Registry Publication 4

Guidance to Operators

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TABLE OF CONTENTS

REVISION HISTORY

Edition 1 April 2016

Edition 2 October 2020

This new edition of RP4 includes a major enhancement to the guidance material provided to operators of M- Registered aircraft.

RP4 is now divided into 3 distinct Parts.

i) Part 1 details the requirements on operators of M- Registered aircraft;
ii) Part 2 provides guidance on applying for Operational Approvals; and
iii) Part 3 includes operator guidance and best practice on various subjects relating to Flight Operations.

Edition 2 - Revision 1 – August 2021

Abbreviations

- List of commonly used Abbreviations added to RP4

Part 1 Operator Requirements

- Part 1 Chapter 1.2 Operators Management Structure
  Clarification on authority of the named operator contact and delegated individuals.
- Part 1 Chapter 1.3 Adequacy and Supervision of Staff
  1.3.0, 1.3.1.1 & 1.3.1.2 added to clarify requirements for Operators to ensure operational staff are made aware of and comply with local rules regulations and procedures.
- Part 1 Chapter 1.4 Security Requirements
  New sub-chapter to clarify that the safety and security of an aircraft is the responsibility of the Operator and delegated to the PIC during the operation of the aircraft.
- Part 1 Chapter 2.0 Operational & Emergency Equipment
  New general sub-chapter to clarify that the aircraft must be equipped with the navigation, surveillance and communication equipment as required by the airspace within which it intends to operate.
- Part 1 Chapter 2.5.1 – Life Raft requirements on Aeroplanes
  Update following revocation of Exemption 07/2019 and issuance of Exemption 2020/103, and additional requirement for marine pyrotechnic equipment.
- Part 1 Chapter 3.2 – License Validation
  The Requirement for the pilot to carry the validation along with their license;
  The IOMAR's understanding of other jurisdictions rules relating to specific license requirements; and
  clarification for pilots who hold more than 1 license regarding which license must be validated to operate an M- Registered aircraft.
- Part 1 Chapter 6.16 – Search and Rescue Information
  New sub-chapter highlighting the requirements for operators to provide the PIC with information relating to search and rescue services in the area over which the aeroplane with be flown.
- Part 1 Chapter 7.2.2.2
  Update to the objectives of DG training/Curricula to comply with the ICAO Technical Instructions.

- Part 1 Chapter 8 – Fuel Requirements
  Clarification that after commencement of flight, use of fuel other than originally intended shall require re-analysis and adjustment of the planned operation if applicable.
- Part 1 Chapter 9 – Rules of the Air and Airborne Operations
  9.1 Rules of the Air section included which provides guidance on the new Civil Aviation (Rules of the Air) Order 2021 order.
  9.2 Operations in RVSM Airspace – this information was previously published in RP30 which has now been revoked.
  9.3 Operations in NAT HLA – this information was previously published in RP31 which has now been revoked.
  9.4 Operations in PBN Airspace – this information was previously published in RP32 which has now been revoked.
  9.5 Operation of ACAS and Note added to ensure climb rate is reduced to less than 1500 ft/min within 1000 ft of clear altitude.
- Part 1 Chapter 11.1.4 – Fatigue Risk Management Programme
  Clarification that the fatigue of personnel not covered under the FRMP shall be managed under the SMS.
- Part 1 Chapter 11.1.0 – Company Operations Manual
  Clarification on the purpose & contents of the COM and requirements for ensuring the contents are kept up to date.
- Part 1 Chapter 11.10 – Route Assessment
  Requirement for the operator to conduct a route assessment

Part 2 Operational Approvals

- Part 2 Chapter 1 – Operational Approvals
  Update to Operational Approvals Application Process
- Part 2 Chapter 2.1 – RVSM
  Additional information on the application process and requirements added which were previously incorporated in RP30 which is now revoked.
- Part 2 Chapter 2.2 – NAT HLA
  Additional information on the application process and requirements added which were previously incorporated in RP31 which is now revoked.
- Part 2 Chapter 3.1 – 3.8 *(PBN Airspace Approvals)*
  Additional information on the application process,
  Additional requirements for each PBN that was previously incorporated in RP32;
  Inclusion of training requirements which were previously included in ICAO Doc 9613; and
  Inclusions of Operational Procedures.
- Part 2 Chapter 3.2 – RNP 4
  Removal of the reference to FANS 1/A from the sub chapter heading.
- Part 2 Chapter 3.3 – RNP 2
  Amendments to the acceptable means of compliance for RNP 2 approval.
- Part 2 Chapter 4 – ATS Communications and Surveillance
  Removal of the requirement to hold an approval for ADS-B Out, FANS 1/A & ATN B1 and corresponding text.
  Introduction of new Performance Based Communication and Surveillance Sub-chapter
- Part 2 Chapter 5.2 – Minimum Equipment List
  Reorder and re-numbering of paragraphs.

- Part 2 Chapter 5.2.2.5 – Removal of Equipment
  Clarification that the MEL is not in itself authorise the removal of an item of equipment
- Part 2 Chapter 5.2.3.1.1 – Temporary Revisions (TRs) to the MMEL
  Additional requirement to include details of TRs incorporated in MEL into the MEL preamble.
- Part 2 Chapter 5.2.4 – MEL Appendices
  Appendix 1 Preamble updated to reflect change to the Rules of the Air definitions.
  Appendix 4 created to assist operator in understanding which MMEL entry to use for non-EASA TCDS aircraft affected by Part-NCC.
- Part 2 Chapter 5.4.2.2.2 – LSZA Training Requirements
  Updated hyperlink to LSZA Training Requirements.
- Part 3 Chapter 1.2 – Extended Range (ER) Operations Definitions
  Clarification to the definition of Threshold Time and removal of Threshold Distance definition.

Edition 2 - Revision 2 – November 2021

Part 1 Operator Requirements

- Part 1 Chapter 12 – Aeroplane Performance
  New Chapter for Aeroplane Performance, which includes the new ICAO Global Reporting Format (GRF)
- Part 1 Chapter 13 – Demonstration & Delivery Flights
  Chapter renumbered (previously chapter 12)

Part 2 Operational Approvals

- Part 2 Chapter 2.1 – RVSM
  Additional background information.
- Part 2 Chapter 2.2 – Acceptable Means of Compliance for NAT HLA Approval
  Introduction of alternative means of compliance if the operator is unable to demonstrate the aircraft is certified for NAT HLA approval.
- Part 2 Chapter 5.2.3 – MEL Amendments
  MEL Amendment approval notification process clarified.

Part 3 Guidance to Operators

- Part 3 Chapter 1.1.2 – Textual changes

Edition 2 - Revision 3 – April 2022

Part 1 Operator Requirements

- Part 1 Chapter 2.1 – Emergency Locator Transmitters (ELTs)
  Provision to apply for an exemption when the operator cannot legitimately correctly code the ELT.
- Part 1 Chapter 3.3.1 – Base Training in an M- Registered Aircraft
  Clarification on the privileges required by the PIC to undertake base training.
- Part 1 Chapter 5.2 & 3 – Conducting Passenger Safety Briefing on Aeroplanes
  Clarification that a passenger safety briefing must be conducted and prior to take-off.
- Part 1 Chapter 7.5 – Carriage of Sporting Weapons and Munitions of War
  Inclusion of conditions which will be applied to an exemption or permission.
- Part 1 Chapter 9.2.1.2.2 – Entering, Flying Within and Leaving RVSM Airspace
  Clarification that any deviation must be report to ATC and then an Occurrence Report filed.

- Part 1 Chapter 9.3.2.1 OTS Construction
  Inclusion of new subparagraphs to provide Planning & Operational considerations when certain Flight Levels are not included in the OTS.

- Part 1 Chapter 9.3.10 Avoiding Errors in the NAT Region
  Updated following updates to NAT Ops Bulleting 2017-002 Rev 04.

- Part 1 Chapter 9.4.2 – RNAV Substitution
  New subchapter for RNAV Substitution in accordance with ICAO State Letter SL21.50

- Part 1 Chapter 9.6 – Operations with an Out-of-Currency Navigation Database
  New Subchapter to provide operators and crew with the requirements when operating with an out-of-currency NavDB.

- Part 1 Chapter 13 – Demonstration & Delivery Flights
  Updated text to reflect General Exemption 2021/074 and removal of application process.

Part 2 Operational Approvals

- Part 2 Chapter 5.2.1.1 Aircraft Affected By Other Civil Aviation Legislation (e.g. Part-NCC)
  Inclusion of changes for Operators who have declared to the UK CAA.

- Part 2 Chapter 5.2.2.1.3 Preamble
  Requirements for what must be included in the Preamble.

- Part 2 Chapter 5.2.2.2 MEL Customisation
  Update on acceptable means of customising MEL to aircraft configuration.

- Part 2 Chapter 5.2.2.2.1 Customisation to Isle of Man Requirements
  Update to point FORs and MEL authors to the new IOM MMEL Supplement (Appendix 3).

- Part 2 Chapter 5.2.2.6.2.3 (M*) Maintenance Procedure
  (M*) Maintenance Procedures now given its own subchapter to highlight the facility.

- Part 2 Chapter 5.2.3.1 Revisions to the MMEL
  Clarification that where amendment to the MMEL does not affect the MEL, the preamble must still be updated and submitted for approval.
  Facility introduced when operators are unable to update the MEL within 90-day requirement.

- Part 2 Chapter 5.2.3.2 Revisions to the Manufacturers O&M Procedures Manual
  Recommendation included.

- Part 2 Chapter 5.2.4 MEL Appendices
  Appendix 1 Preamble:
    - MEL Administration Subchapter detailing MEL amendment process.
    - Additional minimum definitions.
    - Change to 'Day of Discovery' definition.

  Appendix 2 MEL Preamble for Operators Affected by EASA Part-NCC operating non-EASA Type Certificated Aircraft:
    - Adjusted to clarify the preamble is ONLY applicable to EASA declared Part-NCC operators when the aircraft does not conform to the EASA TCDS.

  Appendix 3 IOM MMEL Supplement
    - National MEL Requirements have been formatted into a standard MMEL format for ease of reading by FORs and MEL Authors

  Appendix 4 MEL/CDL Use as it applies to the Certificate of Release to Service
    - Renumbered

  Appendix 5 Non-EASA TCDS aircraft affected by Part-NCC
    - Renumbered & adapted to clarify Appendix 5 is ONLY applicable to EASA declared Part-NCC operators when the aircraft does not conform to the EASA TCDS.

Edition 2 - Revision 4 – August 2022

Part 1 Operator Requirements

- Part 1 Chapter 1.1 – Nomination of Operator
  Updated to reflect the legal requirements as specified in the Civil Aviation (Registration & Marking) Order 2022.
- Part 1 Chapter 1.5 – Nomination of Operator
  New section to highlight the requirements for aircraft insurance.
- Part 1 Chapter 3.3.1 – Base Training in an M- Registered Aircraft
  Updated to reflect the legal requirements as specified in the Civil Aviation (Registration & Marking) Order 2022.
- Part 1 Chapter 6.14 – Journey Log
  Clarification on what constitutes 'flight time'.
- Part 1 Chapter 9.4.2 – RNAV Substitution
  Removal of RNAV 1 as a means of compliance to conduct RNAV Substitution.
- Part 1 Chapter 11.10 – Route Assessment
  Inclusion of the requirement for the PIC to assess the level of safety risk in relation to the available RFFS.
- Part 1 Chapter 13 – Demonstration & Delivery Flights
  Updated to reflect the legal requirements as specified in the Civil Aviation (Registration & Marking) Order 2022 & General Exemption 2021/074.

Part 2 Operational Approvals

- Part 2 Chapter 5.2.2.3.2 Extension to a Rectification Interval
  Updated to reflect recent changes by the Airworthiness Section.
- Part 2 Chapter 5.6 – Aerial Work
  New subchapter on Aerial Work Approvals.

Edition 2 - Revision 5 – December 2022

Introduction

- Abbreviations
  List of Abbreviations updated.

Part 1 Operator Requirements

- Part 1 Chapter 1.2.5 – NATR
  Update on the requirement for the NATR to provide CRS wording to certifying entities.
- Part 1 Chapter 3.3.1 Base Training in an M- Registered Aircraft
  Updated to include 'class rating'.
- Part 1 Chapter 4.4 Safety Information Protection
  Information relating to the Operators' responsibility to protect safety information included from RP5.
- Part 1 Chapter 6.12 – Noise Certificate
  New sub-sections to provide information to operators on the single MTOM/MLM and Multiple MTO/MLM noise certificates and how to apply for and changes to existing certificates.
- Part 1 Chapter 11 – Aerodrome Operating Minima (AOM)
  New chapter concerning AOM and take-off & landing minima.
  Large & Turbojet Aircraft (Chapter 11) moved to become Chapter 13.

- Part 1 Chapter 12 – Aeroplane Performance & Pre-Flight Route Assessment
  Chapter heading expanded to include Pre-Flight Route Assessment requirements, including check of ground and/or water facilities, and availability of rescue and fire-fighting services which are detailed in Chapter 12.2.
- Part 1 Chapter 12.1.2.1 – Runway Condition Codes (RWYCC)
  Updated table to enhance details.
- Part 1 Chapter 14 – Communicable Diseases
  New chapter detailing requirements for flight crew notify ATC of suspected communicable diseases.

Part 2 Operator Approvals

- Part 2 Chapter 1.4 Appropriate Maintenance Procedures
  Updated requirement for the operator to ensure that, in liaison with the NATR, appropriate practices and programmes are instituted with respect to continuing airworthiness.
- Part 2 Chapter 4.1.1.2 FANS 1/A+ (PBCS) Operational Criteria
  Required training extended to other operational staff.
- Part 2 Chapter 5.2.0.2 MEL Concept
  Enhancement to MEL Concept.
- Part 2 Chapter 5.2.2.1.4 Definitions
  Updated to point reader to the new Appendix 3 which contains the minimum definitions for MEL based on the propulsion type.
- Part 2 Chapter 5.2.2.3.1 Rectification Intervals
  Category A definition expanded to clarify Flight Days and additional information provided on the differences between calendar days and flight days in subsequent paragraphs.
- Part 2 Chapter 5.2.2.3.2 Rectification Interval Extension (RIE) Programme
  New ability for Operators to request approval to self-extend a rectification interval.
- Part 2 Chapter 5.2.4 Appendices
  Appendices renumbered.
- Part 2 Chapter 5.2.4 Appendix 1 MEL Preamble
  Category A rectification interval updated.
  Updated to the direct reader to the new Appendix 2 IOM MEL Definitions.
- Part 2 Chapter 5.2.4 Appendix 2 IOM MEL Definitions
  New Appendix to list the mandatory definitions which must be included in an Operators' MEL for fixed wing and rotorcraft MELs.
  'Calendar Day', 'Considered Inoperative', 'Flight Day' and 'Icing Conditions' definitions have all been updated.
- Part 2 Chapter 5.2.4 Appendix 3 IOM MMEL Supplement
  ADS-B Out 'Category C' Rectification Interval amended.
- Part 2 Chapter 5.2.4 Appendix 5 Non-EASA TCDS Aircraft affected by EASA Part-NCC
  Previous Appendix 2 & 5 combined into a single Appendix which deals with EASA Part-NCC MEL requirements.
- Part 2 Chapter 5.4 Airport Specific Approval
  Chapter 5.4 expanded to include other airport specific approvals (instead of only Steep Approach) and a change to London City and Lugano application processes.

