time in any consecutive 28-day period.

Appendix 5

	Clause 6 of Appendix 5 to CAO 48.1 Instrument 2019

The procedures must ensure the FCM does not exceed the cumulative flight time limits of:

- maximum of 50 hours in a 168 consecutive hour period
- maximum of 170 hours in any consecutive 28 day period
- maximum of 450 hours in any consecutive 90 day period
- maximum of 1200 hours in any consecutive 365 day period.

For those sections of the aerial work industry that require high yearly cumulative flight times, there is a provision within Appendix 5 whereby after a significant break FCMs will be able to 'reset' to zero their cumulative flight times.

For these unique provisions to be effective for fatigue risk mitigation, FCMs require freedom from all duty, rather than just from flying duties. Achieving the reset clauses will require adequate planning as the FCM will be unavailable for any duty over the period until the reset provision has been achieved.

Operators and FCMs should be aware that if these extended ODPs do not provide sufficient opportunity to recovery from cumulative fatigue, consideration should be given to not resetting the cumulative limit.

The 28 day and 90 day limits may be reset to zero after the FCM achieves a period of five **consecutive** days off-duty.

The 365 day limit may be reset to zero after the FCM achieves a period of 28 **consecutive** days off-duty.

Appendix 5A

	Clause 5 of Appendix 5A to CAO 48.1 instrument 2019

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

- 100 hours in any 384-hour (16 day) period
- if the operation is a mustering operation and an FCM has less than 500 hours experience in mustering operations as PIC or pilot under supervision - 120 hours in any consecutive 30-day period
- 1200 hours in any consecutive 365-day period.

The 365-day limit may be reset to zero if the FCM achieves a period of 28 consecutive days off-duty.

C2.12 Limit on cumulative duty time

C2.12.1 Introduction

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.

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

While Appendix 5 and 5A have no direct limit on cumulative duty, operators need a process for tracking Appendix 5 and 5A duty if the operator wishes to use the FCM for operations under another appendix.

Except for operators who exclusively operate under Appendix 5 or 5A, the procedures must ensure appropriate rostering processes and guidelines, a means of monitoring the number of hours of duty time for each FCM and processes for the operator's rostering employees.

C2.12.2 Things for consideration

Appendix 1

	Appendix 1 of CAO 48.1 Instrument 2019

There are no limits on cumulative duty under Appendix 1.

Appendix 2, 3, 4 and 6

	Clause 12 of Appendix 2 to CAO 48.1 Instrument 2019 Clause 10 of Appendices 3 and 4 to CAO 48.1 Instrument 2019 Clause 9 of Appendix 6 to CAO 48.1 Instrument 2019

The procedures must ensure:

- rostering processes and guidelines that clearly require tracking and active consideration of each FCMs cumulative duty hours over any consecutive 168 hour and 336 hour period
- a means of monitoring the duty time for each FCM to ensure no FCM exceeds 60 hours in any consecutive 168 hour period and 100 hours in any consecutive 336 hour period
- clear and readily available processes for the operator's employees who are involved in rostering activities to achieve outcome of limiting the duty time.

Appendix 4A

	Clause 7 of Appendix 4A to CAO 48.1 instrument 2019

The procedures must ensure an FCM does not exceed the following cumulative duty limits:

- 45 hours in any consecutive 168-hour (7 day) period
- 84 hours in any consecutive 336-hour (14 day) period.

Appendix 4B

	Clause 7 of Appendix 4B to CAO 48.1 instrument 2019

The cumulative duty time limits under Appendix 4B depend in part on whether an FCM has at least 1 ODP of at least 36 hours, including 2 local nights, during a consecutive 168-hour period.

If an FCM does not have an ODP of at least 36 hours, including 2 local nights, during the consecutive 168-hour period, the FCM is limited to 40 hours of duty during that period.

If an FCM does have an ODP of at least 36 hours, including 2 local nights, during the consecutive 168-hour period, the FCM is limited to 60 hours of duty during that period.

The cumulative duty accrued by an FCM during any consecutive 336 hour period must not exceed 100 hours.

C2.13 Limits on Infringing the WOCL and early starts

C2.13.1 Introduction

For the purposes of CAO 48.1 Instrument 2019, an FCM's window of circadian low (WOCL) is between 0200 and 0559. An 'early start' is an FDP that commences between 0500 and 0659.

There is extensive research showing decreased performance and safety concerns while performing duty periods that infringe the WOCL. Specifically, fatigue-related incidents were found to increase across 4 consecutive night shifts. Subsequent to the initial night, risk increased approximately 6% on the second night, 17% on the third night, and 36% on the fourth night. Biomathematical modelling of consecutive WOCL infringing duties yields similar results. Limiting exposure to 3 consecutive WOCL infringing duties aims to prevent fatigue risk from escalating in subsequent duties.

Early starts impact the ability to get a restorative night's sleep which can cause accumulation of sleep debt. WOCL infringing duties and early starts are two of the most commonly reported fatigue problems in pilot surveys. Reducing the maximum FDP for the fourth and fifth consecutive early start aims to minimise the cumulative fatigue impact.

The manner in which infringements of the WOCL and early starts are handled varies across the Appendices in a manner relevant to the type of operation conducted.

C2.13.2 Things for consideration

Appendix 1

	Clause 2 of Appendix 1 to CAO 48.1 instrument 2019

Appendix 1 does not have specific provisions for the WOCL due to the limit to the hours in which operations are permitted. Operations later than 2200 hours are also dealt with differently.

The procedures must ensure that:

- No more than 3 FDPs that finish later than 2200 hours may be undertaken in any 168 consecutive hours (these a referred to as 'late FDPs')
- FDPs that commence prior to 0600 hours are restricted to a maximum of 8 hours.

Appendix 2, 3, 4 and 6

	Clause 13 of Appendix 2 to CAO 48.1 Instrument 2019 Clause 11 of Appendices 3 and 4 to CAO 48.1 Instrument 2019 Clause 10 of Appendix 6 to CAO 48.1 Instrument 2019

In Appendix 2, the definitions of 'WOCL' and 'early start' depend on the FCM's state of acclimatisation. If the FCM is in an acclimatised state, the FCM's WOCL is based on the local time at the location where they are acclimatised. If the FCM is in an unknown state of acclimatisation, the WOCL is based on the local time at the location where they were last acclimatised. This same concept is applied to determining whether an FDP is an 'early start'.

In Appendix 3, 4 and 6, the definitions of 'WOCL' and 'early start' are based on the local time at the location where an FCM commences an FDP (not where the FDP concludes).

There will be occasions where an FDP will be captured by the definitions of both 'WOCL' and 'early start'. Such FDPs need to be considered as both an infringement of the WOCL and an early start.

The procedures must ensure an FCM is restricted to:

- 3 consecutive early start FDPs
- 3 consecutive infringements of the WOCL.

An FCM whose duties have already infringed 3 consecutive WOCLs, must not be assigned an FDP that would again infringe the WOCL without at least an intervening off-duty period that includes a local night.

However, the operations manual may permit up to 5 consecutive early starts provided the duration of the 4th and 5th consecutive early starts are reduced. The FDP limit for the 4th consecutive early start must be reduced by 2 hours, and the FDP limit for the 5th consecutive early start must be reduced by 4 hours. Reducing the maximum FDP for the 4th and 5th consecutive early starts aim to minimise the cumulative fatigue impact.

Example:

An operator complying with Appendix 4 has procedures that permit rostering an FCM on a series of 5 FDPs commencing at 0600 hours local time. The first 3 FDPs could be assigned up to the normal maximum limit (10 hours or less, subject to the fatigue hazard identification processes); however, the 4th FDP would need to be reduced to a maximum of 8 hours, and the 5th FDP reduced to a maximum of 6 hours.