Edition 2 - Revision 6 – February 2023

Introduction

- Abbreviations
  List of Abbreviations updated.

Part 1 Operator Requirements

- Part 1 Chapter 7.1.4 Limitations on the Carriage of Dangerous Goods
  New sub-chapter to clarify the limitations.
- Part 1 Chapter 7.2.8 Reporting of Dangerous Occurrences
  Updates to requirement of when to report a DG Occurrence.

Part 2 Operational Approvals

- Part 2 Chapter 5.2.4 – Rectification Interval Extension (RIE) Programme
  Moved to Chapter and update on the requirement for an approval.
- Part 2 Chapter 5.2.5 – MEL Appendices
  Renumber due to movement of Rectification Interval Extension (RIE) Programme to Chapter 5.2.4.
- Part 2 Chapter 5.4 – Airport Specific Approvals
  Changes to a training syllabus or procedures requested as part of an approval, must be submitted to the IOMAR for approval.
- Part 2 Chapter 5.6 – Aerial Work
  Enhancement to the requirements for Aerial Work approval, including adoption of Part-SPO SOP Template to assist operators in the development of SOPs.

Edition 2 - Revision 7 – May 2023

Introduction

- Abbreviations
  List of Abbreviations updated.

Part 1 Operator Requirements

- Part 1 Chapter 2.0.2 – Operational & Emergency Equipment Marking Requirements
  Inclusion of 'a passenger safety'.
- Part 1 Chapter 6.0 – Documents to be Carried
  Operator to establish a pre-flight check system in the COM or other suitable document. The PIC is responsible for ensuring the pre-flight checks are completed by all crew.
- Part 1 Chapter 6.5 – Ops Spec
  Clarification that the Ops Spec must be renewed prior to the expiry date of the certificate.
- Part 1 Chapter 9.3 – Operations in the NAT HLA
  Updated to reflect NAT DOC 007

Part 2 Operational Approvals

- Part 2 Chapter 1.0 – Operational Approval General
  Clarification that only the Operator Contact(s) or FOR are authorised to request Operational Approvals.
- Part 2 Chapter 1.2 – Operational Approval Renewals
  Clarification that the Ops Spec must be renewed prior to the expiry date of the certificate, and include a link to the service delivery times on IOMAR Website.
- Part 2 Chapter 2.2.1.1 – Unrestricted NAT HLA

Clarification on the additional approvals required for unrestricted NAT HLA.

- Part 2 Chapter 3.8 – RNP AR APCH
  Update to reflect a general RNP AR APCH Approval will be issued, instead of Approach procedure specific.
- Part 2 Chapter 3.8.3 – RNP AR APCH MEL Requirements
  Specific systems must be operational for RNP AR APCH.
- Part 2 Chapter 3.8.9 – RNP AR APCH FOSA
  Requirements for a FOSA to be submitted along with the application.
- Part 2 Chapter 3.8.10 – RNP AR APCH Application Process
  Update to application process based on generic approval and FOSA
- Part 2 Chapter 5.1 – Master Minimum Equipment List Permission
  As an Approved MEL (or MMEL Permission in lieu of an approved MEL), is required for all large and turbojet aircraft which hold a valid Certificate of Registration, this section has been enhanced to state, the MMEL Permission is valid for a limited period whilst the MEL is being produced, and
  Clarification that the Transitional Aircraft Exemption is only applicable to aircraft recorded by the Registry as 'Transitional'.
- Part 2 Chapter 5.2.0.1.2 – Article 99M
  Clarification that an Approved MEL (or MMEL Permission in lieu of an approved MEL) is required for all Large & Turbojet Aircraft which hold a Certificate of Registration.
- Part 2 Chapter 5.2.1 – MEL Application Process
  Update to reflect that the MEL Revision number will be stated on the Ops Spec.
- Part 2 Chapter 5.2.3 – MEL Amendments
  Update to reflect that once the MEL Amendment is approved, the Ops Spec will be re-issued and include the newly approved revision number.

FOREWORD

Throughout RP4, the terms 'must', 'shall', 'should' and 'may' are used in specific ways: -

- 'Must' indicates a legal requirement and therefore compliance is mandatory.
- 'Shall' indicates an expectation of compliance.
- 'Should' indicates that it is strongly recommended.
- 'May' indicates that it is optional.

RP4 is divided into 3 distinct Parts.

Part 1

Contains information relating to the legal requirements and means of compliance with the operations requirements of the Air Navigation (Isle of Man) Order 2015, the Civil Aviation (Safe Transport of Dangerous Goods by Air) Order 2020 and the International Standards & Recommended Practices (SARPs) contained in Annexes to the Chicago Convention.

> Part 1 has been prepared to provide operators with an easy to read reference document to detail your legal requirements.
>
> The legal requirements are contained mainly in the Air Navigation (Isle of Man) Order 2015.
>
> All applicable legislation is accessible via the ***IOMAR Website***.

Part 2

Contains guidance to assist operators of M- Registered aircraft on how to apply for Operational Approvals, including prerequisites and how to apply.

Part 3

Contains guidance material and best practice on various subjects relating to Flight Operations.

ABBREVIATIONS

ABAS	Aircraft-Based Augmentation System
ACAS	Aircraft Collision Avoidance System
ADS	Automatic Dependent Surveillance
ADS-B	Automatic Dependent Surveillance – Broadcast
ADS-C	Automatic Dependent Surveillance – Contract
AFM	Aircraft Flight Manual
ANO	Air Navigation (Isle of Man) Order 2015
ANP	Actual Navigation Performance
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
AOM	Aerodrome Operating Minima
AWOPS	All Weather Operations
CDI	Course Deviation Indicator
CDU	Control Display Unit
CPDLC	Controller Pilot Data Link Communications
CRC	Cyclic Redundancy Check
CSA	Channel of Standard Accuracy
DME	Distance Measuring Equipment
EDTO	Extended Distance Time Operations
EFB	Electronic Flight Bag
(E)HIS	(Electronic) Horizontal Situation Indicator
ER	Extended Range Operations
FAF	Final Approach Fix
FANS	Future Air Navigation System
FAS	Final Approach Segment
FDE	Fault Detection and Exclusion (GNSS)
FL	Flight Level
FMS	Flight Management System
FPAP	Flight Path Alignment Point
FRT	Fixed Radius Transition
FT	Feet
FTE	Flight Technical Error
IOMAR	Isle of Man Aircraft Registry
GBAS	Ground-Based Augmentation System
GNSS	Global Navigation Satellite System
GPA	Glide Path Angle
GPS	Global Positioning System
GRAS	Ground-based Regional Augmentation System
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organisation
IF	Intermediate Fix
INS	Inertial Navigation System
IRS	Inertial Reference System
ISA	International Standard Atmosphere
LNAV	Lateral Navigation mode (Flight Guidance System)
LoA	Letter of Acceptance
LRNS	Long Range Navigation System
LRCS	Long Range Communication System
LTP/FTP	Landing Threshold Point/Fictitious Threshold Point
M	metres
MAPt	Missed Approach Point
MEL	Minimum Equipment List
MHz	Megahertz

MID	Middle East Region (ICAO)
MNPS	Minimum Navigation Performance Specification
NAT HLA	North Atlantic High Level Airspace
NDB	Non-Directional Beacon
nm	Nautical miles
NOTAM	Notice(s) to Airmen
NSE	Navigation System Error
MMD	Moving Map Display
PAC	Pacific Region (ICAO)
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations
PBN	Performance Based Navigation
PDE	Path Definition Error
PEE	Positioning Estimation Error
PF	Pilot Flying
PM	Pilot Monitoring
P-RAIM	Predictive Receiver Autonomous Integrity Monitoring
P-RNAV	Precision Area Navigation (European Standard)
PSE	Path Steering Error
R/T	Radio Telephony
RAIM	Receiver Autonomous Integrity Monitoring
RF	Radius to Fix (Path Terminator)
RFFS	Rescue and Fire-Fighting Services
RIE	Rectification Interval Extension
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP AR	Required Navigation Performance 'Authorisation Required'
RVSM	Reduced Vertical Separation Minima
SBAS	Satellite-based Augmentation System
SID	Standard Instrument Departure
SiS	GNSS Signal in Space
SLOP	Strategic Lateral Offset Procedure
SPS	Standard Positioning Service (GPS)
SSR	Secondary Surveillance Radar (ATC Transponder)
STAR	Standard Arrival
TCH	Threshold Crossing Height
TMA	Terminal Area
TSE	Total System Error
UTC	Universal Coordinated Time
VHF	Very High Frequency
VOR	Very High Frequency Omni-directional Range
WGS-84	World Geodetic System – 1984

PART 1 – OPERATOR REQUIREMENTS

This part details the requirements for operators of M- Registered aircraft

CHAPTER 1: OPERATORS RESPONSIBILITIES

1.1 Nomination of Operator

The registered owner of an M- Registered aircraft shall nominate an operator who is accountable for the safe operation, management and control of the aircraft. The operator shall be able to communicate effectively in English.

Therefore it is important that the aircraft owner appoints an operator who has the relevant experience and competence to manage the operation of the highly valuable asset.

Typically the owner will appoint a professional aviation management company to be the operator of their aircraft, although the owner may decide to take this function on themselves together with the associated accountability.

The registered owner of the aircraft must inform the IOMAR within 2 working days (or such longer period that has been agreed by the IOMAR) of a change in the nominated operator.

A change of aircraft operator immediately invalidates the aircraft's Operations Specification because the certificate is issued in the name of the aircraft operator. Consequently, advance notification to the IOMAR of the planned change is essential for the transition to take place with minimal impact on the aircraft's operation.

1.2 Operators Management Structure

1.2.1 Proportionate & Effective Management Structure

A proportionate and effective management structure is essential and it is particularly important that the operator has suitably experienced and competent personnel.

The operator is required to nominate the following competent personnel to specific roles recognised by the IOMAR: -

- Nominated Airworthiness Technical Representative (NATR); and
- Flight Operations Representative (FOR).

Managers who are also undertaking flying duties shall be allocated sufficient time to effectively discharge their management responsibilities.

1.2.2 Named Operator Contact

The Named Operator Contact, is required to complete and sign a Form 20 to advise the IOMAR the names of any persons who are delegated the authority to act on behalf of the operator's organisation.

By signing the Form 20, the Named Operator Contact is declaring that:

a) they understand and acknowledge their legal responsibilities and accountabilities in respect of the safe operation of the aircraft; and
b) the aircraft will be equipped with all the required operational & emergency equipment and radio communication & navigation equipment as required by the ANO.

The Named Operator Contact has full authority to act on behalf of the operator company, including appointment/removal of: -

- Additional Operator Contacts (refer to Part 1 Chapter 1.2.3);

- Additional Flight Crew Licence Validation Contacts (refer to Part 1 Chapter 1.2.4);
- Nominated Airworthiness Technical Representative (NATR) (refer to Part 1 Chapter 1.2.5); and
- Flight Operations Representative (FOR) (refer to Part 1 Chapter 1.2.6).

The Named Operator Contact has authority to apply for Operational Approvals, refer to Part 2 Chapter 1.

The Named Operator Contact will also receive automated emails from the IOMAR to advise when aircraft certificates (permissions, approvals, etc.) are due to expire and notification regarding findings raised by Flight Operations.

Automated email reminders should not be relied upon – the operator shall have a robust process to ensure certificate renewals are applied for with sufficient time for the IOMAR to process such applications. Please refer to the IOMAR website for our standard service delivery times.

1.2.3 Additional Operator Contacts

The Named Operator Contact may also nominate up to three Additional Operator Contacts who are able to act on behalf of the operator.

Additional Operator Contacts have the same authority as the Named Operator Contact.

Additional Operator Contacts have delegated authority to act on behalf of the Named Operator Contact, including appointment/removal of: -

- Additional Operator Contacts;
- Additional Crew Licence Validation Contacts;
- Nominated Airworthiness Technical Representative (NATR); and
- Flight Operations Representative (FOR).

Additional Operator Contacts have the authority to apply for Operational Approvals, refer to Part 2 Chapter 1.

Additional Operator Contacts will also receive automated emails from the IOMAR to advise when aircraft certificates (permissions, approvals, etc.) are due to expire and notification regarding findings.

1.2.4 Additional Crew Licence Validation Contacts

The Named Operator Contact and Additional Operator Contacts may also nominate up to three Additional Crew Licence Validation Contacts who have the authority to request and approve aircraft specific flight crew validation applications only.

Additional Crew Licence Validation Contacts will not receive any automated email reminders from the IOMAR.

1.2.5 Nominated Airworthiness Technical Representative (NATR)

The NATR has delegated responsibility for the full airworthiness management of the aircraft on behalf of the Operator and is the single point of contact for all matters of airworthiness with the IOMAR.

The NATR will exercise full Airworthiness Management & shall review the following documents, at a regular interval or as appropriate to the task, which contain specific Airworthiness information and requirements in the management role which are available to download from the IOMAR website:

- RP7;
- RP9; and
- RP17.

NATRs should ensure they provide the correct wording of the IOMAR Release to Service, to certifying entities, as part of the work scope instruction, and must review the Release to Service made at the first available opportunity, but no later than 30 days after receipt of the closure notification. This ensures logbook entries are accurate and compliant.

The NATR shall liaise with the operator to ensure that the Maintenance Control Manual (MCM) (refer Part 1 Chapter 11.5) remains up to date, especially following the issuance of or expiry of Authorisations issued to individuals by the IOMAR for the specific aircraft.

The NATR shall liaise with the FOR (see below) regarding in service defects.

The NATR has authority to submit all airworthiness related forms to the IOMAR on behalf of the operator.

1.2.6 Flight Operations Representative (FOR)

The FOR has delegated responsibility for all flight operational matters on behalf of the operator and will be the primary point of contact with the IOMAR for this area.

The FOR is responsible for: -

- the Minimum Equipment List (MEL); and
- ensuring the Aircraft Flight Manual or Pilot Operating Handbook is always at the latest revision.

In addition, the FOR: -

- shall be able to communicate effectively in English;
- shall have a good working knowledge of flight operations processes and procedures;
- be involved in the management of the company operations manual (where applicable); and
- liaise, as appropriate, with the NATR regarding the airworthiness of the aircraft.

The FOR has authority to apply for Operational Approvals, refer to Part 2 Chapter 1.

The FOR also has authority to apply for flight operations related Permission & Exemptions and flight crew licence validations on behalf of the operator.

The FOR will also receive automated emails from the IOMAR to advise when aircraft certificates (permissions, approvals, etc.) are due to expire and notification regarding findings.

Note: a minimum of 2 named operational contacts are required, therefore, the FOR cannot be the Main Operator Contact, unless an Additional Operator Contact is nominated.

1.2.7 Chief Pilot & Safety Officer

Where applicable, the operator may wish to appoint a Chief Pilot to provide supervision of the flight crew as well as a Safety Officer to lead the development and application of the safety management system. These individuals shall have the experience, competence and skills necessary to ensure they maintain a high level of professional standards. The duties and responsibilities of these officials should be carefully defined and their flying commitments suitably restricted in order that they may have sufficient time to carry out their managerial functions effectively.

1.3 Adequacy and Supervision of Staff

1.3.0 General

Operators shall ensure that all employees understand that they must comply with the laws, regulations and procedures of those States in which operations are conducted.

Operators shall ensure that all operations personnel are properly instructed in their particular duties and responsibilities and the relationship of such duties to the operation as a whole.