To avoid these restrictions, an operator could consider rostering the FCM on a non-early start (an FDP that commences at or after 0700) to break the cycle of early starts. This would permit the FCM to obtain more effective rest in preparation for a longer FDP.

Appendix 4A

Appendix 4A to CAO 48.1 Instrument 2019

Appendix 4A has no restriction on WOCL infringements as the FDP and cumulative duty time limitations, along with prior sleep opportunity and off-duty requirements, are tailored to ballooning operations.

Appendix 4B

	Clause 8 of Appendix 4B to CAO 48.1 Instrument 2019

Appendix 4B contains a special clause on 'late-night operations' rather than restricting infringements of the WOCL or early starts. A late-night operation is any FDP that includes more than 30 minutes between the hours of 2330 and 0529 local time (effectively any FDP that is undertaken between 2330 and 0500 local time).

The procedures must:

- limit the number of late-night operations that are assigned or conducted to a maximum of 4 in any consecutive 168-hour period
- ensure that if, during any consecutive 168-hour period, an FCM conducts 3 or more late-night operations, the FCM is limited to 40 hours cumulative duty during that period.

Appendix 5

	Subclause 1.6 of Appendix 5 to CAO 48.1 Instrument 2019

The procedures must limit the number of FDPs assigned or conducted which include any time between midnight and 0459 to a maximum of 4 in any consecutive 168 hour period.

Note: Unlike other appendices this restriction does not then limit the total number of FDPs in the 168 consecutive hour period.

Appendix 5A

	Appendix 5 to CAO 48.1 Instrument 2019

Under Appendix 5A, the restriction on operating solely within daylight hours mitigates operations within an FCM's WOCL.

C3 Subsection 12 - Private Operations

C3.1 Introduction

In general CAO 48.1 Instrument 2019 does not apply to an AOC holder when conducting private operations.

Similarly CAO 48.1 Instrument 2019 does not generally apply to an FCM when conducting private operations.

However there are some occasions when private flying may impact on the potential fatigue of an FCM in an associated FDP, and in these circumstances, the private flying must be included as part of the FDP.

These occasions are limited to when an FCM performs duty by conducting a private operation (a private flight) during an FDP that involves a flight that is not a private operation (a commercial flight).

This is dealt with in Subsection 12 of CAO 48.1 Instrument 2019 which applies to all Appendices.

C3.1.1 Things for consideration - Subsection 12

In order for an FCM to perform duty by conducting a private flight during an FDP that involves a commercial flight, the operator must have procedures to ensure:

- if the private flight is conducted before any commercial flight is conducted, the private flight time must be taken to be part of the FCM's FDP
- if the private flight is conducted between commercial flights, the private flight time must be taken to be part of the FCM's FDP
- if 1 commercial flight is conducted during the FDP and the private flight is conducted after the commercial flight, the private flight time must be taken to be part of the FCM's duty period
- if more than 1 commercial flight is conducted during the FDP and the private flight is conducted after the last commercial flight, the private flight time must be taken to be part of the FCM's duty period
- in any of the circumstances above, the private flight must not be taken as part of the FCMs ODP.

C4 Subsection 13 - Operations under multiple appendices

C4.1 Introduction

Two sections within CAO 48.1 Instrument 2019 need to be considered when assessing whether procedures for transitioning between appendices are adequate: • subsection 13 • subparagraph 15.2 (d)

Operating under multiple appendices means either or both of:

- an FCM working to multiple appendices within a single FDP
- an FCM switching from one appendix to another on consecutive FDPs.

In order for an FCM to be able to operate under more than one appendix, operators must have procedures which comply with the requirements of subsection 13.

Operating under multiple appendices requires a number of steps. The first step is to ensure the FCM is within the limits of the new appendix prior to transitioning.

As an example, Appendices 4B, 5 and 5A have no requirement for a specific number of off-duty days in a 28-day period. This may result in an FCM having less off-duty days than the minimum required to commence an FDP under Appendix 2, 3, 4 or 6. If an operator wanted to transition an FCM from Appendix 4B, 5 or 5A operations to charter work under Appendix 4,

the FCM must first meet all the requirements of Appendix 4 including the requirement for 6 days off in 28 days.

When the operator is satisfied all requirements are met, the second step is to determine the limits that will apply, bearing in mind the complexity introduced by working to more than one appendix in a single FDP, as discussed below.

C4.1.1 Things for consideration - Subsection 13

If the operator intends to undertake operations where two or more appendices apply to a single FDP, the procedures must ensure:

- the maximum FDP is the FDP limit that applies to the specific activity being conducted at the time. The maximum FDP for the activity being conducted at any one time is based on the start time of the entire FDP, not on the start time of the operation under each appendix
- the maximum flight time is the flight time limit contained in the appendix under which the operation is being conducted at that particular time (based on the assumption that the entire FDP was conducted under that appendix). It must be based on the original start time of the FDP, not on the start time of the operation under each appendix.

The ODP that must be applied following the FDP is the greater of the minimum ODPs worked out by assuming the entire FDP was conducted under each appendix. For example, the procedures should require:

- the operator works out the minimum ODPs required if the entire FDP was conducted under each appendix; then,
- the longest minimum ODP that was calculated is then the minimum ODP that must be completed before the FCM can commence another FDP under any appendix.

If the operator intends to undertake operations where two or more appendices apply to a single FDP of an FCM:

- the operations manual must contain procedures that ensure that at any particular time in the FDP the operator and FCM must each ensure that the FCM remains within the cumulative duty and cumulative flight time limits for the appendix under which the operation is being conducted at that particular time.

C4.1.2 Things for consideration - Subsection 13A Transitioning from Appendix 4B, 5 or 5A, or Subpart 137.Q of CASR

When operating under multiple appendices, consideration will need to be given to the particular requirements of transitioning from an FDP or standby under Appendix 4B, 5 or 5A, or Subpart 137.Q of CASR to an FDP or standby under any other Appendix.

If the FCMs conduct this transition, the operator must have procedures to ensure the FCM has had at least 6 days off-duty in the previous 28 consecutive days, before the FCM can conduct an FDP or standby any other appendix.

For all appendices except Appendix 1, there is an alternative to the FCM having had at least 6 days off-duty in the previous 28 consecutive days. To invoke this relaxation, the operator must have procedures to ensure that the FCM may commence a first FDP or standby under the other appendix subject to all the following conditions:

- the ODP immediately before the first FDP or standby under the other appendix is at least 12 hours;
- the report time for the FCM for the first FDP is not earlier than 0700 hours local time
- the FCM's previous FDP prior to the transition was less than 8 hours
- the FCMs first FDP after the transition is less than 8 hours in duration
- after the first FDP, there is only 1 subsequent FDP, which must also be less than 8 hours in duration, before the requirement of the FCM having had at least 6 days off-duty in the previous 28 consecutive days are met.

C5 Subsection 15 - Additional operator obligations - risk management

C5.1 Introduction

If the operator has chosen to operate to one or more of Appendices 2-6, the assessor must assess whether the operator's risk management procedures comply with subsection 15 of CAO 48.1 Instrument 2019. This subsection details requirements for risk management and training and represents the foundation upon which the operator's limits (FDP, OPD etc) are substantiated.

The management of fatigue risk is not considered an 'add on' but rather it is an integral part of ensuring safe operations. An assessor should review the operations manual to evaluate the appropriateness of the operator's plan for risk management, and training. From this information, the assessor should be satisfied that the procedures provided are sufficiently robust to manage the fatigue risk expected when operating up to the fullest extent of the maximum and minimum limits in the operator's operations manual.

If the operator has an approved SMS then some or all of the requirements of paragraph 15.2 may be met by referencing the applicable SMS processes. This would also require evidence that fatigue risk has been identified and can be effectively addressed by the SMS.

Example:

> If an operator has an existing SMS with a reporting process, a section on the hazard/occurrence reporting form should require information about sleep history and subjective assessment of fatigue (i.e. 'Identify on a scale how fatigued you felt at time of occurrence').

C5.1.1 Things for consideration

The assessor should review both the operations being conducted by the operator and the prescriptive limits the operator has identified.

There are potentially many aspects to the operational context that need to be considered by the operator when determining fatigue hazards. Some examples are:

- environmental conditions such as hot weather, noise and vibration (aircraft equipment)
- factoring in age, experience, currency of the FCM
- operational tempo
- equipment unserviceability.

The CASA assessor cannot be expected to have a high level of familiarity with the wide range of fatigue hazards which may be present in the operations of any particular AOC.

The assessor's judgement on the level of detail and sophistication required of the risk management procedures will be highly dependant on the provision of information from the operator as to the fatigue hazards.

If the assessor is not satisfied the operator has adequately mitigated the fatigue hazards the assessor can present some options to the operator to lower the risk:

- one option might be to lower the FDP limits or increase the ODPs. This would be particularly pertinent if the operator didn't actually need the full extent of the maximum or minimum limits available in the appendix for the current operation
- another option might be to increase efforts at risk mitigation by doing one or more of:
  - introduce new procedures or improve current practice to increase the likelihood the FCM will not incur additional or unforeseen fatigue
  - increase monitoring and supervision for the areas in the operation where there is greater fatigue risk
  - improving training by specifically addressing the fatigue risk in the operation.

The operator must provide a documented process to achieve compliance with subparagraph 15.2 . The assessor needs to be able to identify the specific risk management procedures in the manual which support this process.

C5.1.2 Things for consideration - Risk management procedures

If the AOC holder or Part 141 Operator has selected any or a combination of Appendix 2-6, the operations manual must include risk management procedures to enable the organisation to comply with the operator obligations within sub-paragraph 15.2 (a) and (b).

The procedures should include a method of identifying any reasonably foreseeable fatigue hazards that may compromise an FCM's alertness during an FDP.

Fatigue Hazard Identification

Fatigue hazard identification procedures describe the formal means of collecting and recording information about fatigue hazards that may affect the safety of the operational activities. From the fatigue hazard identification processes, a list or register of the identified fatigue hazards should be created with each identified hazard having an associated risk assessment.

It must be clear from the operators procedures that fatigue hazard identification is an ongoing process. There are many ways of identifying fatigue hazards and depending on the size of an organisation, some or all of the following examples might be acceptable for use:

- small/non-complex operations might include brainstorming, where the organisation's Safety Committee or a small group of suitably experienced members of the organisation meet to consider the operator's operations and identify possible fatigue hazards in this manner
- gathering information from previous accidents and incidents (internal and external) with fatigue related causal or contributing factors
- considering fatigue reports resulting from fatigue reporting schemes

- considering fatigue related results of internally or externally conducted safety assessments/audits
- considering fatigue related safety information from external sources, i.e. similar organisations, Australian Transport Safety Bureau (ATSB), CASA audit reports etc
- considering results from generic fatigue hazard checklists
- larger, more complex operations may additionally include confidential reporting processes, bio-mathematical modelling, and formal data analysis techniques.

Fatigue hazards can only be controlled if their existence is known. Through a confidential safety reporting system, circumstances or conditions where fatigue could have the potential to endanger the safety of aircraft operations can be identified by the following processes:

- safety reporting that is reactive (an event that has happened)
- proactive (identification of a potentially unsafe situation)
- predictive (using data and experience to predict what might happen in the future).

Fatigue reports are a pivotal piece of the fatigue hazard identification process. It is important that the operator displays an understanding that through their policies and the culture created by day-to-day management they determine the likelihood that FCMs will participate voluntarily in the fatigue reporting and data collection procedures of the organisation. A positive reporting culture will further enable the FCM to realise how important it is for them to manage their own expectations/responsibilities.

The operator should clearly identify through their policies and procedures they understand an absence of fatigue reporting does not necessarily demonstrate an absence of fatigue in the operation.

The operator should take all reasonable steps to facilitate fatigue reporting with evidence of every aspect being considered from the design of the fatigue report, the submission options, the actions on submission, the response to the reporter and so on.

The operator should have procedures which identify for the FCMs and other individuals who may have a role in fatigue management (management, rostering staff, etc) the expectations of the organisation to report fatigue hazards, fatigue risk, and any incident or accident which may have fatigue related aspects.

If reporting fatigued or making a fatigue report is a difficult or challenging process or leads to poor outcomes for the FCM submitting the report, then almost inevitably, reporting will not happen. In these circumstances the hazard identification process will be ineffective and will therefore not fulfil the obligations under subsection 15.

Example: If an FCM who submits a fatigue report is required to see a medical doctor and not permitted to fly until the doctor has subsequently given them the 'all clear', this will almost inevitably reduce the likelihood of FCMs reporting fatigued.

Note: Fatigue is not normally a medical issue. Like getting hungry and thirsty, it is a normal physiological response - fatigue is a response to lack of quality sleep. Unless there is an associated health issue that requires an assessment by a medical doctor, a medical assessment should not be part of the fatigue reporting and management process.

Risk Assessment and Mitigation:

The fatigue hazard identification procedures should include a means of recording the fatigue hazard in a risk register that captures where, when, why and how the hazard could degrade the safety of the flying operation and enables tracking of the assessment, treatment, and ongoing monitoring process.

The risk assessment process will determine the consequences and likelihood of any event to evaluate the level of fatigue related risk. The need to identify and evaluate existing measures in place that control the fatigue hazard or reduce the likelihood of occurrence or consequence is a crucial step in risk analysis management.

The operator will need to consider the range of potential outcomes through risk analysis that include the most likely and likely worst consequence, how these could occur and how effective the controls already in place are.

Where this risk assessment is assessed as being greater than as low as reasonably practicable (ALARP), there should be a documented risk mitigation plan/action that has been assessed as likely to result in a subsequent assessment of ALARP with an associated responsible person identified for monitoring the plan/action to ensure the ongoing effectiveness of the mitigation(s).

Operator’s should not accept any risks that are above a tolerable level and are encouraged to manage risks already deemed tolerable to a level ALARP. This is the point where further treatment would be prohibitive with little increase in safety.

The operator must have procedures for monitoring risk mitigation. These procedures should identify that evidence of the effectiveness or otherwise of the mitigation is used when available and includes a process to enable changes to be made when the control measures identified are inadequate or become no longer necessary.

It is important that the operator has procedures that identify and record who will carry out any tasks required by a particular fatigue risk mitigation strategy and who is responsible for ensuring the task is being performed on an ongoing basis.

The overall risk management will rely extensively on the experience of the operator's personnel. However, relevant safety data should also be used if it is available.

An operator may need data in order to satisfy itself and CASA the fatigue risks are appropriately managed. When an operator collects information on fatigue they need to consider the validity of the data. Some considerations for data collection procedures are as follows:

- how and when the data is collected. The procedures used to collect data can influence validity of any decisions made based on the data
- the time and frequency of data collection can influence the quality of data obtained
- collecting data during a period of substantial organisational change is useful however the context needs to be considered when comparing to pre-change and post change data
- collecting data too often can lead to participant burn-out and reducing participant levels.

> **Example:**
>
> Whether or not participants were guaranteed anonymity may affect whether participants are fully honest in their responses to surveys.
>
> **Note:** Asking an FCM to provide information on fatigue into a laptop or mobile device while other staff, a supervisor or a manager are standing nearby may discourage the FCM from providing honest and complete information

Any data collected by an operator should be analysed to elicit the best possible value from the data. While a level of diligence is required to ensure the data collected and analysed is genuinely representative and informative, the operator does not need to apply the level of rigour which would be required for a scientific research study.