1.3.1 Flight Crew

Note: Flight Crew means those members of the crew of the aircraft who respectively undertake to act as pilot, flight navigator, flight engineer and flight radiotelephony operator of the aircraft.

Operators shall have sufficient number of flight crew for the type of operations to be conducted. It is recognised that contract flight crew are often used on an ad-hoc basis, however for consistency best practice dictates that the flight crew should generally be employed by the operator under a contract of employment.

The minimum flight crew is specified in the Aircraft's Flight Manual. In some cases the operator will need to consider whether a particular circumstance of the operation, for example long range flights, calls for the carriage of additional crew.

In addition, operators of aircraft certified for single pilot operation, may wish to operate multi crew, in such cases, the IOMAR strongly recommends CRM training is completed by all pilots, and the operator reviews the SOPs to ensure they are suitable for multi-crew operations.

The operator must designate a pilot to act as pilot in command (PIC) for each flight.

Further information on flight crew training, licensing and CRM contained in Part 1 Chapter 3.

1.3.1.1 Adherence to Local Rules, Regulations and Procedures

Operators shall ensure that all pilots are familiar with the laws, regulations and procedures, pertinent to the performance of their duties, prescribed for the areas to be traversed, the aerodromes to be used and the air navigation facilities relating thereto.

Operators shall ensure that other members of the flight crew are familiar with such of these laws, regulations and procedures as are pertinent to the performance of their respective duties in the operation of the aeroplane.

1.3.1.2 Reporting of Deliberate Violation of Local Regulations or Procedures due to Emergencies

If an emergency situation occurs which endangers the safety or security of the aeroplane or persons necessitates the taking of action which involves a violation of local regulations or procedures, the Operator shall ensure that the pilot-in-command notifies the appropriate local authority without delay.

If required by the State in which the incident occurs, the pilot-in-command shall submit a report on any such violation to the appropriate authority of such State; in that event, the pilot-in-command shall also submit a copy of it to the IOMAR. Such reports shall be submitted as soon as possible and normally within ten days.

1.3.2 Cabin Crew

The minimum cabin crew required is specified in the Aircraft's Flight Manual. Not all aircraft require cabin crew to be carried, however it is recognised that cabin crew members provide an important role in the safety of a flight.

However all operators of Large and Turbojet aircraft have specific additional requirements relating when cabin crew are required. Refer to Part 1 Chapter 13.7 for more details.

1.3.3 Responsibilities of Other Operational Personnel

Where appropriate the COM should define the duties and responsibilities of other operational personnel employed or contracted as:

a) flight dispatchers/flight watch officers;

b) flight planning assistants who prepare navigation flight plans and flight briefs, compute fuel requirements, RTOWs and AOM; and

c) 'traffic officers' responsible for calculating maximum payload and/ or fuel uplifts or completing load/trim sheets.

It is important that operational personnel shall be made fully aware of the overriding responsibility and the ultimate authority of the pilot-in-command. Manuals shall state that in order to secure the safety of a particular flight the pilot-in-command is authorised to apply greater safety margins, e.g. AOM, fuel reserves and terrain clearance standards, than those specified by the operator for normal operations.

1.3.4 Safety Pilot

1.3.4.1 Definition

A Safety Pilot is a pilot holding an appropriate Isle of Man issued validation who is current and qualified to act as Pilot In Command (PIC) on the class/type of aeroplane and carried on board the aircraft operated by a pilot who has been assessed as being unfit for solo flying but fit to fly with a Safety Pilot. The Safety Pilot must not have an Operations Medical Limitation (OML) or Operations Safety Pilot Limitation (OSL) on their medical certificate.

1.3.4.2 When is a Safety Pilot Required?

A Safety Pilot is required on single pilot certified aircraft, where the PIC has been medically assessed as being unfit for solo flying, but fit to fly with a Safety Pilot.

An OSL limitation is added to a medical certificate when a pilot is considered to be at increased risk of incapacitation compared to his/her peer group. The holder of the medical certificate is precluded from solo flying and always has to fly with a Safety Pilot.

1.3.4.3 Functions of the Safety Pilot

Whilst the Safety Pilot is part of the constituted crew, they do not perform any function during the flight, unless the PIC becomes incapacitated. The aircraft must have dual controls and the Safety Pilot must be sat at one set of controls. Unless the Safety Pilot has to take over the controls the Safety Pilot is supernumerary and therefore cannot log hours as flying time.

RL4 provides a briefing sheet for Safety Pilots.

1.4 Security Requirements

The safety and security of an aircraft operation is the responsibility of the Aircraft Operator.

During the operation of aircraft, this responsibility is delegated to the pilot in command.

1.5 Aircraft Insurance

It is a legal requirement that, regardless of the geographical location of the aircraft, the aircraft shall not be flown unless the aircraft insurance meets the minimum requirements of Regulation (EC) No 785/2004.

RP67 – Aircraft Insurance provides further information and guidance on our requirements and the levels of cover necessary to meet the requirements of Regulation (EC) No 785/2004.

CHAPTER 2: OPERATIONAL & EMERGENCY EQUIPMENT

2.0 General

An aircraft registered in the Isle of Man shall be equipped with the navigation, surveillance and communication equipment as required by the airspace within which it intends to operate.

2.0.1 Legal Requirement

The aircraft must be equipped with the required Operational and Emergency Equipment mandated by the ANO. The type of equipment will depend on the type of aircraft and circumstances of flight.

Information to assist the owner/operator to locate the equipment requirements within the legislation and to determine what equipment is required to be carried on-board M- Registered aircraft, can be found in RL2 & 3:

RL2 Operational and Emergency Equipment - Aeroplanes

RL3 Operational and Emergency Equipment - Helicopters

Additional information on selected equipment requirements can be found in Part 1 Chapters 2.2 to 2.6 below.

2.0.2 Operational & Emergency Equipment Marking Requirements

All emergency equipment must be indicated by clear markings in or on the aircraft in accordance with Article 33(2) of the ANO.

Where the markings are not required by an approved source data, e.g. AFM, Modifications, TCDS, STCs etc., operators can meet the legal requirement by use of passenger safety briefing cards provided to all passengers prior to flight which identify the location of the emergency equipment.

2.1 Emergency Locator Transmitters (ELTs)

An Emergency locator transmitter (ELT) is equipment which broadcasts distinctive signals on designated frequencies and, depending on application, could be automatically activated by impact or be manually activated. An ELT can take any of the following forms:

- Automatic fixed ELT (ELT(AF)) – an automatically activated ELT which is permanently attached to an aircraft.
- Automatic portable ELT (ELT(AP)) – an automatically activated ELT which is rigidly attached to an aircraft but readily removable from the aircraft.
- Automatic deployable ELT (ELT(AD)) – an ELT which is rigidly attached to an aircraft and which is automatically deployed and activated by impact, and, in some cases, also by hydrostatic sensors. Manual deployment capability is also provided.
- Survival ELT (ELT(S)) – an ELT which is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by survivors.

An essential function associated with ELT/PLBs is provided by Cospas-Sarsat, a satellite system designed to provide distress alert and location data to national administrations with responsibility for search and rescue operations.

All ELTs carried on board an aircraft, including those contained within life rafts, are required to operate on 406 MHz and 121.5 MHz simultaneously in order to meet the frequency specifications of ICAO Annex 10, Volume III, Part II, Chapter 5.

Such ELTs on-board M- registered aircraft are required to be UK-coded and registered with the UK Distress and Security Beacon Registry. If, for a limited period, the operator is legitimately unable to correctly code the ELT, they may apply for an Exemption from the requirement for the ELT to be UK-coded by completing a Form 37a.

2.2 Mode S Transponder

2.2.1 24-Bit Aircraft Address

The ICAO 24 bit aircraft address is assigned by the IOMAR to the specific airframe whilst the aircraft remains on the Isle of Man Aircraft Register and a change to another M- registration mark will not require the issue of a new 24-bit aircraft address.

It is good practice to periodically carry out verification checks using a mode S external receiver to ensure the aircraft is transmitting the correct hexadecimal code and especially when the aircraft undergoes a major maintenance check.

2.2.2 Flight ID

The Flight ID shall be inserted in to the Mode S Aircraft Identification input device in the cockpit by the flight crew prior to each flight. The Flight ID shall correspond to the aircraft identification that is recorded in item 7 of the ICAO flight plan. The aircraft identification is normally the aircraft registration. Where the operator, as recorded on the aircraft Operations Specifications Certificate (Ops Spec), has been issued with an ICAO 3 letter designator, it is acceptable to use the designator followed by numbers (e.g. XXX 123) as the Flight ID.

M- Registered operators who wish to apply for an ICAO 3 letter designator should refer to the latest Aeronautical Information Circular (AIC Yellow – Operational Matters) entitled "UK Policy for the Assignment and use of ICAO Location Indicators, 3-Letter Designators and Telephony Designators" which can be found on the UK AIS website.

2.3 First Aid Kit(s)

2.3.1 Minimum Number of First Aid Kits

One or more first aid kits, appropriate to the number of passengers the aircraft is authorised to carry, must be available on all flights.

The contents of the first aid kit(s) is to be determined by the operator having due regard to the nature of the operation.

2.3.2 Guidance on Contents

As guidance to aircraft operators, the list below includes typical items found in aviation first aid kit(s), although operators may choose to vary from this to meet their own requirements and the circumstances of their flight operations:

- Antiseptic swabs (10/pack)
- Bandage: adhesive strips
- Bandage: gauze 7.5 cm × 4.5 m

- Bandage: triangular; safety pins
- Dressing: burn 10 cm × 10 cm
- Dressing: compress, sterile 7.5 cm × 12 cm
- Dressing: gauze, sterile 10.4 cm × 10.4 cm
- Tape: adhesive 2.5 cm (roll)
- Steri-strips (or equivalent adhesive strip)
- Hand cleanser or cleansing towelettes
- Pad with shield, or tape, for eye
- Scissors: 10 cm (if allowed by national regulations)
- Tape: Adhesive, surgical 1.2 cm × 4.6 m
- Tweezers: splinter
- Disposable gloves (multiple pairs)
- Thermometers (non-mercury)
- Mouth-to-mouth resuscitation mask with one-way valve
- First-aid manual, current edition
- Incident record form

The following suggested medications can also be included in the first aid kits:

- Mild to moderate analgesic
- Antiemetic
- Nasal decongestant
- Antacid
- Antihistamine

2.4 Life Jackets

A life jacket must be available for each person on board when:

- flying over water beyond gliding or autorotational distance from land suitable for an emergency landing; and
- at a greater distance from land suitable for making an emergency landing than that corresponding to 30 minutes at cruising speed or 100 nautical miles, whichever is the less.

The life jackets must be equipped with a whistle and survivor locator light, however life jackets constructed for children less than 3 years old need not be equipped with a whistle.

2.5 Life Rafts

2.5.1 Aeroplanes

When operating overwater at a greater distance from land suitable for making an emergency landing than that corresponding to 30 minutes at cruising speed or 50 nautical miles, whichever is less[1].

The operator shall:

i) determine the risks to survival of the occupants of the aeroplane in the event of ditching;
ii) take in to account the operating environment and conditions such as but not limited to, sea state and air temperatures, the distance from land suitable for making an emergency landing, and the availability of search and rescue facilities;
iii) based upon the assessment of the findings from i) and ii) above, ensure that the aeroplane is appropriately equipped with life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in an emergency, provided with life-saving equipment, including means of sustaining life, as is appropriate to the flight to be undertaken; and
iv) marine type pyrotechnic equipment for making distress signals.

2.5.2 Helicopters

Life rafts are required when a flight involves manoeuvers on water.

[1] Enabled by Exemption 2020/103

CHAPTER 3: FLIGHT CREW VALIDATION & TRAINING REQUIREMENTS

3.1 Operator Responsibility

Aircraft operators are reminded that they are accountable for ensuring that any flight crew that operate a M- Registered aircraft their crew are appropriately trained and maintain currency to the required standards and that only flight crew that meet these requirements shall be permitted to operate the aircraft in accordance with its particular Operational Approval(s). This applies regardless of if the flight crew are full time employed, part time, or freelance.

3.2 Licence Validation

The IOMAR does not issue personnel licences.

Flight crew of M- Registered aircraft must hold and carry with the license a current certificate of validation of their flight crew licence issued by the IOMAR when operating an M- Registered aircraft.

Some states place additional requirements on operators who have their principal place of business in a particular state or group of states, e.g. operators affected by the EASA/UK Air Crew Regulations. In these cases, the IOMAR understands that the flight crew member must hold an EASA or UK issued license (as applicable).

Individual who holds more than one license may hold a validation for each license; however, the license being exercised for the particular flight must be validated by the IOMAR.

The IOMAR validate licences issued by appropriate contracting states to the Convention on International Civil Aviation (ICAO) and accept the licensing/medical certificate variations/exemptions issued by the State of Licence Issuance (the "Licensing Authority") unless specified otherwise.

Any restrictions or conditions imposed by the Licensing Authority (including their variations/exemptions) must also be complied with by the licence holder when exercising the privileges of their Certificate of Licence Validation. Any non-compliance by the licence holder with the Licencing Authority, its regulations and or exemptions whilst would in our view invalidate the licence and therefore invalidate the Isle of Man Certificate of Validation.

It is the responsibility of the licence holder to satisfy themselves that exercise of their licence privileges remains in accordance with the requirements and conditions imposed by their Licencing Authority.

3.3 Flight Crew Training

Flight Crew must complete all training required to maintain the currency on their license as prescribed by the State of Issuance.

The IOMAR requires all Flight Crew to undertake Dangerous Goods training commensurate with their responsibilities. Refer to Part 1 Chapter 7.2.2 for more details.

Prior to exercising any operational approval granted to the aircraft (e.g. Operational Credit, LVTO, operations in the NAT HLA etc.), the operator and PIC shall ensure that all required training has been completed and is current.

3.3.1 Base Training in an M- Registered Aircraft

All base training must be conducted with a fully constituted crew as required by the AFM/RFM.

The fully constituted crew must hold appropriate type/class rating and be validated by the IOM to operate the aircraft. The pilot in command must also be an instructor with the appropriate privileges as specified by the state of license issuance (and in the case of an EASA or UK license, a TRI/CRI under the control of an appropriately approved ATO).

Once the base training has been successfully completed by the pilot under training and the type/class rating added to their licence, a flight crew licence validation can then be applied for from the IOMAR.

The IOMAR would suggest that you notify the authority in whose airspace the training will take place to confirm that they have no objection to the flights.

In addition, the operator should confirm with their insurance company that their policy covers the use of the aircraft for the base training to be carried out.

Details of allowable remuneration and valuable consideration for training flights is provided in RP68.

3.4 Crew Resource Management (CRM) Training

3.4.1 CRM Training Requirements

Operators shall ensure that all crew are provided with appropriate CRM training.

Whilst initial and recurrent type rating courses for multi-crew aircraft will include crew cooperation and interaction training, it is no substitute for CRM training. Therefore the IOMAR strongly recommends operators to include CRM training for all crew, regardless of whether operated as single or multi-crew.

3.4.2 Multi-Crew Aircraft

Example CRM Training Syllabus for Multi-crew aircraft operators.