Time zone transition

Assessors should determine whether FCMs are required to travel across time zones. This may be for simulator sessions, positioning or conducting actual operations as crossing time zones can result in a fatigue hazard which needs risk assessment and mitigation.

The matter of an FCM being in acclimatised or in an unknown state of acclimatisation is described in subsection 7 and is a fatigue risk which all operators must manage for FCMs who cross multiple time zones.

CASA has determined a reasonable approach for managing the risk of acclimatisation as described in Appendix 2.

Should the fatigue risk of acclimatisation/acclimatised FCMs be present when operations are conducted under other appendices, assessors should evaluate the operator's approach to managing this risk.

The approach contained within Appendix 2 could be used by an operator conducting operations under another appendix. Alternately an operator may propose another method to manage this risk, and this may be assessed as suitable if in all likelihood it will achieve an equivalent outcome.

Biomathematical models

Operators may use a biomathematical model to assist in predicting and managing fatigue risk for any appendices.

As the most frequent use of a biomathematical modelling tool is in support of an FRMS, the assessor would need to consult the CASA FRMS Handbook for guidance on the appropriate conditions for use and the limitations of such tools.

Process to incorporate the risk assessment outcomes

Procedures should reflect that operations manual limits are adjustable within the limits of the applicable appendix as a result of the risk assessment processes. The limits identified by the operator require ongoing assessment for their appropriateness given changing operational context and environment and new information regarding the fatigue risk in their operations.

Examples of procedures could include ongoing and regular meetings to consider the appropriateness of existing limits given the outcomes of risk assessment and risk mitigation efforts and with consideration of predicted operations or changes to operations.

The process for continuous monitoring and evaluation of the operator's policies, limits, practices and relevant organisational experience with a view to continuous improvement of fatigue risk management must be documented in the operations manual.

Examples of procedures that may meet the requirement for continuous monitoring include:

- procedures that set out how to report, what to report and who to report to
- an example/template of the fatigue reporting form
- a procedure that guides supervisors and managers in what questions to ask to ensure an FCM that wishes to report fatigued is supported and the engagement results in a safe outcome and ensures appropriate questions are asked and information gathered
- conducting an annual survey of FCMs in relation to the management of fatigue risk.

It is important that the operator's procedures reflect that fatigue hazard identification is not a static, one-off process. It needs to be performed on an ongoing basis and whenever a change in the organisation might affect the fatigue risk or fatigue risk management processes and mitigations. For example when organisational change is planned or when the organisation is undergoing expansion or contraction, or when new equipment or procedures are introduced

Changes may also be required as a result of key staff member changes or whenever there is a possibility that a new fatigue risk may be created.

C5.1.3 Things for consideration - Flight simulators

Operators may use flight simulators which necessitates overseas travel and/or 'back of the clock' simulation sessions.

- Simulator sessions can result in significant increases in fatigue levels. In addition, there may be an increase in fatigue levels resulting from the timing of a simulator session and the travel requirements to and from sessions. These aspects of simulator programming are a foreseeable fatigue risk and need to be managed.
- Quality of training issues may also arise from FCMs undertaking such training at overseas locations and/or in back of the clock sim sessions - as these fatigue hazards may also result in the importation of risk into the operational environment, the

oorganisation must have procedures to ensure these risks are identified, managed and mitigated.

C5.1.4 Things for consideration – Inclusion into SMS

Assessors should determine whether the operator has an established SMS either formally approved by CASA under Civil Aviation Order 82.3 and 82.5 or CASR Part 142, or an SMS which is not formally approved.

Where an SMS is in place, whether approved or not, it is logical the operator uses the SMS procedures to assist in managing fatigue risks.

Assessors should review the current SMS policies and procedure to ensure compliance the specific requirements of CAO 48.1 2019. For example, the SMS change management processes may need to be consider changes as varied as changes to crew rest facilities, company growth, significant organisational change, change to route structure, roster stability, changes to crew sign-on locations, changes to pre and post flight duties any other factor that might impact the assumptions underpinning the operations manual limits or procedures.

C6 Subsection 15 - Additional operator obligations - Training

C6.1 Introduction

Assessors should ensure that the operations manual contains details of the training and assessment program and this information is sufficient to meet both operator and individual obligations. The content and frequency of the training should reflect the degree to which the training is being relied upon to manage the fatigue risk in the operation.

An operation that has a specific fatigue risk must have training content that specifically addresses the nature of the fatigue risk in the operation. For example an operator that regularly conducts operations between the east and west coasts or an operator that regular conducts back of clock operations, must train all relevant staff in managing the inherent fatigue risks of these operations.

Additionally, fatigue risk associated with any specific requirements of an appendix, such as split-duty operations should be addressed in the training content.

While fatigue risk cannot be mitigated by training alone, if a fatigue risk is being managed in part through training, then there should be evidence of this in the operations manual.

C6.1.1 Things for consideration

The assessment by CASA of training may require enquiries into two key areas:

- the assessor should conduct a desk top assessment of the procedures adopted and the training syllabus within the submitted operations manual; and
- based on the desk-top assessment, the assessor should consider the need to assess the operator’s training via an on-site visit.

Example A:

A large airline has already established formal training to meet its obligations for Human Factors and Non-Technical Skills training. This has been recently assessed and the operator provides information to satisfy an assessor that a Training Needs Analysis (TNA) has been undertaken to meet compliance with the chosen appendix. The operator has established training methods and suitably qualified training staff. In such cases, an on-site assessment may not be required.

Example B:

An Aerial Work operator may have fatigue risk in that they intend using the maximum limits available in the appendix in circumstances that are significantly less than optimal. The operator does not have an SMS and has proposed fatigue related training that will be relied upon to manage some of the fatigue risk evident in the operation. In a case such as this, the assessor may choose to confirm the quality of the proposed training by conducting an on-site assessment and make an appointment with an operator to evaluate the training provided to FCMs and other employees.

C6.2 Training assessment method

C6.2.1 Introduction

Assessors are to ensure that the documented training program for the operator meets the minimum standards of the legislation. As training is comprehensively described in the CAAP 48-1, this will not be repeated here - while a brief overview of the assessment is provided below, the assessor will need to consult the CAAP 48-1 to facilitate the assessment of the training.

A suitable level of detail should form a part of the submission about training. The operator could submit a training manual or manual supplement detailing all relevant matters including at least the syllabus with sample lesson plans, the assessment processes and criteria, currency time frames, standards for instructors, the quality control processes and the like.

There should be enough detail in the documentation so that there is a relatively seamless transition for this required training should course designers or individual training personnel leave the organisation.

C6.2.2 Things for consideration

Training forms a major part of overall fatigue risk management. CAO 48.1 Instrument 2019 provides for minimum training requirements for Appendices 2-6.

If the operator has decided to use fatigue training content and facilitator guides provided by CASA it can be expected that these will be, at least in part, acceptable; however, the assessor should consider the fatigue risks each operator's FCMs are exposed to and whether the generic training material adequately addresses these specific risks.

In addressing the training and assessment requirements of subsection 15 of CAO 48.1 Instrument 2019, the operations manual must include more than a reference to the training

materials, whether CASA provided or otherwise. The operations manual must set out the training program in sufficient detail to meet all the requirements of paragraphs 15.3 - 15.9 of CAO 48.1 Instrument 2019.

While a deferral of training may be permissible in some circumstances, the assessor should consider that if the training provided is relied upon as a way of mitigating specifically identified operational fatigue risk, then the six-month delay for initial training to transition to the new regime and induct new employees (paragraph 15.4 of CAO 48.1 Instrument 2019) may not be appropriate. In such cases, the training should be conducted before the FCM commences operations that specifically rely on the training for fatigue risk mitigation.