1) Automation and philosophy on the use of automation, including: -
    i) Use and knowledge of automation;
    ii) Recognitions of systems and human limitations associate with use of automation;
    iii) how automation increases the need for crews to have a common understanding of the way in which the system performs, and
    iv) any features of automation that make this understanding difficult
2) Monitoring and intervention, including: -
    i) CRM-related aspects of operation monitoring before, during and after flight, together with any associated priorities;
    ii) guidance to the pilot monitoring on when it would be appropriate to intervene, if felt necessary, and how this should be done in a timely manner.
3) Resilience development, including: -
    i) Mental flexibility; and
    ii) Performance adaptation

4) Surprise and startle effect – CRM training should address unexpected, unusual and stressful situations. The training should cover surprises and startle effects; and management of abnormal and emergency situations, including:
    i) the development and maintenance of the capacity to manage crew resources;
    ii) the acquisition and maintenance of adequate automatic behavioural responses; and
    iii) recognising the loss and re-building situation awareness and control.
5) Cultural differences – CRM training should cover cultural differences of multinational and cross-cultural crews. This includes recognising that:
    i) different cultures can have different communication specifics, ways of understanding and approaches to the same situation or problem;
    ii) difficulties can arise when crew members with different mother tongue communicate in a common language which is not their mother tongue; and
    iii) cultural differences can lead to different methods for identifying a situation and solving a problem.
6) Operator's safety culture and company culture – CRM training should cover the type of operations and the associated procedures of the operator. This should include areas of operations that can lead to particular difficulties or involve unusual hazards.
7) Case studies – CRM training should cover aircraft type-specific case studies, based on the information available within the operator's management system, including:
    i) accident and serious incident reviews to analyse and identify any associated non-technical causal and contributory factors, and instances or examples of lack of CRM; and
    ii) analysis of occurrences that were well managed.

Note: If relevant aircraft type-specific or operator-specific case studies are not available, the operator should consider other case studies relevant to the scale and scope of its operations.

3.4.3 Single Pilot Operations

Example CRM Training Syllabus for single pilot aircraft operators.

1) Automation and philosophy on the use of automation, including: -
    i) Use and knowledge of automation;
    ii) Recognitions of systems and human limitations associate with use of automation;
    iii) how automation increases the need for an understanding of the way in which the system performs, and
    iv) any features of automation that make this understanding difficult.
2) Situational Awareness;
3) Workload management;
4) Decision Making;
5) Resilience development, including: -
    i) Mental flexibility; and
    ii) Performance adaptation.

6) Surprise and startle effect – CRM training should address unexpected, unusual and stressful situations. The training should cover surprises and startle effects; and management of abnormal and emergency situations, including:
   i) the acquisition and maintenance of adequate automatic behavioural responses; and
   ii) recognising the loss and re-building situation awareness and control.
7) Effective communication and coordination with other operational personnel and ground service, including cultural differences: -
   i) different cultures can have different communication specifics, ways of understanding and approaches to the same situation or problem;
   ii) difficulties can arise when other operational personnel with different mother tongue communicate in a common language which is not their mother tongue; and
   iii) cultural differences can lead to different methods for identifying a situation and solving a problem.
8) Operator's safety culture and company culture – CRM training should cover the type of operations and the associated procedures of the operator. This should include areas of operations that can lead to particular difficulties or involve unusual hazards.
9) Case studies – CRM training should cover aircraft type-specific case studies, based on the information available within the operator's management system, including:
   i) accident and serious incident reviews to analyse and identify any associated non-technical causal and contributory factors, and instances or examples of lack of CRM; and
   ii) analysis of occurrences that were well managed.

Note: If relevant aircraft type-specific or operator-specific case studies are not available, the operator should consider other case studies relevant to the scale and scope of its operations.

Chapter 4: Occurrence Reporting

4.1 Occurrence Reporting Requirements

Operators shall ensure that all their employees and contractors are aware of the mandatory reporting criteria and encouraged to report voluntary occurrence reports.

Further details can be found in RP5.

4.2 Purpose of Occurrence Reporting

The purpose of occurrence reporting is to improve aviation safety by ensuring that civil aviation safety hazards are reported, collected, analysed, and acted upon. It plays an essential role in accident prevention by enabling the identification and implementation of appropriate remedial actions. Consequently, the proactive safety reporting of hazards by operational personnel is a vital foundation for the management of aviation safety.

4.3 Effective Reporting Systems

Effective safety reporting systems ensure that people are willing to openly report occurrences and create an environment in which people can be confident that their report will be used exclusively for improving safety.

Operators shall drive forwards their commitment to a positive safety culture so that employees have trust in their occurrence reporting system. The workplace culture shall be error-tolerant and 'just'. The reporting system needs to be perceived as being fair in the way unintentional errors and mistakes are treated. Actions are more important than words – it is what is done and said that counts most. Building an effective safety culture takes time, but it can be destroyed in an instant through inappropriate words or behaviour.

Employees also have a key role to play and recognise that as part of working in a safety critical environment, preventative, corrective or remedial actions can sometimes need to be taken by their employer or the safety regulator. These steps are not punitive but can be needed in order to maintain or improve safety.

Everyone can be assured of the IOMAR's commitment to a just safety culture and our overriding aim to maintain and wherever possible to improve aviation safety through working in partnership with those that we regulate.

4.4 Safety Information Protection

Operators must take such measures, as are reasonably necessary, to protect all safety data and safety information obtained by the person under the provisions of the Civil Aviation (Occurrence Reporting) Order from use for a purpose otherwise than in accordance with the Occurrence Reporting Order.

Operators must not use safety data or safety information obtained under the Occurrence Reporting Order for any purpose other than for the purposes of maintaining or improving safety and to take any preventative, corrective or remedial action that is necessary, including restricting or withdrawing any persons under the person's control from an operational duty.

Operators must not disclose any safety data or safety information other than for the purpose of promoting or improving aviation safety. Any such disclosure must not identify any individual, whether by the omission of names or otherwise. Persons requiring to disclose safety data or safety information for any other purpose must only do so in accordance with an approval granted by the IOMAR and subject to any conditions specified in the approval. Refer to RP5 for further details.

Chapter 5: Pre-Flight Passenger Safety Briefing

5.1 Requirements for a Pre-Flight Safety Briefing

A pre-flight safety briefing must be given to all passengers. Operators should adopt a positive approach to the pre-flight briefing of passengers.

The pilot-in-command must ensure that passengers are made familiar with the location and use of the emergency equipment, including:

- seat belts;
- emergency exits;
- life jackets, if the carriage of life jackets is prescribed;
- oxygen dispensing equipment if the use of oxygen is anticipated;
- other emergency equipment provided for individual use, including passenger emergency briefing cards; and
- actions that they shall take in the event of an emergency.

In addition, the pilot-in-command must ensure that all persons on board are aware of the location and general manner of use of the principal emergency equipment carried for collective use.

The pre-flight brief can be delegated to the cabin crew where carried.

Regardless of who conducts the briefing, it must be compliant with the applicable requirements and the use of a formal checklist is recommended.

5.2 Conducting the Briefing

The briefing must be conducted prior to every flight when passengers are carried.

The briefing can be presented verbally and/or via an audio-visual presentation.

Passengers with additional needs can require an individual safety briefing. Examples of these passengers would include visually or hearing-impaired persons or those travelling with infants.

Safety briefings must explain where to locate and how to use the emergency equipment passengers may be required to operate. In an emergency, a well-briefed passenger will depend less on a crew member and optimise their chance of survival. This life-saving information shall be conveyed to passengers in conjunction with a safety-briefing card featuring signs and placards specific to your aircraft.

5.3 Aeroplanes

The pilot-in-command must ensure the passenger briefing is conducted prior to take-off. The type of operation dictates what sort of briefing will be conducted with suggested content as follows:

5.3.1 Pre-flight Briefing

- Seat belt fastening, tightening, releasing procedures;
- Importance of using a shoulder harness where fitted;

- Location and operation of doors and emergency exits;
- Location and operation of emergency equipment such as the emergency locator transmitter, survival kit, first-aid kit, fire extinguisher and any other safety equipment;
- Location and use of life jackets, including fitment and when to inflate;
- No smoking;
- Oxygen-dispensing equipment;
- Remain in the seat unless given permission to move;
- Do not distract the pilot during take-off, manoeuvring or landing.

5.3.2 Emergency Briefing

- Follow instructions;
- Do not distract the pilot;
- Check that any loose equipment or baggage in the cabin is secured in the appropriate area;
- Brace position.

5.3.2.1 Emergency landing on land:

- When and how to exit the aeroplane;
- Assist others to evacuate well clear of the aeroplane;
- Remove first aid kit and other emergency equipment after no threat of fire.

5.3.2.2 Emergency landing on water:

- Establish your position in relation to the exit;
- Release the seat belt;
- Inflate life jacket and life raft when clear of the aeroplane.

5.4 Helicopters

The pilot-in-command should conduct the passenger briefing prior to entering the helicopter and engine start. The type of operation dictates what sort of briefing will be conducted with suggested content as follows.

5.4.1 Pre-boarding Briefing

Safety procedures can vary slightly from one helicopter model to another, however, the following could be included in relevant passenger briefings:

- Wait for instructions to approach or leave the helicopter;
- Stay well clear of the helipad when the helicopter is arriving or departing;
- Approach and leave to the side or front in a crouched position; never by the rear of the helicopter;
- If possible, wait until the rotors stop turning;
- Carry tools horizontally, below waist level, never upright, over the shoulder or above the head;
- Never throw items towards or out of a helicopter;
- Hold firmly onto hats and loose articles;

- Never reach up or dart after a hat or other object that might have blown off or away;
- Protect eyes against blown dust and particles by shielding them with a hand or by wearing sunglasses, safety glasses or safety goggles;
- If sudden blindness occurs due to dust or a blowing object, stop and crouch lower or sit down and wait for assistance;
- Approach and leave by the downslope side for rotor clearance;
- Never feel their way toward or away from the helicopter;
- Protect hearing by wearing ear plugs or muffs.

5.4.2 Pre-flight Briefing

- Seat belt fastening, tightening, releasing procedures;
- Importance of using a shoulder harness where fitted;
- Location and operation of doors and emergency exits;
- Location and operation of emergency equipment such as the emergency locator transmitter, survival kit, first-aid kit, fire extinguisher and any other safety equipment;
- Location and use of life jackets, including fitment and when to inflate;
- No smoking;
- Remain in the seat unless given permission to move;
- Do not distract the pilot during take-off, manoeuvring or landing.

5.4.3 Emergency Briefing

- Follow instructions;
- Do not distract the pilot;
- Check that any loose equipment in the cabin is secured;
- Brace position.

5.4.3.1 Emergency Landing on Water

- Establish your position in relation to the exit;
- Release the seat belt;
- Inflate life jacket and life raft when clear of helicopter.

CHAPTER 6: DOCUMENTS TO BE CARRIED

6.0 General

The documents listed below must be carried on all flights[2].

The documents can be carried on an Electronic Flight Bag (EFB) approved by the IOMAR, or where the documents are not used operationally, on a Portable Electronic device (PED).

The operator should establish a pre-flight check system in the Company Operations Manual or other suitable document. The PIC is responsible for ensuring the pre-flight check is completed.

6.1 Aircraft Flight Manual (AFM)

The Aircraft Flight Manual (AFM), or equivalent document, must be carried on all flights.

The AFM must be kept up to date with the latest revisions, including temporary revisions.

- Hard copy revisions (including temporary revision) must be included in the AFM as soon as they are delivered to the aircraft.
- Electronic revisions (including temporary revisions) must be included in the aircrafts EFB prior to the next dispatch.

Where the operator has both hard copy and electronic copy of the AFM on the EFB, both electronic and hard copy AFM must be at the same revision status. Therefore the IOMAR strongly recommends, operators only keep an electronic copy of the AFM on the EFB and not the hard copy on-board.

The operator must establish a process to check the contents of the AFM with reference to the list of effective pages, to ensure that the manual contains all the applicable pages, including temporary revisions and applicable supplements.

Where the AFM is stored on an approved EFB, refer to Part 2 Chapter 5.3.6.3 for an acceptable means of compliance for the incorporation of ADs and/or STCs.

6.2 Certificate of Registration

The original Certificate of Registration (CoR) must be carried each flight.

The original CoR is the electronic/digital copy sent to the operator via email. If the electronic/digital CoR is printed, it is no longer the original copy.

As an alternative to an electronic/digital being issued, operators can request a 'true and certified' hard copy of the CoR from the IOMAR.

[2] Except where the flight begins and ends at an aerodrome in the Isle of Man and does not overfly any other territory, in which case the documents may be kept at the aerodrome instead of being carried on the aircraft, unless explicitly stated in the applicable paragraph.

6.3 Certificate of Airworthiness

The original Certificate of Airworthiness (CoA) must be carried on each flight.

The original CoA is the electronic/digital copy sent to the operator via email. If the electronic/digital CoA is printed, it is no longer the original copy.

As an alternative to an electronic/digital being issued, operators can request for a 'true and certified' hard copy of the CoA from the IOMAR.

6.4 Flight Crew Licence and Validation

Pilots Flight Crew must carry both their license (and any other required documents) and the IOMAR issued certificate of validation. Operating an aircraft without either of these documents on board, is a breach of the ANO.

6.5 Operations Specification Certificate (Ops Spec)

The valid Ops Spec shall be carried on-board the aircraft.

The Ops Spec lists the operational approvals granted to the operator for the specific aircraft and the expiry date of the certificate

Renewal of the Ops Spec must be applied for prior to the expiry of the certificate. Refer to Part 2 Chapter 1.2 for renewal application process and requirements.

6.6 Maps & Charts

Maps and charts for the intended flight of the aircraft including any diversion that can reasonably be expected must be carried on-board in either hard copy or on an approved EFB.

NOTE: a tablet device which contains charts and/or maps for operational use on-board an aircraft is an EFB, and therefore an approval to use an EFB is required from the IOMAR.

6.7 Permission Certificate

Any permission certificate issued by the IOMAR and in-force at the time of the flight must be carried.

6.8 Company Operations Manual

Operators of Large and Turbojet aircraft must establish and maintain a Company Operations Manual (COM) in respect of the aircraft.

The relevant sections of the COM must be carried on board the aircraft, refer to Part 1 Chapter 13.1 for more details.

The IOMAR produces a Company Operations Manual Template (COMT) to assist operators to produce a COM. The COMT provides a framework for an operator to produce a COM which meets the requirements of the IOMAR. RP56a is available upon request to our current operators. Please contact flightoperations@gov.im to request a copy.

6.9 Minimum Equipment List (MEL)

Defects cannot be deferred using a Master Minimum Equipment List (MMEL), unless a Permission to do so has been issued by the IOMAR.

Deferring a defect in accordance with the MMEL without a Permission does not restore the aircraft's Certificate of Airworthiness.

Operators of Large and Turbojet aircraft must prepare and ensure that an MEL for the aircraft is approved by the IOMAR prior to its use.

Operators of all other aircraft types for which a MMEL has been established, can apply for approval to use an MEL. The MEL must be in compliance with the requirements published in Part 2 Chapter 5.2 of this document.

6.10 Checklists

The operator of an aircraft shall ensure that checklists are used by the flight crew of the aircraft prior to, during and after all phases of its operations, and in emergencies, all as detailed in the aircraft's company operations manual.

It is the responsibility of the pilot-in-command to ensure that the checklists are fully complied with.

6.11 Radio Licence

All M- Registered aircraft must have an Aircraft Radio Licence. Licenses are issued by Ofcom, the communications regulator for the UK and Crown Dependencies which includes the Isle of Man.