Example:

An operator provides a hazard register indicating that fatigue risk will be mitigated by specific training elements. The operations manual also states that training requirements will be met within the six-month window after commencement of an FCM. The assessor should consider that this creates an unacceptable fatigue risk for proposed company operations during the six months the FCM is not specifically trained in relation to managing and mitigating this fatigue risk.

Poor quality of training could easily compromise the effectiveness of the organisation's fatigue risk management; therefore, assessors should consider the training offered and the overall delivery technique in detail. The training manual or operations manual should identify control mechanisms such as:

- how the training will be delivered and who is to deliver the training
- when initial and recurrent training is to occur
- how assessments are to be conducted, what are the thresholds for competence or requiring further training
- the minimum requirements/qualifications of the trainer
- remedial actions required should competence not be achieved

Example:

An operator has many bases spread out over Australia. The opportunity to provide face-to-face training for FCMs and employees does not occur. The operations manual submission contains details of a plan to use alternative means of training delivery via a web- based program. The manual indicates that the training will be provided more regularly than if it was done face to face and has created a comprehensive assessment method to ensure knowledge transfer.

Assessors should consider all factors when making a determination that the training offered is suitable.

The manual should state the qualifications required for staff, which are tasked for the delivery of fatigue training.

Example:

> A submitted operation manual states the training duty is assigned to a company line pilot. The assessor should obtain clarification of the qualifications of the FCM for this task. The operator subsequently makes it clear to the assessor that the FCM will have either a current Flight Instructor Rating, Training Pilot approval or a Certificate IV in Workplace Training and Assessment.
>
> The assessor should make a determination as to the suitability of these qualifications considering the complexity of the required fatigue training and, if appropriate ensure the operator documents these minimum requirements within the operations manual.

Assessors should be aware that it may be appropriate for operators to use additional training for particular FCMs and employees to assist in the management of identified fatigue risks in specific operations or roles. As an example, an operator may have one base from which FCMs regularly conduct multiple early morning operations. In these circumstances, the operator may manage the fatigue risks of this activity by providing enhanced training to the FCMs at this base in relation to fatigue management strategies for such operations.

C7 Subsection 14 - Operator obligations

C7.1 Introduction

Subsection 14 of CAO 48.1 Instrument 2019 in effect sets some of the ultimate overarching requirements that the assessor must be satisfied have been met by the operator. Specifically, subsection 14 sets out the following requirements:

- setting and publishing limits
- managing employee responsibilities
- access to meals
- maintenance of records and reporting
- identifying home base
- publishing rosters.

This subsection also contains the additional operator obligation regarding FCM fitness for duty (paragraph 14.1) which is the ultimate goal for operators in order to achieve safe operations. All other requirements of CAO 48.1 Instrument 2019 serve to add meaning and practical application to this operator obligation.

In assessing these broad overarching requirements as the final step, the assessor is provided the opportunity to consider the overall adequacy of the operator's operations manual. At this point the assessor has already checked that the operations manual limits and procedures do not exceed the limits within the applicable appendices and the limits have been adequately modified for each FCM in accordance with the requirements of subsection 15. With this context in mind, the assessor is ready to assess the adequacy of the broader requirements and documented processes and procedures required under subsection 14.

C7.1.1 Things for consideration

Paragraph 14.1 – Fitness for duty

Paragraph 14.1 sets out the operator's obligation around taking fatigue into account when requiring an FCM to operate an aircraft.

- The operations manual must not include any statement or content that could reasonably be interpreted as the operator requiring an FCM to operate an aircraft when, considering the circumstances of the flight to be undertaken, the holder would have reason to believe that the FCM would be suffering from, or is likely to suffer from, fatigue which may so impair the FCMs performance that the safety of the operation may be affected.
- There is no specific requirement that the fitness for flight obligation be documented in the operation manual; however, the operator demonstrates their compliance with this paragraph by providing a compliant operations manual. In addition, it is suggested that this intent should be reflected in any policy statements regarding the objectives of the fatigue management process of the operator.

> **Example:**
>
> An operator might make the obligation found in paragraph 14.1 (or something of similar meaning – see below) into a policy statement that is highly visible to employees (e.g. posted on the safety notice board). This could be reasonably be considered an act of an operator genuinely committed to the management and control of fatigue-related risks. The assessor should encourage the operator to provide a statement such as the following or something similar:
>
> 'XXX will not require or request an FCM to operate an aircraft if the FCM is fatigued or may become fatigued considering the circumstances'.

Paragraphs 14.2 and 14.3 – Limits and the operations manual

Paragraphs 14.2 and 14.3 contain the legal mechanism by which the limits found in the CAO 48.1 Instrument 2019 appendices become requirements for FCMs:

- sub-paragraph 14.3 (b) requires the limits in the operations manual be modified for FCMs conducing a particular operation. This does not mean that each FCM requires individually documented limits, but that the limits should take into account all the operator's FCM employees and where an FCM or group of FCMs cannot be safely included in the broad FCM employee group, then one or more modified limits need to be included for that FCM or group of FCMs. This may result in a different limit or set of limits based on such aspects as experience level, qualification, geographic location and commute time, and requirements due to other roles within the organisation or with other employees. CASA supports the concept of an operations manual containing multiple sets of limits where such limits are specific to specific fatigue risks
- for operations under Appendices 2-6, when other means of risk management are unavailable or existing risk management measures are insufficient to manage fatigue risk to the level of ALARP operators must adjust applicable maximums downward or applicable minimums upward until the risk is managed to ALARP

- the operations manual should have procedures to enable the documenting of amended FDP, flight time limits and off-duty limits for specific FCMs. This must occur when the operator becomes aware of circumstances that indicate a higher fatigue risk for a particular FCM or group of FCMs employed by the operator. These circumstances may be discovered by the FCM informing the operator or through other hazard identification processes
- where there is evidence that an operator has become aware, either through being notified by an FCM or through the other hazard identification processes that an FCM or FCMs have been found to have specific circumstances that increase fatigue risk over and above those of the other FCMs. The limits must be adjusted for these FCMs so that they reflect their specific circumstances.

> **Example:**
>
> When the operator is aware of circumstances which may introduce specific fatigue risks for an individual (such as having a newborn baby, being diagnosed with a sleep disorder) or a group of FCMs (such as living so far from the base of operations that commuting times are excessive), the operator needs to have processes to modify the limits to manage the hazards.
>
> **Note:** Given the operator may not wish to refer to specific FCMs in the operations manual it would be acceptable to list the FCMs generically, as if there was a group of them, such as '*For all FCMs who live more than two hours from the base.' or 'For all FCMs with less than 50 flying hours on type'.*

- as an alternative, it would be acceptable for the operations manual to state a procedure for employees to follow that ensures specific FCMs circumstances are taken into account in the application of limits in the rostering process. In this case, there would need to be sufficient evidence that such a procedure would reliably record FCMs with particular circumstances that increase fatigue risk along with the adjusted limits that apply to them; and that such a procedure would result in employer's reliably assigning FDPs to those FCMs that did not exceed the adjusted FDP or flight time limits
- subparagraph (a) and (b) in paragraph 14.3 apply to all operators, while subparagraph (c) only applies to those operators that will operate to appendix Appendices 2-6
  - subparagraph (a) requires that the limits must not exceed those found in the applicable appendices and these limits must be placed in the operations manual; and
  - subparagraph (b) requires that the limits must be modified for each FCM in each operation to reduce fatigue risk to an acceptable level and therefore, reliably meet the obligation under paragraph 14.1
    - subparagraph (c) does not apply to operators whose operations are contained within Appendix 1; therefore, subparagraph (b) provides the requirement for these operators having to modify their limits for each FCM in each particular operation.
  - subparagraph (c) requires that in addition to meeting the requirements of subparagraphs (a) and (b), operators intending to operate to one or more of

Appendices 2-6 must take into account the outcomes of the hazard identification and risk management processes required by paragraph 15.2 when modifying each limit.

- as an example, because personal fatigue management strategies may take some time to develop and as inexperienced FCMs may accrue fatigue more quickly without such strategies, it would be reasonable for an operator to document reduced maximums and increased minimum limits for inexperienced FCMs and/or FCMs that are new employees in the operator's organisation.

Changing limits and rostering procedures to manage fatigue risk can take many different forms:

Example A:

Individuals who have secondary employment or extended commute times may require modified limits.

Example B:

There could be a limit on maximum flight times before ODPs in low-level survey operations.

Example C:

A flying school could reduce maximum flight times relevant to an instructor's experience or reduce the number of a particular type of instructional flight in any one day.

Example D:

There could be a reduced limits policy and/or a limit on late-night operations for FCMs who have responsibilities for a baby.

As well as examples of effective fatigue risk management procedures, the assessor should be alert for procedures that may appear to have an inadequate risk assessment. If the opportunity arises, these examples may also prove useful as discussion items to check the understanding of operators.

Example A:

An operator has only allowed sufficient time in the rostered ODP for the FCM to commute from the aerodrome to and from the hotel without considering the time taken to clear customs and immigration. This might occur if the operator requires the FCM to record sign-on time as the time when then they reach the aircraft or briefing room. Where the operator can reasonably be expected to be aware of these requirements they should either extend the minimum ODP to include enough time to clear customs and immigration or identify the sign-on time as the time the FCM arrives at the aerodrome terminal rather than after they have been through customs and immigration.

Example B:

Poor risk management technique or non-compliance with limits could occur where FCMs are required to travel to or from an away base accommodation in peak hour traffic and inadequate time is allowed by an operator for travel at these times.

Example C:

Shifting an FCM's home base primarily to take advantage of the reduced minimum ODP requirements when away from home base would be considered an inappropriate fatigue risk management strategy.

Example D:

Using a non-rostered version of standby such as requiring the FCM remain contactable in case a flight comes up is not an appropriate fatigue risk management strategy. This approach would likely not be compliant with paragraph 14.11 due to the resulting lack of opportunity for the FCM to prepare for the FDP as well as potentially being in conflict with any prior sleep opportunity requirement of the applicable appendix (depending on the appendix).

Paragraph 14.4 – Employee responsibilities

Paragraph 14.4 requires the operator set out the employee's responsibilities for fatigue risk management. This paragraph captures all employees so that if an employee has a responsibility associated with fatigue management, (for example, rostering, responding to FCMs reporting fatigued, the selection of suitable sleeping accommodation) the responsibility must be documented in the operations manual. These responsibilities should be associated with roles rather than employee names.

Assessors are to review whether, in addition to FCMs, an operator has identified employees with fatigue management responsibilities. An assessor's knowledge of company operations will assist here.

Example:

Rostering staff, Operations and Safety Managers have responsibilities for fatigue risk management . An operator must set out these responsibilities and through the hazard identification processes determine the training requirements and so on for these personnel as a fatigue risk management mitigation.

Paragraph 14.5 - Meals

Paragraph 14.5 requires that where an FCM's FDP is to exceed five hours, the operator must provide the opportunity for the FCM to have access to adequate sustenance (a meal) during the first five hours and periodically after that meal, so that not more than five hours elapse between each meal.

It is important to note that this paragraph does not require the operator to provide the meal however the operator must provide the opportunity for access to a meal (see definition of access in CAO 48.1 Instrument 2019).

If the nature of the operation makes it very difficult or even impossible for the FCM to provide their own meal then in order to meet the requirements of this paragraph, the operator may be required to provide the meal in addition to providing the opportunity to consume it.

Paragraphs 14.6, 14.7, 14.8 and 14.9 – Records, reports and record keeping

Paragraphs 14.6 through to 14.9 addresses the requirements for:

- record keeping
- record retention
- reporting to CASA.

The assessor must ensure the operator has procedures for making and retaining records (including relevant reports and documents) of the following:

- FCM rosters
- actual duty periods and flight times
- actual split-duty rest periods, standby periods and ODPs
- the FDPs and flight time limits specified in the operations manual that were extended under the relevant provision (if any) of the appendix which the operator has chosen to comply with. Including information about the extensions in such detail that enables the holder to comply with subparagraph 14.8 (a)
- FCM training records (See section C5.2 - Training assessment methodology).

The procedures must also document the required retention period of 5 years for these records and reports.

The operator must have a procedure to ensure that any extension has a report written about it which contains enough detail to enable it to be studied for the purposes of continuous improvement of the operator's fatigue management policies and procedures.

- over time, when the number of extension reports indicate they are not occurring in a manner which can reasonably be considered unforeseeable, this would require a limit change, a change to rostering practices or procedure change in order to manage the fatigue risk and remain within applicable limits

- the procedures must detail that all extension reports (other than those that relate to operations under Appendix 5) must be provided to CASA on written request.

Paragraph 14.10 - Home base

Under all appendices except 5 and 5A, the operator must have a documented procedure for determining each FCM's home base and informing the FCM of this determination. There must also be procedures that must be followed when changing a FCM's home base. These procedures must be sufficient to ensure that any change in a FCM's home base will not adversely affect aviation safety.

The implications from a fatigue perspective for determining the home base are varied, with the most pivotal consideration being the longer ODP at home base than at an away location. As such the assessor, will need to ensure the procedures for determining the home base genuinely reflect the intent of CAO 48.1 Instrument 2019 to achieve this outcome.

From a fatigue risk perspective, it is important that a determination of home base should be assigned with a degree of permanence. Depending on the FCM and the situation, it is likely that any change in home base will require an extended ODP in order to complete the move and for individual fatigue management. It would be reasonable to expect at least a 72-hour period after a change to home base that required moving house before the FCM re-commenced duty. If the change to home base involved a change in time zones of two or more hours, the minimum ODP should in all likelihood be even longer.

Consideration needs to be given by the assessor to the home base for operators who operate from remote locations and/or have 'touring rosters' in which an FCM may be change the location at which they start and finish their FDPs with some degree of regularity to ensure such changes do not adversely affect aviation safety.

For example, an operator may only run rotary operations to the oil rigs from remote locations where the FCMs live while they are on roster. These operators will need to determine the remote location as the 'home base' for the FCM for duration of the on-site roster cycle as it is clear that this is where the FCMs start and end their duty.

While CAO 48.1 Instrument 2019 does not prescribe a process for determining the home base for operators with 'touring rosters', an assessor may reasonably consider that if an FCM is provided an extended ODP (i.e. at least 36 consecutive hours off-duty, including 2 local nights) at a location, then that location should be determined by the operator to be the 'home base' with the ODP requirements as per the home base limits of that Appendix. Conversely, if an FCM is away at a remote location for a shorter period and not provided an extended ODP, then that could be considered as 'away from home base' with the 'away' ODPs applying.

Assessors need to be aware that while the 'home base determination' procedures for most operators will be reasonably straightforward, operators who operate from remote locations and/or have 'touring rosters' will need to have specific procedures to manage the fatigue risks of the unusual circumstances relating to their home base determinations.

Paragraph 14.11 - Rosters

An operator must publish each roster so far in advance of the FDPs and standby periods listed in it as to provide the FCM to whom it applies with a reasonable opportunity to plan adequate rest before their duty.

Note: Guidance for operators concerning their obligations is contained in CAAP 48-1.