6.12 Noise Certificate

A noise certificate will be issued to every aircraft and must be carried during flight.

2 types of noise certificates can be issued by the Registry: -

1) A single MTOM/MLM noise certificate; and
2) A Multiple MTOM/MLM noise certificate.

6.12.1 Single MTOM/MLM Noise Certificates

A single MTOM/MLM noise certificate will be issued as standard during the registration process.

6.12.1.1 Change to a Single MOTM/MLM Noise Certificate

Aircraft which have undergone modifications which affect the MTOM/MLM and/or Noise Levels must receive a new noise certificate.

Changes to a single data set Noise Certificate should be submitted to the IOMAR using Form 124 Change to Single MTOM – MLM Noise Certificate.

6.12.2 Multiple MTOM/MLM Noise Certificates

Airports in noise sensitive areas may restrict access to aircraft with certain noise levels (decibels). Aircraft manufacturers may offer modification options to change the maximum certified weight of the aircraft and published noise levels to allow for operations into noise sensitive airports. Where the modification allows, the changes to the certified weight may be deactivated and/or reactivated as operations require.

The initial installation of the modification requires a maintenance input. However subsequent de/activation and re-activation of the modification, may be classified under that particular state's classification system as being a 'Major Change' which could require the deactivation and/or reactivation of the modification to be performed by a certified 145 repair station.

As the State of Register, the IOMAR can define who is authorised to perform the deactivation and/or reactivation of the modification (i.e. removal and/or reinstallation of the placard & AFM Supplement).

Where the deactivation and/or reactivation of the modification involves: -

- Swapping of placards;
- Removing/inserting AFM Supplements;

The IOMAR has determined that this task may be carried out by the PIC without the requirement for a Certificate of Release to Service (CRS).

Some modifications permit the operator to tactically decide which weights to use without any changes to placards.

In both cases, a robust process is required to be approved by the IOMAR in order to issue a multiple MTOM/MLM noise certificate – refer to Part 1 Chapter 6.12.2.1 for the tactical change procedures requirements.

To apply for a multiple MTOM/MLM noise certificate, Operators need to complete and submit Form 125 Multiple MTOM/MLM Noise Certificate.

Questions relating to Multiple MTOM/MLM Noise Certificate should be addressed to Flight Operations.

6.12.2.1 Tactical Change procedure for MTOM/MLM Noise Certificate

In order to be granted a MTOM/MLM Noise Certificate the operator must provide a robust procedure to: -

- control the de-activation/re-activation of a modification; or
- control the change of MTOM/MLM allowed by an AFM Supplement (e.g. G7500 Supplement 6).

The procedure must include: -

a) Roles and responsibilities (i.e. who can perform the change);
b) Clear simple step by step instructions to follow, including:-
    i) swapping of placards (if applicable),
    ii) removal/inserting of AFM Supplement (if applicable),
    iii) stowage of AFM Supplements which are not currently in use (if applicable);
    iv) Recording the deactivation and/or reactivation of the specific modification(s) or options;
c) Reporting for error in the procedure; and
d) Any supplementary actions/changes to documentation that are necessary as a result of the task (i.e. change of speed category for a G450 with ASC 007 embodied which can affect min RVR for LVTO.)

Questions relating to tactical change requirements should be addressed to Flight Operations.

6.12.2.2 Changes to Noise Certificates

Aircraft which have undergone modifications which affect the MTOM/MLM and/or Noise Levels must receive a new noise certificate.

Changes to a single data set Noise Certificate should be submitted to the IOMAR using Form 124 Change to Single MTOM – MLM Noise Certificate.

Changes to a multiple MTOM/MLM noise certificate must be submitted to the IOMAR using Form 125 Multiple MTOM/MLM Noise Certificate

6.13 Notified Procedures for Intercepted Aircraft

Notified procedures for intercepted aircraft must be carried. Please refer to Registry Leaflet 8 – Intercept Procedures.

6.14 Journey Log

A Journey Log Book (JLB) must be maintained and carried on board. The journey log must include:-

- Nationality & Registration Mark;
- Date of the flight;
- Names of the crew members and duty assignments;
- Departure and arrivals points and times of the flight (from the moment the aircraft moves under its own power for the purpose of taking off until the moment when it next comes to rest after landing);
- Purpose of flight;
- Any observations regarding the flight (including any suspected or actual defects noticed by the crew members following dispatch); and
- Signature of the log by the pilot-in-command.

Completed JLBs shall be retained to provide a continuous record.

All suspected or actual defects shall be recorded in the observations section of the journey log when they become evident. Defects shall be transferred on to maintenance paperwork for maintenance personnel involvement and where appropriate, deferred in accordance with the approved MEL.

The system that controls the maintenance and operational status of the aircraft can be either in hard copy or by electronic means.

6.15 Passenger and Cargo Manifests

A Passenger and/or Cargo Manifest must be completed:

- where passengers are carried (the manifest must contain passengers' names, and their places of embarkation and disembarkation); and
- where cargo is carried (the cargo manifest must contain detailed declarations of the cargo).

A copy of each of these documents, where prepared, shall be left at the aerodrome of departure.

6.16 Search and Rescue Information

Operators shall ensure that the pilot-in-command has available on board the aeroplane all the essential information concerning the search and rescue services in the area over which the aeroplane will be flown.

6.17 Retention of Documents

The following documents must be retained: -

a) **journey log books** for the aircraft and until at least two years after the aircraft has been destroyed or has been permanently withdrawn from use, or for such shorter period as the Department may permit in a particular case;

b) **aircraft log books** must be preserved by the operator of the aircraft until at least two years after the aircraft, the engine or the variable pitch propeller has been destroyed or has been permanently withdrawn from use;

c) **aircraft mass schedule** must be preserved by the operator of the aircraft until at least six months after the next occasion on which the aircraft is weighed; and

d) the last 25 hours of recording made by a **flight data recorder** required by our legislation in an aeroplane; and a record of at least one representative flight made within the last 12 months.

In the event of a change of operator, the original operator has a legal obligation to provide the future new operator with:

a) certificates of maintenance review and release to service;

b) the log books;

c) the mass schedule; and

d) records made by a flight data recorder.

CHAPTER 7: DANGEROUS GOODS, WEAPONS & MUNITIONS OF WAR

7.1 Overview

7.1.1 What are Dangerous Goods?

Dangerous Goods are any articles or substances capable of posing a hazard to health, safety, property or the environment in relation to and shown in the list of dangerous goods in the "Technical Instructions" or classified according to those Instructions (see below).

These include obvious things, such as explosives, radioactive materials, flammable liquids, dangerous or volatile chemicals, strong acids, compressed gases, poisons and aerosols. However, many common items found in the household can also be considered dangerous goods for the purpose of air transport, including toiletries, aerosols, tools and lithium batteries etc.

Dangerous goods can be carried safely by air transport providing they are prepared, packaged, marked/labelled and carried in accordance with the Technical Instructions.

7.1.2 What are the Technical Instructions?

The Technical Instructions are the Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284) published by the International Civil Aviation Organisation (ICAO). The Technical Instructions amplify the basic provisions of Annex 18 to the Convention on International Civil Aviation and contain all the detailed instructions necessary for the safe international transport of dangerous goods by air.

The International Air Transport Association (IATA) publishes their own Dangerous Goods Regulations Manual based on the Technical Instructions and with additional restrictions imposed by airlines. Compliance with the IATA Dangerous Goods Regulations will result in compliance with the ICAO Technical Instructions and the Civil Aviation (Safe Transport of Dangerous Goods by Air) Order 2020 (Dangerous Goods Order).

7.1.3 What is the Dangerous Goods Order?

The Civil Aviation (Safe Transport of Dangerous Goods by Air) Order 2020, referred to hereafter as Dangerous Goods Order, sets requirements on M- Registered aircraft, wherever they may be.

7.1.4 Limitations on the Carriage of Dangerous Goods

Unless the operator has been approved to carry dangerous on-board the specific aircraft by the IOMAR (refer to Part 2 Chapter 5.5), dangerous goods cannot be carried on-board an aircraft unless:-

- the item is required to be aboard the aircraft in accordance with the pertinent airworthiness requirements and operating regulations or are authorised by the IOMAR to meet special requirements;
- the items of dangerous goods are permitted to be carried by Passengers and Crew, refer to Part 1 Chapter 7.2.4 for more details;
- the items of dangerous goods are required to provide Medical Assistance, refer to Part 1 Chapter 7.2.5 for more details; or
- the items of dangerous goods are required to provide Veterinary Aid, refer to Part 1 Chapter 7.2.6 for more details.

7.2 Operator Requirements

7.2.1 General

An aircraft operator must ensure that:

- all operational staff are trained on the carriage of dangerous goods, refer to Part 1 Chapter 7.2.2;
- passengers are provided information on what can and cannot be carried, refer to Part 1 Chapter 7.2.3 & Part 1 Chapter 7.2.4;
- emergency response information is provided to flight crew, refer to Part 1 Chapter 7.3; and
- guidance on the carriage of dangerous goods is provided to all operational staff, refer to Part 1 Chapter 7.4.

7.2.2 Dangerous Goods Training

7.2.2.1 Initial and Recurrent Training

Initial and recurrent dangerous goods training programmes must be established and maintained by or on behalf of an aircraft operator of all aircraft registered in the Isle of Man, whether approval to carry dangerous goods is held or not. Such training must be provided to:

- flight crew and other crew members; and
- load planners, flight operations officers, flight dispatchers.

Initial training must be completed before the staff commences operations. Recurrent training must be provided within 24 months of the previous training; however, if the training is completed within the final three months of validity, the period extends to 24 months after the expiry date of the previous training.

7.2.2.2 Objective of Dangerous Goods Training/Curricula

The operator must ensure that personnel are competent to perform any function for which they are responsible for prior to performing any of these function. This must be achieved through training and assessment commensurate with the functions they are responsible for and must include:

- General awareness/familiarisation;
- Function specific training pertinent to their role.
- Safety training on how to recognise dangerous goods hazards, safe handling, and emergency response procedures.

In order to assist aircraft operators, the IOMAR has produced a non-carry operator dangerous goods training template that meets the legislative requirements and is tailored to non-commercial operations. Operators must customise the training template to their own operation. The training template is available to download from the ARDIS Portal post login.

7.2.2.3 Training Records & Certificate of Training

The operator must maintain a record of training and assessment, which includes:

- the individual's name;
- month and year of completion;
- description, copy or reference to the training materials used;
- name and address of the person/organisation providing the training and assessment; and
- evidence which shows that the personnel have been assessed as competent.

Training records must be retained by the operator for a minimum of 36 months from completion and must be made available on request to the individual or the IOMAR.

7.2.2.4 Dangerous Goods Instructor Qualification

Most dangerous goods training is delivered via Computer Based Training (CBT). Where training is classroom delivered, instructors must have adequate instructional skills and have successfully completed either a Category 6 course or a dangerous goods training programme relevant to the functions that they will instruct, prior to delivering such training. Instructors must deliver such courses at least every 24 months or in the absence of this attend recurrent training.

7.2.3 Provision of Information to Passengers

Operator's of **all** aircraft registered in the Isle of Man must ensure that passengers are warned prior to aircraft departure as to the types of dangerous goods which they are forbidden from carrying aboard an aircraft.

Refer to Part 1 Chapter 7.2.4 for details on what passengers and crew can carry.

7.2.4 Provisions for Passengers and Crew

Passengers and crew can carry certain items of dangerous goods either as carry-on baggage, hold baggage or on their person provided:

a) the item(s) is included in the Table of Permissible Items (refer to RL5); and
b) are for personal use only.

The operator must establish a process to ensure that passengers are made aware of the restrictions on what can and cannot be carried.

7.2.5 Recognition of Undeclared Dangerous Goods

Not all dangerous goods are easily identifiable and passengers may not even be aware they are carrying dangerous goods.

In order to assist operators to prevent passengers inadvertently taking undeclared dangerous goods on-board, ICAO have produce a list of 'General Descriptions of Dangerous Goods' , a copy of the list is published in RL6.

Operators of Large and Turbojet Aircraft must include a copy of the list in the Company Operations Manual.

For operators who do not require a Company Operations Manual, a copy of the list (or RL6) shall be provided to relevant operational staff.

7.2.6 Medical Assistance

An approval is not required for dangerous goods which: -

- are to provide in-flight medical assistance to a patient, when those dangerous goods are placed on board with the approval of the operator; or
- form part of the permanent equipment of the aircraft when it has been adapted for specialized use, providing that:
    - i) gas cylinders have been manufactured specifically for the purpose of containing and transporting that particular gas; and
    - ii) equipment containing wet cell batteries is kept and, when necessary, secured in an upright position to prevent spillage of the electrolyte.

7.2.7 Veterinary Aid

An approval is not required for dangerous goods which are carried for use in flight as veterinary aid or as a humane killer for an animal. Such dangerous goods must be stowed and secured during take-off and landing and at all other times when deemed necessary by the pilot-in-command.

The dangerous goods must be under the control of trained personnel during the time when they are in use on the aircraft.

7.2.8 Reporting of Dangerous Goods Occurrences

Dangerous goods occurrences which may represent a significant risk to aviation safety shall be reported using the mandatory occurrence reporting process, refer to RP5.

Such events include:

- the discovery of undeclared or misdirected dangerous goods in company mail or cargo;
- dangerous goods having been carried when not loaded, segregated, separated or secured in accordance with the Dangerous Goods Order, or any condition stipulated in an approval or exemption;
- dangerous goods having been carried without information being provided to the pilot in command in accordance with the Dangerous Goods Order;
- the discovery of dangerous goods not permitted by the Dangerous Goods Order either in the baggage or on the person of passengers or crew members.

Dangerous goods accidents and serious incidents shall be notified in accordance with normal accident and serious incident reporting processes, refer to RP5.

7.3 Emergency Response Information

All operators must provide information to the flight crew on the actions to be taken in the event of an emergency involving dangerous goods.

RL7 contains example checklists incidents involving dangerous goods.

ICAO publish the Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (ICAO Doc 9481), which can provide operators with additional guidance on how to handle such emergencies and includes the fully expanded checklists contained in RL7.

7.4 Guidance on the Carriage of Dangerous Goods

7.4.1 Carriage of Aircraft Equipment and Spares that are Classified as Dangerous Goods

Replacement items of aircraft equipment and spares which are classified as dangerous goods have an inherent hazard that needs to be recognised as having the ability to cause an accident or incident unless proper procedures are followed in their preparation for and carriage by air.

Such equipment and spares may well be safe when in their operating location but when carried as cargo on the same aircraft they could present a considerable hazard unless all the requirements applicable to their carriage as items of dangerous goods are complied with. The items that can come under this description include (but are not limited to) fire extinguishers, oxygen cylinders, chemical oxygen generators (which can be contained in passenger service units (PSU) or crew PBE, pyrotechnics for life-rafts, batteries, aerosols (such as insecticide sprays) and dry ice for the preservation of food.

There is a need to ensure that all items of aircraft equipment and spares which meet the definition of dangerous goods are identified and the correct method established for consigning them as cargo, if the need to ship them is likely to arise. Equipment and spares may need to be shipped as replacements for items which have been used or have reached their expiry date, as AOG spares, or as return items which have been replaced. Sometimes the items are needed urgently; often there is no urgency but they are still sent on that basis.