Operator's procedures for developing and publishing rosters should reflect awareness that their FCMs require some degree of certainty in organising their work/life balance, and more importantly from a fatigue management point-of-view, organising sleep.

It is important that operators publish the roster sufficiently in advance of flights covered by the roster, with a consistent lead time, and this period is communicated to all FCMs. While late changes to rosters are understandable, it is important that these changes be kept to a minimum. It is necessary to have procedures in place so that the effects of late roster changes are managed.

While it is not possible to provide assessors with a definitive time frame for roster publication due to the variations in operations, as guidance in regular operations providing less than 14 days' notice is unlikely to be considered adequate notice, in the absence of unusual circumstances. Even in ad hoc operations, the roster can still identify duty and non-duty periods, even if the exact details of the time and length of FDP are not advised until a time closer to the day of operations.

A consideration for the assessor is the degree of fatigue risk inherent in the operation. Higher fatigue risk operations such as FDPs extended by augmented crew operations should demand greater a period of notice for FCMs.

C8 Facilities

C8.1 Introduction

The ability of FCMs to achieve adequate sleep and rest is highly dependent on the suitability of the facilities provided both in aircraft and on the ground. The requirements in relation to crew rest facilities on the aircraft have been described above.

The operator needs to have processes to ensure that suitable sleeping accommodation is fit for purpose. CASA takes it as given that an FCMs home is suitable and as such, the focus of the assessment is on the facilities provided by the operator.

Accommodation may be provided in a range of facilities varying from multi-star hotels to dongas in mining communities through to converted hangars at the airport. The assessor must ensure the operator has procedures to determine the facilities are appropriate for their operational needs, whatever these may be.

The standard of available accommodation facilities can be impacted by external and internal factors which may vary over time. For example a four star hotel may appear suitable, however if there are day-time roadworks outside or the hotel is undergoing construction work from 0900-1700, the hotel may be unsuitable for an operator who has FCMs rostered for day-time ODPs.

As such the assessor must ensure the procedures for facility assessment are ongoing and able to respond to changes in the suitability of the facility which may occur with little or no notice.

The facilities provided may also change over time and so the procedures for selecting any new facility (including minimum criteria) must be satisfactorily documented in the operations manual.

It is considered unlikely any direct assessment of an accommodation facility will be conducted by CASA.

C8.1.1 Things for consideration

The assessment of facilities described in the operations manual may take several forms and cover a range of matters. An assessor should consider the overall impact of adequate facilities upon an operator's fatigue risk management. The limits and procedures in the operations manual need to be considered in light of the facility selection criteria procedures, for example using a minimum ODP when away from home base may only be achievable when accommodation is located proximate to the airport.

Facilities will also be required for operators proposing split-duty and these may be at home base or away. The operator must have appropriate procedures to evaluate these facilities and the mechanisms to ensure adequate rest/sleep is achieved to ensure unmitigated fatigue risk is not introduced into the operation.

Operators who require FCMs to undertake ODPs away from home base may regularly use accommodation close to the airport to maximise the FCMs sleep opportunity. Travel time and from the hotels can have a significant impact on whether the FCM can achieve the required sleep opportunity.

Example A:

An operator intends to use overnight accommodation for FCMs at a mining site in central Queensland. The operator is able to provide comprehensive evidence to the assessor the accommodation is suitable with photographs, facility information from mine site operator and a detailed report on the facilities from the Chief Pilot. The operator also has a procedure to survey FCMs after every use of the accommodation for the first three months with a report to be provided to CASA.

Example B:

A helicopter operator conducts remote outback surveys. Work practices include split duty at remote locations. Scrutiny by an assessor of the suitability of the sleeping accommodation could include reviews of photographs and relevant construction information (in relation to environmental issues such as noise and temperature control) and interviews with FCMs who use these facilities.

Example C:

An operator arranges accommodation close to an airport where the crews will have minimum ODP. The assessor should evaluate the arrangements to determine whether it is reasonable to expect that the required minimum sleep opportunity will be assured. This may require the provision of relevant evidence by the operator as to the ready availability of transport; average travel times between the airport and hotel and back at the applicable times; expedited check-in/check-out processes and whether there is timely access to meals.

Example D:

An operator proposes to use an FDP extended by augmented crew who will have access to in-flight rest facilities. The assessor conducts a desk-top evaluation to determine the facilities meet the requirements for the class of in-flight rest. The assessor may consider a direct inspection is required in order to have a more comprehensive understanding of the suitability of the facilities, and so makes arrangements with the operator for access to the aircraft to evaluate aspects such as physical separation from other crew members and passengers, noise mitigation, environmental controls and so on.

Appendix A CAO 48.1 Instrument 2019 Appendix 1-6 Technical Assessor Worksheet

The following worksheet/checklist is electronically appended:

1. CAO 48.1 Instrument 2019 Appendix 1-6 Technical Assessor Worksheet.

QCP - please insert hyperlink to CAO 48.1 Instrument 2019 Appendix 1-6 Technical Assessor Worksheet and delete this text box.

Appendix B Guidance for Assessors - the operator's risk mitigation processes

It is important that assessors have a sufficient understanding of the nature of the operations so that an overall judgement can be made of the submission to ensure it is capable of meeting regulatory compliance. Knowledge of the type of operation and of the operator will assist the assessor in determining whether the fatigue hazards identified by the operator are likely to be those the operation may be exposed to.

As a minimum, the assessor should understand the primary activities that are undertaken. The assessor should also be aware of the facilities available for the FCMs and the locality and number of bases that are used. The more the assessor is aware of the nature of the operations, the more confident they will be as to the suitability of the approach towards effective fatigue risk management.

Notwithstanding the above, assessors should resist conducting their own independent risk management process. Judgment should be based on consideration of the merits of operator’s submission with the operator confirmation they consider the residual risk to be acceptable. Feedback will need to be provided to the operator if the hazard identification and risk assessment processes are considered by the assessor to require further work.

The scenarios below have been developed to provide fictional examples of operators selecting risk mitigators to assist assessors in understanding they type of information they may be provided. The scenarios are focussed on fictional operators in an industry sector where there only may be a developmental level of familiarity with formal hazard identification and risk assessment and mitigation processes.

Example 1:

The company fleet comprises of eight PA31 aircraft, one turbo prop aircraft, six single engine aircraft and three piston multi-engine training aircraft. Company operations are Australia wide with pilots based in Darwin, Sydney and regional NSW.

The organisation's AOC and Operational Specification authorises Charter and Airwork while their CASR Part 141 certificate authorises certain training activities.

The Operational Specification shows that both Charter and Airwork operations are conducted in single pilot PA31 aircraft and a small single pilot turbo prop aircraft which necessitates a CAR 217 organisation.

There is a separate Head of Operations (HOO) for the Part 141 and Chief Pilot (CP) for the AOC with the CP also responsible for the CAR 217 training organisation (HoTC).

The assessor is advised the CAR 217 has two training and checking pilots and that the company asked CASA to direct them to include the PA31 aircraft within the Training and Checking (T&C) requirements. The PA31 aircraft are regularly used for early morning photographic and mapping Airwork type operations while Charter activities occur at any time to meet customer requirements.

The Part 141 training organisation is busy with students progressing through to CPL, IR or FIR then being considered for employment within the charter division. The school has 10 instructors (some students who achieve a FIR and are then employed in the Part 141).

There are 15 pilots conducting Air Transport and Airwork activities including the CP and one check captain. The CP, Check Pilot and one other pilot are the only pilots authorised to operate the turboprop aircraft.

From the above example, the assessor should consider several areas that are likely to present fatigue hazards for personnel within the organisation. Such aspects as CP and T&C workloads, sustained early morning tasking for the PA31 pilots (and associated accumulation of sleep debt), inexperienced flight crew as they are taken on within the charter operations or within the flying school (continuous circuit training, aerobatics training etc.). The seasonal environmental effects for the locations operated from may also be a consideration.