7.4.2 Inoperative Aircraft Equipment

Certain items of aircraft equipment when inoperative and removed from its stowage, may be classified as dangerous goods and therefore are not permitted for carriage on an aircraft and must be removed prior to flight.

A typical example is Portable Protecting Breathing Equipment (PBE). PBE may be inoperative due to either being unserviceable, have passed its expiration date or been used. PBE which has damaged packaging or seal must be removed from the aircraft.

The PIC shall refer to the approved MEL or permission to determine whether the aircraft is able to dispatch with an inoperative PBE. Any applicable conditions, e.g. placarding requirements, must be fully complied with.

7.4.3 Batteries Carried Loose on Aircraft

Batteries are commonly carried on-board and used by passengers during flight. Due to the power needed by some of the items, the batteries are often lithium batteries but other types are also carried. By virtue of their size, the lithium batteries are likely to be excluded from the requirements of the Technical Instructions; other types are not likely to be dangerous goods by definition.

However, the Technical Instructions recognise that all batteries, irrespective of their type, have the potential to cause a fire through being short- circuited across the terminals, which can happen if several batteries come into contact with each other. The Technical Instructions require that they must be packed so this cannot occur. (A nickel cadmium (nicad) battery, which had been removed from a diving torch and placed loose in an item of cabin baggage, was short-circuited by metal objects in the bag causing them to begin to melt and emit smoke.)

In addition to small fires on aircraft, there have been several ground incidents where fires were caused by batteries being short-circuited; there is always the potential for this to happen if the terminals of a battery or several batteries are allowed to come into contact with metal. Carrying batteries loose in a bag or in some way that does not provide protection for the terminals could lead to an incident in flight.

7.4.4 Christmas Crackers and Party Poppers

Christmas crackers when complete and in their retail packaging (i.e. in a box of Christmas crackers) do not have sufficient grains of explosive in the "snap" to be regarded as dangerous goods and they can be carried without restriction. However, the snaps when shipped on their own are regarded as having an explosive potential because of the number likely to be contained in a single package and they need to be consigned as dangerous goods under the classification assigned to them by the relevant competent authority and in accordance with the requirements of the Technical Instructions.

Although party poppers appear to contain a minimal quantity of explosive, tests have shown there is sufficient to give rise to a hazard similar to that posed by toy gun caps. Therefore, they are not considered to be suitable for carriage.

7.4.5 Fireworks

The Technical Instructions identify fireworks as items of dangerous goods, no matter what type and what quantity; the list of dangerous goods which passengers are permitted to take on aircraft does not include fireworks in any form, which means they are not permitted in baggage.

7.4.6 Carriage of Dry Ice

Dry ice is one of the more frequently carried items of dangerous goods on aircraft. It is used as a refrigerant to preserve fresh food, keep food frozen, maintain the purity of chemicals and drugs and preserve medical specimens; therefore, it can be in the cargo compartments, passenger cabin or galley areas.

Dry ice is solid carbon dioxide which at ambient temperatures gradually vaporises into carbon dioxide gas: this will be undetectable and have the effect of depleting the amount of oxygen in the atmosphere. In the open air or in a large area, the evolution of carbon dioxide is not at a sufficient rate for there to be a problem.

However, in a confined space or where there is a restricted air flow there is a potential for the percentage of carbon dioxide in the air to rise to the level at which a person will begin to feel the effects, which are a striking headache, a raised breathing rate and a feeling of being flushed, hot and uncomfortable.

The Technical Instructions recognise the potential hazard of dry ice by only permitting passengers to carry up to 2.5 kg each of dry ice in the passenger cabin of an aircraft without informing the operator; they can have up to 2.5 kg in their hold baggage providing the operator has agreed.

7.4.7 Battery-Powered Wheelchairs

There have been occasions when battery-powered wheelchairs have been inadvertently activated during transit, and even caught fire. The Technical Instructions provides for the carriage by passengers of battery-powered mobility aids, in hold baggage, subject to the approval of the operator. By far the most common battery used on mobility aids is the non-spillable type, most of which have a gel electrolyte.

During air transport, such batteries must be securely attached to the mobility aid and protected from:

a) inadvertent operation - there are a variety of ways a wheelchair can be protected, and in the first instance the passenger should be asked how this can be achieved; generally this will involve certain actions being taken with the joystick, but can also be as simple as removing a key or turning a deactivation switch. If the latter, care must be taken during loading to ensure that the switch cannot be activated by adjacent baggage.

b) **NOTE:** Application of the brake is not sufficient; unless the motor is rendered inoperative the motor can still be activated and overheat;

c) short circuit of the battery - adequate protection can already be afforded by the battery being contained in a battery box fitted to the mobility aid; and

d) damage - including to associated wiring, by the movement of baggage, mail, stores or other cargo.

The Technical Instructions do not require disconnection of non-spillable batteries, since this is often very difficult to do, and if not done properly can increase the risk of a fire. Consequently, only if deactivation cannot be achieved, should disconnection be considered. If this is done it must be ensured that the battery terminals are protected against short circuit, e.g. by the effective insulation of exposed terminals.

Spillable batteries are subject to further restrictions, which are detailed in Part 8, Chapter 1 of the ICAO Technical Instructions.

7.5 Carriage of Sporting Weapons and Munitions of War

7.5.1 Definitions

Munitions of War (MoW) are: -

a) weapons or ammunitions; or
b) articles containing explosives, noxious liquids or gas; or
c) any other thing, that is designed or made for use in warfare or against persons, including components or accessories for such weapons, ammunition or articles.

Sporting Weapons are: -

a) weapons or ammunitions; or
b) articles containing explosives, noxious liquids or gas; or
c) any other thing, including parts, whether components or accessories, for such weapon, ammunition or article,

that is not a munition of war.

7.5.2 Carriage of Sporting Weapons

Permission for the carriage of Sporting Weapons from the IOMAR is NOT required provided the weapons is unloaded and stored in the aircraft hold which is NOT accessible from the passenger cabin.

However approval from the Operator is required.

The operator must ensure that: -

a) ammunition carried must be in accordance with Registry Leaflet 5 – Table of Permissible Items 19); and
b) the commander notifies the aerodrome authorities if the weapons are to be taken into a Restricted Area of that aerodrome.

7.5.2.1 Carriage of Sporting Weapons where the Aircraft Hold is Accessible

If the aircraft hold is accessible from the passenger cabin, the operator must submit Form 77 to apply for an exemption from the IOMAR to carry the sporting weapon(s).

The operator must ensure that: -

a) the weapon(s) are unloaded, stowed beneath any other baggage in the cargo compartment and cargo netting must separate the cargo compartment from the cabin during flight;

b) ammunition carried must be in accordance with Registry Leaflet 5 – Table of Permissible Items 19); and

c) the commander notifies the aerodrome authorities if the weapons are to be taken into a Restricted Area of that aerodrome.

7.5.3 Carriage of Munitions of War

Munitions of War, i.e. firearms, ammunition, electroshock weapons and CS gas spray can only be carried with a Permission from the IOMAR.

To apply for Permission from the IOMAR, operator must complete and submit Form 78.

The Munitions of War must not be carried on the flight deck.

Note: CS gas spray must be carried in a manner such that accidental discharge is prevented and shall not be used on-board. In the event of a release of CS gas the commander must be notified without delay.

The operator must ensure that the PIC is provided with a copy of the Permission Certificate.

The Permission will include the type, mass/quantity and location of any munition of war on board or suspended beneath the aircraft.

Munitions of war must be stored in a compartment that is NOT accessible from the passenger cabin. If the location of the munitions of War ARE accessible, this must be clearly identified on Form 78, so that an exemption may be considered by the IOMAR.

7.5.3.1 Carriage of Munitions of War by Armed Police Protection Officer(s) or Armed Bodyguard(s)

Operator who are required to carry Armed Police Protection Officer(s) or Armed Bodyguard(s) and require the officer or bodyguard to have access to the Munitions of War **during** flight, must submit Form 78 to apply for permission and an exemption from the IOMAR.

When the Armed Police Protection Officer or Armed Bodyguard is not accompanying the principal, unloaded firearms and ammunition must be stowed in a location on the aircraft that is inaccessible to passengers unless inaccessible stowage cannot be achieved in which case they may be carried on the person.

CHAPTER 8: FUEL REQUIREMENTS

8.1 General Fuel Requirements

The PIC must ensure, taking into account both the meteorological conditions and any delays that are expected in flight, the aircraft carries sufficient fuel and oil to ensure that it can safely complete the flight.

The use of fuel after flight commencement for purposes other than originally intended during pre-flight planning shall require a re-analysis and, if applicable, adjustment of the planned operation.

8.2 Refuelling with Passengers On-board

The PIC must ensure that prior to the aircraft being refuelled whilst passengers are embarking, on board or disembarking—

a) qualified personnel are readily available to initiate and direct the evacuation of the aircraft;
b) passengers are instructed to ensure that any seat belts or harnesses are unfastened; and
c) two-way communication is maintained between the ground crew supervising the refuelling and the qualified personnel on board the aircraft.

8.3 Insufficient Fuel Remaining

8.3.1 General Requirements

If it becomes apparent that the fuel remaining is close to the minimum amounts specified, the PIC shall have clear instructions on the actions he shall take. In normal circumstances the aircraft is expected to land with Reserve Fuel, which is the Final Reserve Fuel plus Alternate Fuel.

The PIC shall advise ATC of a minimum fuel state by declaring "MINIMUM FUEL" when, having committed to land at a specific aerodrome, the pilot calculates that any change to the existing clearance to that aerodrome can result in landing with less than the planned final reserve fuel.

Note: The declaration of "MINIMUM FUEL" informs ATC that all planned aerodrome options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance can result in landing with less than the planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible if any additional delay occurs.

8.3.2 Fuel Emergency

The pilot-in-command shall declare a situation of fuel emergency by broadcasting "MAYDAY MAYDAY MAYDAY FUEL" when the calculated usable fuel estimated to be available upon landing at the nearest aerodrome where a safe landing can be made is less than the planned final reserve fuel.

8.4 Fuel Requirement for Large & Turbojet Aircraft

8.4.1 Fuel Requirements

An aircraft shall carry a sufficient amount of usable fuel to complete the planned flight safely and to allow for deviations from the planned operation.

The amount of usable fuel to be carried shall, as a minimum, be based on:

a) fuel consumption data:
   - i) provided by the aeroplane manufacturer; or
   - ii) if available, current aeroplane-specific data derived from a fuel consumption monitoring system; and

b) the operating conditions for the planned flight including:
   - i) anticipated aeroplane mass;
   - ii) Notices to Airmen;
   - iii) current meteorological reports or a combination of current reports and forecasts;
   - iv) air traffic services procedures, restrictions and anticipated delays; and
   - v) the effects of deferred maintenance items and/or configuration deviations.

8.4.2 Pre-flight Fuel Calculation

The pre-flight calculation of usable fuel required shall include:

a) **taxi fuel**, which shall be the amount of fuel expected to be consumed before take-off taking into account local conditions at the departure aerodrome and auxiliary power unit (APU) fuel consumption;

b) **trip fuel**, which shall be the amount of fuel required to enable the aeroplane to fly from take-off until landing at the destination aerodrome taking into account the operating conditions as described above;

c) **contingency fuel**, which shall be the amount of fuel required to compensate for unforeseen factors. It shall be not less than 5% of the planned trip fuel;

   Note — Unforeseen factors are those which could have an influence on the fuel consumption to the destination aerodrome, such as deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions, extended delays and deviations from planned routings and/or cruising levels.

d) destination alternate fuel, which shall be:

   1) where a destination alternate aerodrome is required, the amount of fuel required to enable the aeroplane to:
      - i) perform a missed approach at the destination aerodrome;
      - ii) climb to the expected cruising altitude;
      - iii) fly the expected routing;
      - iv) descend to the point where the expected approach is initiated; and
      - v) conduct the approach and landing at the destination alternate aerodrome; or

2) where a flight is operated without a destination alternate aerodrome, the amount of fuel required to enable the aeroplane to fly for 15 minutes at holding speed at 450 m (1 500 ft) above destination aerodrome elevation in standard conditions; or

3) where the aerodrome of intended landing is an isolated aerodrome:

   i) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes plus 15 per cent of the flight time planned to be spent at cruising level, including final reserve fuel, or two hours, whichever is less; or

   ii) for a turbine-engined aeroplane, the amount of fuel required to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel;

e) **final reserve fuel**, which shall be the amount of fuel on arrival at the destination alternate aerodrome, or the destination aerodrome when no destination alternate aerodrome is required:

   1) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes; or

   2) for a turbine-engined aeroplane, the amount of fuel required to fly for 30 minutes at holding speed at 450 m (1 500 ft) above aerodrome elevation in standard conditions;

f) **additional fuel**, which shall be the supplementary amount of fuel required to enable the aircraft to descend as necessary and proceed to land at an alternate aerodrome in the event of engine failure or loss of pressurization based on the assumption that such a failure occurs at the most critical point along the route;

g) **discretionary fuel**, which shall be the extra amount of fuel to be carried at the discretion of the pilot-in-command.

8.4.3 In-Flight Fuel Management

The operator shall establish policies and procedures to ensure that in-flight fuel checks and fuel management are performed. The COM shall specify the frequency of in-flight fuel checks, the recording of information and the application of that information. It is recommended that in-flight checks are carried out at least once on every sector and at intervals not exceeding 60 minutes on flights that exceed 90 minutes. A calculation to determine the amount of fuel remaining and to predict the amount of fuel expected to remain overhead the aerodrome of intended landing should follow every check.

The pilot-in-command shall continually ensure that the amount of usable fuel remaining on board is not less than the fuel required to proceed to an aerodrome where a safe landing can be made with the planned final reserve fuel remaining upon landing.

The protection of final reserve fuel is intended to ensure a safe landing at any aerodrome when unforeseen occurrences may not permit safe completion of an operation as originally planned. Guidance on flight planning including the circumstances that may require re-analysis, adjustment and/or re-planning of the planned operation before take-off or en-route, is contained in the ICAO Flight Planning and Fuel Management (FPFM) Manual (Doc 9976).

The pilot-in-command should request delay information from ATC when unanticipated circumstances may result in landing at the destination aerodrome with less than the final reserve fuel plus any fuel required to proceed to an alternate aerodrome or the fuel required to operate to an isolated aerodrome.

8.5 Fuel and Oil Requirements for Non Large & Turbojet Aircraft

8.5.1 Fuel Requirements

The amount of fuel to be carried must:

a) when the flight is conducted in accordance with the instrument flight rules and a destination alternate aerodrome is not required, or when the flight is to an isolated aerodrome, flight to the aerodrome of intended landing, and after that, have a final reserve fuel for at least 45 minutes at normal cruising altitude; or

b) when the flight is conducted in accordance with the instrument flight rules and a destination alternate aerodrome is required, flight to the aerodrome of intended landing, then to an alternate aerodrome, and after that, have a final reserve fuel for at least 45 minutes at normal cruising altitude; or

c) when the flight is conducted in accordance with day VFR, flight to the aerodrome of intended landing, and after that, have a final reserve fuel for at least 30 minutes at normal cruising altitude; or

d) when the flight is conducted in accordance with night VFR, flight to the aerodrome of intended landing and thereafter have a final reserve fuel for at least 45 minutes at normal cruising altitude.

8.5.2 Inflight Fuel Monitoring

The pilot-in-command shall monitor the amount of usable fuel remaining on board to ensure it is not less than the fuel required to proceed to an aerodrome where a safe landing can be made with the planned final reserve fuel remaining.

CHAPTER 9: RULES OF THE AIR AND AIRBORNE OPERATIONS

9.0 General

Chapter 9 includes information regarding the Rules of the Air, operations in designated airspace and specific operations of airborne equipment.

The information in Sub Chapters 9.2 (RVSM Operations), 9.3 (NAT HLA Operations), and 9.4 (PBN Operations) were all previously incorporated in RP30, 31 & 32 respectively. RP30, 31 & 32 have been revoked.

9.1 Civil Aviation (Rules of the Air) Order 2021

9.1.0 General

The Civil Aviation (Rules of the Air) Order 2021 provides the Isle of Man's Rules of the Air as required by Annex 2 to the Chicago Convention.

9.1.1 Rules of the Air Applicability

The Rules of the Air apply to:

- all aircraft operating within the Isle of Man; and
- aircraft registered in the Isle of Man, wherever they may be to the extent that they do not conflict with the rules published by the State having jurisdiction over the territory overflown.

The rules mirror those of the UK. Consequently, they consist of the European Union's Standardised European Rules of the Air (SERA) (as retained in UK legislation) as well as the UK's additional complementary rules. The Isle of Man has also adopted the European Union's Acceptable Means of Compliance (AMC) and Guidance Material (GM) to SERA.

To assist operators an 'easy access' document is available on the IOMAR website that consolidates the Isle of Man Rules of the Air together with relevant general permissions/approvals, and the European Union's Acceptable Means of Compliance (AMC) and Guidance Material (GM) to SERA.

9.1.2 Operator Requirements

Operators must ensure that all validated pilots comply with the Civil Aviation (Rules of the Air) Order 2021 as applicable (refer to Part 1 Chapter 9.1.1).

Operators of Large and Turbojet Aircraft (refer to Part 1 Chapter 11) must ensure that the Company Operations Manual appropriately refers to and is consistent with the requirements specified in the Civil Aviation (Rules of the Air Order) 2021.

9.2 Operations in RVSM Airspace

9.2.0 General

An approval from the IOMAR is required for operations in RVSM airspace. Please refer to Part 2 Chapter 2.1.1 for the application process.

9.2.1 RVSM Operational Procedures

9.2.1.1 Before Flight

Before flight in RVSM airspace, the flight crew must:

- Ensure that the aeroplane remains approved for flight in RVSM airspace by confirming that there is no technical log (or equivalent) entry to the contrary, and that its serviceability state satisfies dispatch requirements shown in the MEL (if applicable) for the route intended to be flown, noting any operating limitations that might apply (e.g. restricted range of Mach Number);
- Review the current flight levels to which RVSM rules apply, noting that there may be differences between regional or national airspace RVSM applications;
- Ensure that 'W' has been entered at Item 18 of the ICAO flight plan (or at item 'Q' of a repetitive flight plan) indicating that the aeroplane has State approval to be flown within RVSM airspace. Enter any additional annotations that may be required to signify that additional navigation approval requirements have been met (e.g. NAT HLA navigation approval, RNAV5 (B-RNAV) approval or similar lateral navigation performance approvals);
- Carry out external checks in accordance with the appropriate guidance for the aeroplane which should include ensuring that pitot and static ports, and the surfaces on which these are mounted, are free of damage. In addition, there may be additional RVSM critical areas on the skin of the aeroplane which will also have to be checked for damage or deterioration;
- Conduct an altimeter check in accordance with the standard operating procedures for the aeroplane.

Note: For the purposes of RVSM compliance, the maximum acceptable tolerance for the difference between altimeters is 75 feet, but aeroplane type-specific tolerances will normally be less.

9.2.1.2 In-Flight

9.2.1.2.1 Prior to Entering RVSM Airspace

Prior to entering RVSM airspace, the flight crew must:

- Ensure that the flight has an ATC clearance to enter RVSM airspace and then confirm that aeroplane serviceability still allows flight to be made in such airspace. ACAS should be operated in TA/RA mode or equivalent;
- Carry out an altimeter cross-check shortly before entering RVSM levels and record on the operational flight plan that no errors are apparent: at least two primary altimeters must agree within +/- 200 feet. Any greater discrepancy must be resolved (e.g. check the altimeter subscale setting) and use the opportunity as the aeroplane levels off to confirm that the altitude alert system is operating normally.

Note: Any unsolved problem with the height keeping, altimetry or altitude alert systems should be reported to ATC prior to entry to RVSM transition airspace and as soon as possible after it has been detected.

9.2.1.2.2 Entering, Flying Within and Leaving RVSM Airspace

When approaching the first cleared flight level, and/or when changing flight level in RVSM airspace, aim to keep vertical speed within 500 to 1000 ft per min; do not exceed 1500 ft per min, and ensure that the aeroplane neither undershoots nor overshoots the cleared flight level by more than 150 ft, manually overriding if necessary.

One autopilot should be operative and engaged in altitude hold mode throughout the cruise.

Note: The autopilot selected for engagement should use the same air data source as the operating transponder: i.e. if the #1 or L autopilot is in use, then the #1 or L air data source should also be selected on the transponder and vice versa.

Exceptions to the requirement for the autopilot to remain engaged in altitude hold mode are when it may be necessary to re-trim the aeroplane, or when the aeroplane encounters turbulence and operating procedures necessitate disengaging or modifying this mode. Any disengagement should be kept to as short a period as is necessary.

At time intervals not exceeding 60 minutes, or when required by aeroplane operating procedures, carry out altimetry system cross-checks. If these are outside the tolerances specified for the aeroplane, carry out appropriate drills which may include having to alert ATC that RVSM flight cannot be maintained.

Any deviations from the assigned flight level greater than 300 ft (90 m) must be reported to ATC and then to the IOMAR by submitting a Form 30 Occurrence Report.

Note: R/T phraseology when flying in RVSM airspace is shown at Appendix A.

9.2.1.2.3 After Flight in RVSM Airspace

The flight crew must ensure that any unserviceabilities that could prevent subsequent flight within RVSM airspace are recorded on the technical log (or equivalent) sector record page and, where possible, ensure that an adequate debrief is given to engineering personnel to assist in system rectification.

9.2.2 RVSM Contingency Procedures

9.2.2.0 General

The flight crew must report to air traffic control, as soon as practicable, any event that may affect ability to comply with the current clearance, examples being:

- severe turbulence;
- loss of thrust;
- loss of pressurisation;
- need to divert;
- uncertainty of present position.

If, at any time, it is not possible to notify air traffic control immediately that a problem has occurred and obtain a new clearance before departing from the old, comply as accurately as possible with any procedures that may be specified for the airspace.

In all cases a good look out should be maintained and the ACAS visual display should be used to assist in the sighting of proximate traffic.

The following equipment failures must be reported to air traffic control:

- ***Loss of thrust on one or more engines necessitating descent;***
- ***Loss of one or more altimetry systems;***
- ***Failure of all altitude-reporting transponders;***
- ***Failure of all automatic altitude-control systems; and***
- ***Failure of any other equipment that could affect the ability of the aeroplane to maintain flight as cleared.***

9.2.2.1 RVSM Contingency Procedures

In this RVSM airspace, it is expected that all aeroplanes will be in continuous radio contact with ATC on the assigned frequency with the international VHF distress and emergency frequency (121.5MHz) available as a back-up. They will therefore be able to advise ATC of any abnormal circumstances where RVSM performance requirements cannot be met, including encounters with turbulence greater than 'moderate'. ATC will then respond and issue an appropriate revised clearance before the pilot initiates a deviation from the original clearance.

It is recognised, however, that there may be some circumstances (such as an emergency descent following the loss of cabin pressurisation) where deviations may have to occur with little or no prior notice to ATC. In such cases the pilot will need to obtain a revised clearance as soon as possible after the deviation.

9.2.2.2 Contingency Procedures in Oceanic/Remote RVSM Airspace

For oceanic and remote area RVSM applications, where continuous direct controller-pilot communication may not always be possible, CPDLC, where available, should be used to request a revised clearance.

A range of contingencies have been considered which allow independent action by flight crews. In general, they permit crews, in exceptional circumstances, to deviate from assigned clearances by selecting flight levels and/or tracks where other aeroplanes are least likely to be encountered. During such deviations, crews are required to make maximum use of aeroplane lighting and to transmit relevant information on all appropriate frequencies, including the distress and emergency frequency. Once contact with ATC has been re-established, the crew will be assisted and issued with new clearances as required. Offset track procedures are permitted if an encounter with turbulence is considered to be due to a wake vortex.

9.2.3.2.1 General Concept

Whenever possible, offset the route by at least 5 nm first, and then stabilise the flight at a level 500 feet above or below the cleared level (1000 feet above if climbing above FL 410). Seek a re-clearance at an achievable flight level from ATC.

The sequence of actions are:

- ***Turn at least 30° left or right of the cleared track;***
- ***Maintain the minimum safe vertical speed until clear of the core of the existing track;***
- ***Establish an appropriate track offset (normally 5 nm).***

Unless the nature of the event dictates otherwise, maintain the offset track whilst descending to an altitude below FL 290 or climbing to an altitude above FL 410 according to the revised ATC clearance.

Note: Details of any specific contingency procedures for each area or route are to be found in commercial flight guides.

9.2.3.2.2 Weather Deviations

If the deviation from your assigned track is due to anything weather-related, a different procedure must be followed:

- ***In the first instance, increase the urgency with the phrase "WEATHER DEVIATION REQUIRED." ATC will attempt to provide separation, and if unable they will ask you to advise your intentions.***
- ***If you intend to deviate, let them know, using phraseology similar to – "I am deviating under PIC emergency authority. At 5 NM from course I will employ the Weather Deviation contingency."***

Then apply the following:

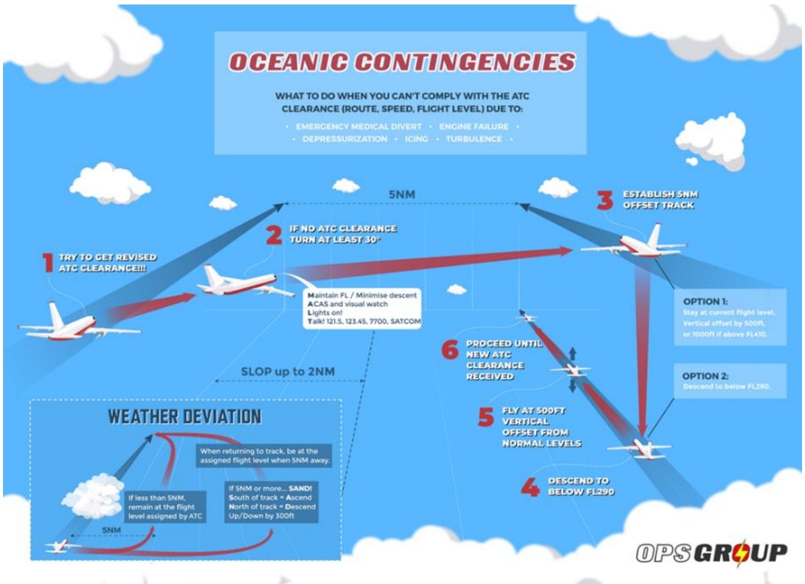
- ***Declare a PAN.***
- ***Deviate away from other airways if practical.***
- ***Talk to other aircraft on 121.5 MHz and 123.45 MHz.***
- ***Keep an eye on your TCAS and outside.***
- ***Turn on all your exterior lights.***

For deviations of less than 5 NM, remain at the flight level assigned by ATC.

For deviations of 5 NM or more, when you are at the 5 NM point initiate a change as follows:

If flying	**EAST**	**descend** left by 300ft,	or	**climb** right by 300ft.
If flying	**WEST**	, **climb** left by 300ft,	or	**descend** right by 300ft.
In other words – **SAND!** (**S**outh of track = **A**scend, **N**orth of track = **D**escend; Up/Down by 300ft)				

Once back on track, resume your cleared level. If you're already deviating and cannot get a clearance to deviate further, change your level immediately in accordance with the table above.



9.2.2.3 Wake Vortex Events

When an aeroplane is operating in RVSM airspace and encounters severe turbulence due to weather or wake turbulence, and height-keeping requirements for RVSM can no longer be maintained, flight crew should advise ATC using the phraseology shown in Part 1 Chapter 9.2.3.

Experience with RVSM over the North Atlantic has shown that aeroplanes in the cruise generate relatively long-lived vortices that can drift down 1,000 ft into the next level, or back up to the level of the generating aeroplane. In airspace where an Organised Track System exists, with nearly all traffic flying parallel tracks, such as NAT HLA, flying a small offset is effective in avoiding such encounters. This is not effective in more complex airspace where traffic at adjacent levels is mostly crossing at an angle.

All non-trivial wake vortex encounters in RVSM airspace should be reported to ATC so that theoretical assessments of the associated risks can be confirmed.

9.2.3 RVSM R/T Phraseology

Message	**Phraseology**
For ATC to ascertain the RVSM approval status of a flight:	***(callsign)*: CONFIRM RVSM APPROVED**
Pilot indication of non-RVSM approval status: To be stated: a) In the initial call on any frequency within the RVSM airspace *(ATC will provide a readback with this same phrase)*; b) In all requests for Flight Level changes pertaining to flight within the RVSM airspace; c) In all readbacks to Flight Level clearances pertaining to Flight Levels within the RVSM airspace ***Note***: *Pilots must also respond with this phrase to level clearances involving the vertical transit through either FL290 or FL410*.	***NEGATIVE RVSM***
Pilot indication of RVSM approval status:	***AFFIRM RVSM***
ATC denial of clearance into the RVSM airspace:	***(callsign)*: UNABLE CLEARANCE INTO RVSM AIRSPACE, MAINTAIN *(or* DESCEND TO, *or* CLIMB TO) FLIGHT LEVEL *(number)***
For the case of an aeroplane reporting severe turbulence or other severe weather related phenomenon that compromises RVSM operations:	***UNABLE RVSM DUE TURBULENCE***
For a pilot to communicate those circumstances which would cause an aeroplane's equipment to degrade to below altimetry compliance: ***Note***: *The phrase is to be used to convey both the initial indication of the non-altimetry compliance and, after, on initial contact on all frequencies within the lateral limits of the RVSM airspace until such time as the problem ceases to exist*	***UNABLE RVSM DUE EQUIPMENT***

For ATC to request an aeroplane to provide information as soon as RVSM approved status has been regained or the pilot is ready to resume RVSM operations.	***(callsign)*: REPORT WHEN ABLE TO RESUME RVSM**
For ATC to request confirmation that an aeroplane has regained RVSM approved status or the pilot is ready to resume RVSM operations	**(callsign): CONFIRM ABLE TO RESUME RVSM**
For a pilot to communicate the ability to resume operations within the RVSM airspace after an equipment- related contingency, or the ability to resume RVSM operations after a weather-related contingency:	***READY TO RESUME RVSM***

Note: **xxxx* indicates a pilot transmission.*

9.2.4 RVSM Training Syllabus

9.2.4.0 General

Flight crews who are required to operate in RVSM airspace will be required to undergo additional training.

Elements of RVSM training should be conducted during:

- Conversion Training;
- Recurrent Ground and Refresher Training; and
- Recurrent STD/Aeroplane Training.