The operator provides the following identified risks and subsequent mitigation within a submission to enable them to comply with Appendix 3 (the two-crew turbo prop), Appendix 4 (for both the aerial work operations and itinerant charter) and Appendix 6 (the flying school).

The flying school operations

Identified risks associated with:

Personnel

Risk: New grade three instructors experience high workload fatigue with ab initio circuit training.

Mitigation: Limit in place so that no more than eight hours per day on duty and three hours of circuits per day until 100 hours of training experienced.

Risk: HOO experiences high workload fatigue with administration and flight-testing duties.

Mitigation: HOO projects workload of flying duties not to exceed 550 hours per year. Uses Aviation Testing Officer (ATO)/Flight Examiner as an alternative. When conducting six flight tests per week, limits total weekly duty time to 50 hours.

Risk: Senior instructors conducting Instrument Flight Rules (IFR) training may not be IFR current. In monsoon season, this lack of IFR currency provides for an increase in stress levels which may result in an earlier onset of fatigue.

Mitigation: Instructors have unlimited access to company synthetic trainer to enable hours to be accrued in simulated instrument meteorological conditions (IMC). HOO has a program in place to increase currency in IFR operations by ensuring an IPC is conducted by each instructor prior to the season. Refresher ground training conducted at regular intervals addressing all procedures taught.

Aircraft

Risk: Cramped training aircraft in hot environment.

Mitigation: Operator provides reflective screens and training for students and instructors that are used after every flight. Operator provides sheepskin seat covers for aircraft used on navigation exercises.

Risk: Company pilots ferry multi-engine training aircraft a long distance to maintenance base. As this is done during a working day, this activity can introduce fatigue when considered along with additional training after maintenance.

Mitigation: Company ensures these aircraft have operational autopilots. Pilots trained to use autopilots in these circumstances to alleviate in-flight fatigue.

Environment

Risk: IFR training operations provide high workload related fatigue. Fatigue is further exacerbated by flying late at night (although not an LNO).

Mitigation: IFR training operations limited to no more than 25 flying hours per week. Limit on IFR training operations after last light to no more than six hours per week.

Risk: High seasonal heat in NSW in summer with dry conditions resulting in increased fluid loss possibly causing dehydration and fatigue.

Mitigation: Operator provides portable water bottles. New students and all instructors trained on dangers of dehydration. Limit of no more than six hours flying per day for instructors and three hours per day for students when temperature exceed 35 degrees.

Risk: Personnel exposure to high temperatures when conducting daily inspections (possible high internal temperature of a building) leading to possible early onset of fatigue.

Mitigation: Training on dangers of dehydration. Students and instructors required to use a broad brimmed hat when airside. Aircraft hangar used for aircraft when parked whenever possible. AOC holder provides air-conditioned crew room facilities.

Activities

Risk: Instructors conduct aerobatic training. Experience shows more than four hours per day of these activists are fatiguing.

Mitigation: Daily limit placed on total flying training including more than two and less than four hours of aerobatic training, totalling six flight hours. No more than three hours aerobatic training for instructors with less than 100 hours aerobatic training. Requirement for half hour break after each aerobatic dual sortie.

Risk: In daylight savings period, instructors expected to conduct night IFR training or Night Visual Flight Rules (NVFR) training. These activities combined with Late Night Operations (LNOs) provides for a possible high level of fatigue.

Mitigation: Requirement to have no more than two LNOs in one week. Should an LNO take place, then an additional two-hour period is required to be added to the minimum ODP.

In this example, the assessor has concluded the operational context is less than optimal however that the operation has reduced the risks by:

- appropriately reducing maximum allowable flight and duty time limits
- increasing the minimum ODP requirements
- applying other time based limits to various activities
- introducing a variety of mitigation to deal with varying extreme environmental conditions

Should the assessor consider this approach is reasonable but in need of some further mitigation, the assessor could ask the operator to include enhanced training as a relatively simple further mitigator.

Itinerant operations in turbo prop aircraft

Example 2:

An organisation based elsewhere in Australia proposes operations in the height of summer in Darwin with one turbo prop aircraft positioned there with the crew for three months of the year.

The assessor is advised there are three company FCMs endorsed on this aircraft - the CP, the HOTC and another FCM who only flies as co-pilot in the multi-pilot operation.

The assessor is advised the CP flies around 500 hours per year and that the HoTC conducts at least half of the flight checks required for the company and also flies around 600 hours per year. The HoTC only has one other T&C pilot to assist him and this pilot can only fly in single pilot operations.

As key personnel, the CP and HoTC also have other duties such as

- administration
- manual development
- maintaining crew levels
- co-ordinating maintenance (HAAMC) and various other duties such as:
  - assisting the safety officer
  - meetings with the AOC holder and other company

The operator provides the following identified risks and subsequent mitigation to enable them to comply with Appendix 2 of CAO 48.1 Instrument 2019.

Personnel

Risk: The CP and HoTC experience high workload due to current duties and the itinerant nature of charter operations for the turbo-prop aircraft. These operations peak in the monsoon season in Darwin where both these pilots are temporarily positioned for three months. This high workload could cause high fatigue due to workload and disruption due to a change in the in home base.

Mitigation: The company has provided two days off to enable the move to the new home base in Darwin. The company will also arrange the shift to Darwin for the third turbo-prop endorsed pilot. The HoTC will have his training and checking functions taken on by the remaining T&C pilot for the duration of his transfer of home base.

Aircraft

Risk: The company conducts regular freight carriage for a mining company. This involves the FCMs removing and replacing cabin seats at the departure point. This is hot and heavy work and can cause dehydration for the pilots who perform this task in Darwin in summer.

Mitigation: The company provides bottled water to be available at all times. The company provides for training on how dehydration affects fatigue management. Pilots are required to take bottled water on all flights.

Environment

Risk: Workload induced fatigue is increased for flight crew members in the monsoon season due to weather conditions necessitating multiple instrument approaches, often to the landing minima and the need to negotiate hazardous weather on a daily basis.

Mitigation: The turbo-props weather radar is a mandatory item for all flight operations. The company provides for internet access up to the minute weather situations.

Activity

Risk: Pilots may experience high workload should operational tempo increase. Occasionally a contract may require multiple sectors with early morning departures or LNOs.

Mitigation: Should operational tempo increase the company will ensure an engineer is on duty to assist pilots in preparing the aircraft or reconfiguring it on return.

In considering the extent the operator is proposing to manage risks associated with the operation of the turbo-prop aircraft in Darwin during the monsoon season, the assessor may reasonably conclude not all risks have been identified. For example there are only minimal

personnel available for the proposed operations and there is no mitigation proposed for the workload hazard of multiple instrument approaches.

Additionally, the assessor could reasonably conclude the mitigations proposed are unlikely to be sufficient, and/or the operator has not been able to substantiate the basis for them. For example, the operator cannot substantiate how the two days assigned for home base transfer is reasonable. Similarly, the operator has not provided appropriate information to support that having water available will mitigate the fatigue risk associated with having pilots conduct work to remove/replace seats in hot weather.

There is also a risk identified for an increase in operational tempo with no clear parameters identified for the enabling of further assistance or for providing on the increase of minimum time off or reduction in possible work hours, especially for LNOs or regular early morning starts.

The assessor should advise the operator the management of fatigue risk for this operation is considered to be inadequate. The assessor could suggest the operator consider increasing minimum ODP limits; reducing maximum FDP and flight time limits; introducing a sector limit to reduce the number of instrument approaches and manage the operational tempo; and so on to further mitigate the risks. This feedback should prompt the operator to further examine possibilities for enhanced risk mitigation.