9.2.4.1 Ground Training

RVSM Ground Training should include the following topics:

- Basic RVSM criteria;
- Flight planning;
- Pre-flight procedures, including altimeter cross-checks;
- Procedures prior to RVSM airspace entry;
- In-flight procedures;
- Contingency procedures;
- Post-flight procedures;
- Specific regional RVSM procedures.

Special emphasis should be placed on the following:

- knowledge and understanding of ATC phraseology applicable to each area of RVSM operation;
- knowledge and understanding of any published contingency procedures applicable to each area of RVSM operation;
- the equipment requirements for flight in RVSM airspace;
- the reinforcement of SOPs to ensure that ATC clearances are fully understood, correctly complied with, and queried should the need arise;
- the use and limitations in terms of accuracy of standby altimeters in contingencies. Where applicable, the pilot should review the application of static source error correction/ position error correction through the use of correction cards;

  Note: Such correction data will need to be readily available on the flight deck.
- the problems of visual perception of other aeroplanes at 1,000 ft (300 m) planned separation during darkness, and when encountering local phenomena such as Northern Lights, for opposite and same-direction traffic and during turns;
- the characteristics of aeroplane altitude capture systems which may lead to altitude overshoots;
- the relationship between the aeroplane's altimetry, automatic altitude control and transponder systems in normal and abnormal conditions and the requirement to select the transponder to the same air data source as the autopilot;
- procedures when encountering turbulence within RVSM airspace and associated reporting requirements;

- use of ACAS within RVSM airspace and control of rates of climb and descent; and
- any airframe operating restrictions such as Mach Number/Flight Level combinations related to RVSM airworthiness approval.

9.2.4.2 Recurrent Aeroplane/STD Training

Although there is no specific requirement for recurrent RVSM training, flight crew shall undergo RVSM ground refresher training at regular intervals. RVSM operations shall be included in aeroplane/STD training whenever possible and Line Oriented Flying Training (LOFT) is a particularly suitable vehicle.

9.2.5 RVSM Height Monitoring Requirements

Following approval to operate in RVSM airspace, the operator must ensure that height-keeping performance is monitored: -

a) at least once every 2 years; or
b) within intervals of 1000 flight hours per aircraft,

whichever is the longer period.

Note: Where an operator has 2 or more aircraft of the same type, the monitoring must be conducted on a minimum of 2 aircraft of each aircraft type grouping.

For further information on how to have an aircraft height monitored as part of the ongoing height-keeping performance monitoring program, can be found on www.natcma.com.

More details are also available on the RVSM Height Monitoring page on the IOMAR website.

9.3 Operations in NAT HLA

9.3.0 General

An approval from the IOMAR is required for operations in NAT HLA (MNPS) airspace. Please refer to Part 2 Chapter 2.2.1 for the application process.

RP43 – NAT HLA Checklist is available for use by M- Registered aircraft, a copy is available on the IOMAR Website.

The following information is based upon ICAO Nat Doc 007 v2023 eff January 2023 Any conflict between this sub-chapter document and NAT Doc 007, the NAT Doc takes precedence.

Operators with approval from the IOMAR to operate in the NAT HLA should regularly monitor the ICAO NAT Ops Bulletins.

9.3.0.1 NAT HLA Region

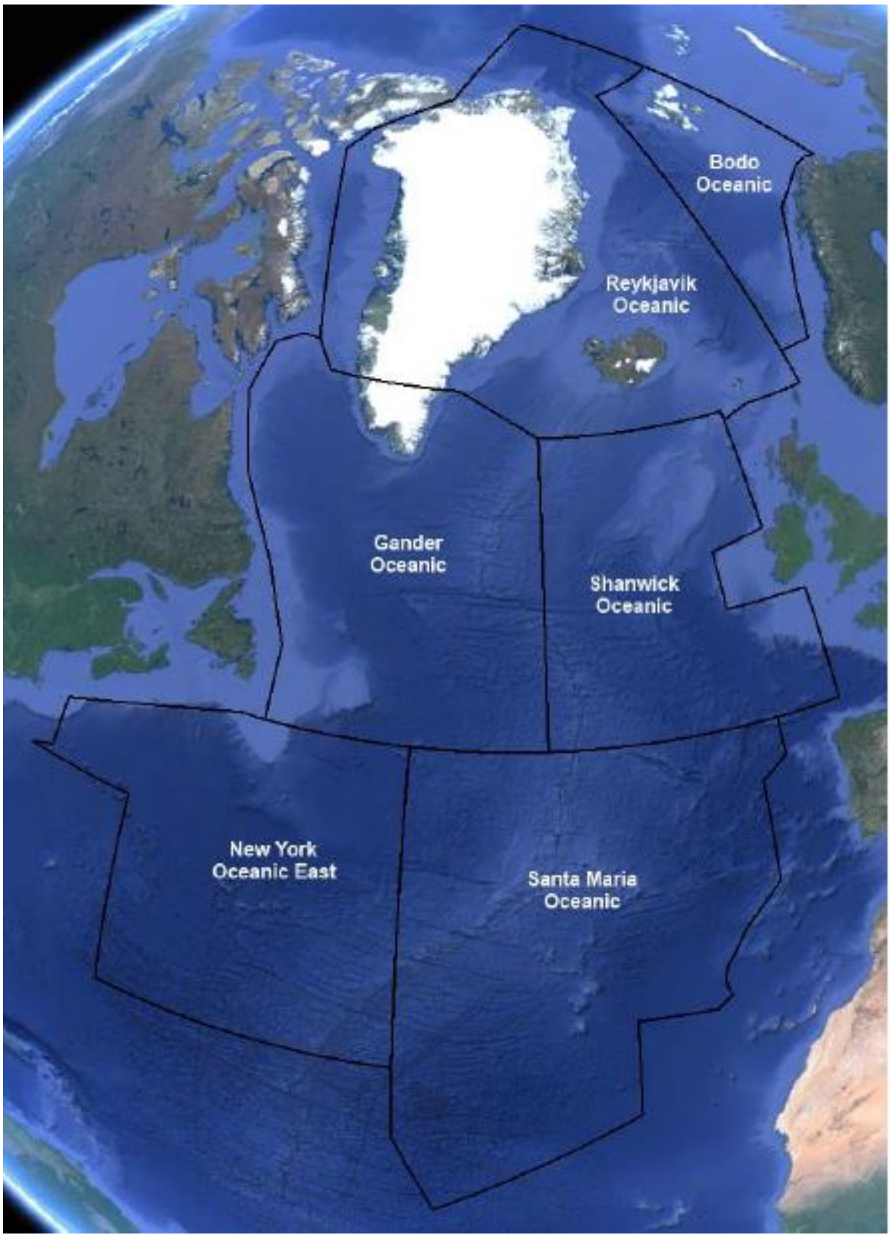
Operators wishing to apply for NAT HLA airspace approval must comply with the requirements shall demonstrate the aircraft is certified and equipped.

Aeroplanes approved by the IOMAR as meeting NAT HLA requirements will be deemed certified to meet CNAT HLA requirements, as the minimum equipment to enter Canadian NAT HLA airspace is the same as for North Atlantic NAT HLA airspace. However, if an aeroplane suffers a navigation equipment failure whilst in North Atlantic NAT HLA and elects to continue, then approval to continue into Canadian NAT HLA must be obtained from Canadian ATC.

Since NAT HLA is also designated as RVSM airspace at all levels (i.e. FL290-410 inclusive), RVSM Approval is also required to operate within NAT HLA, refer to Part 2 Chapter 2.1.1. An RVSM Approval granted by the IOMAR is not regionally specific, but is valid for world-wide operations. However, some crew operating procedures, particularly those to be followed in contingency situations, are specific to the NAT HLA environment.

Note: RVSM Contingency Procedures for use in NAT HLA airspace may vary from those required in a domestic airspace environment.

The NAT HLA consists of that portion of the North Atlantic Region airspace between FL285 and FL420 inclusive extending between latitude 27º North in the New York FIR, the southern boundary of Santa Maria Oceanic, and the North Pole, bounded in the east by the eastern boundaries of control areas Santa Maria Oceanic, Shanwick Oceanic and Reykjavik, and in the west by the western boundary of Reykjavik CTA, the western boundary of Gander Oceanic CTA, and the western boundary of New York Oceanic CTA, excluding the area west of 60º West and south of 38º30’ North.

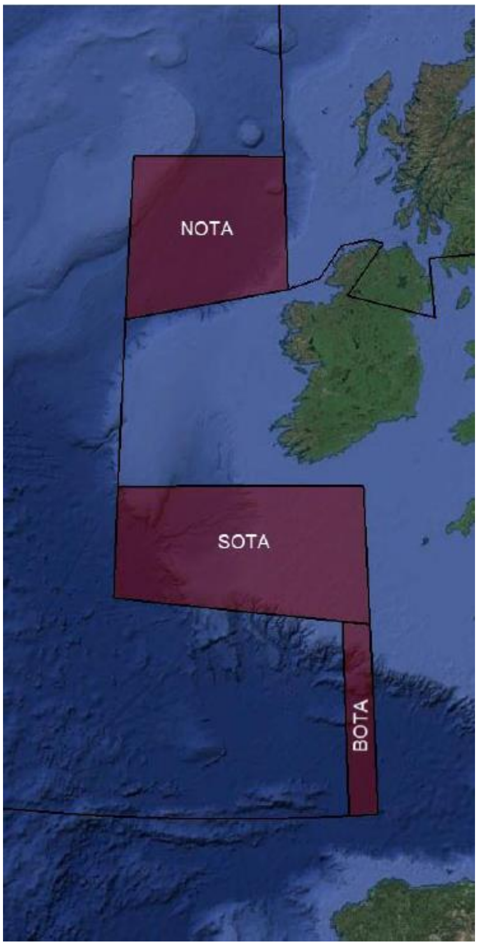


Aeroplanes with reduced navigational capability may utilise special routes between NE Canada and Europe via Greenland and Iceland (Blue Spruce Routes), and between the Azores and the Portuguese mainland (refer to Part 2 Chapter 2.2.1.2).

The whole of the NAT HLA is designated as RVSM airspace, as is the New York Oceanic FIR (WATRS area) west of 60W and south of 3830N, between FL290 and FL410 (inclusive).

The West Atlantic Route System (WATRS) resides within the New York OCA West, the Miami oceanic airspace, and the San Juan oceanic airspace. Details of these routes and associated procedures are contained in the United States AIP.

9.3.0.1.1 Transition Areas



9.3.0.1.1.1 SOTA

Part of the Shanwick OCA is designated as the Shannon Oceanic Transition Area (SOTA). NAT HLA Airspace requirements apply from FL285 to FL420. SOTA has the same vertical extent as the Shanwick OCA, and is bounded by lines joining successively the following points: N5100 W01500 – N5100 W00800 – N4830 W00800 – N4900 W01500 – N5100 W01500. Air Traffic Service is provided by Shannon ACC using the call sign "SHANNON CONTROL".

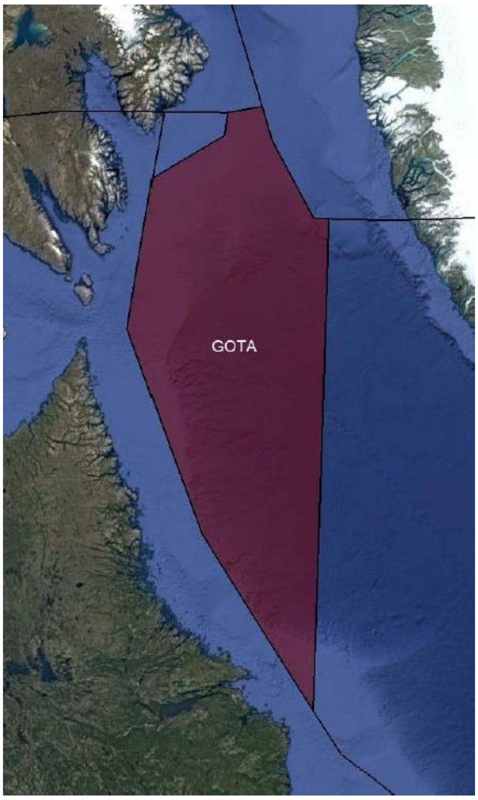
9.3.0.1.1.3 NOTA

A further part of Shanwick OCA has been designated as the Northern Oceanic Transition Area (NOTA). NAT HLA requirements apply from FL 285 to FL 420. NOTA has the same vertical extent as the Shanwick OCA and is bounded by the lines joining successively the following points: N5400 W01500 – N5700 W01500 – N5700 W01000W – N5434 W01000 – N5400 W01500. Air Traffic service is provided by Shannon ACC using the callsign "SHANNON CONTROL".

9.3.0.1.1.3 BOTA

Another part of the Shanwick OCA is designated as the Brest Oceanic Transition Area (BOTA). NAT HLA Airspace requirements apply from FL285 to FL420. BOTA has the same vertical extent as the Shanwick OCA, and is bounded by lines joining successively the following points: N4834 W00845 – N4830 W00800 – N4500 W00800 – N4500 W00845 – N4834 W00845. Air Traffic service is provided by the Brest ACC, callsign "BREST CONTROL".

9.3.0.1.1.4 GOTA



Part of the Gander OCA is designated as the Gander Oceanic Transition Area (GOTA):

6530N 060W east to the Reykjavik ACC boundary, southeast along the Reykjavik boundary to 6330N 05540W, east to 6330N 055W, southwest to 5352N 05458W, northwest along the Gander boundary to PRAWN, north to MOATT, northwest to 61N 063W, then north along the Montreal ACC boundary to the Edmonton ACC boundary.

FL 290 to FL 600 inclusive

NAT HLA FL 285 to FL 420

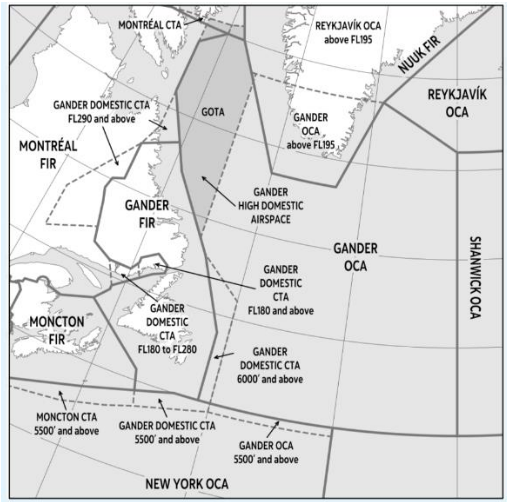
Air Traffic service is provided by the Gander ACC, call sign GANDER CENTRE. Full details of the service provided and the procedures used are contained in Canada Flight Supplement (CFS).

9.3.0.2 Northern Canada NAT HLA

The Northern Canada NAT HLA consists of the airspace between FL330 to FL410 inclusive and enclosed by rhumb lines joining:

The North Pole – N82.00 W060.00 – N76.00 W076.00 – N65.00 W057.45 – N67.00 W088.00 – N70.00 W130.00 – The North Pole

The HLA Transition Area extends from FL270 to FL330 below the main area. The whole of the HLA is designated as RVSM airspace, together with certain other areas adjoining it.



9.3.0.3 NAT Data Link Mandate (DLM)

NOTE: The following information was correct at the time of this publication, please always refer to ICAO Doc 007 at the latest revision for information.

The NAT Data Link Mandate (DLM) requires aircraft to be equipped with, and operating, FANS 1/A in the NAT region. Currently, the mandate incorporates FL290 to FL410 inclusive.

The DLM is not applicable to aircraft operating in:

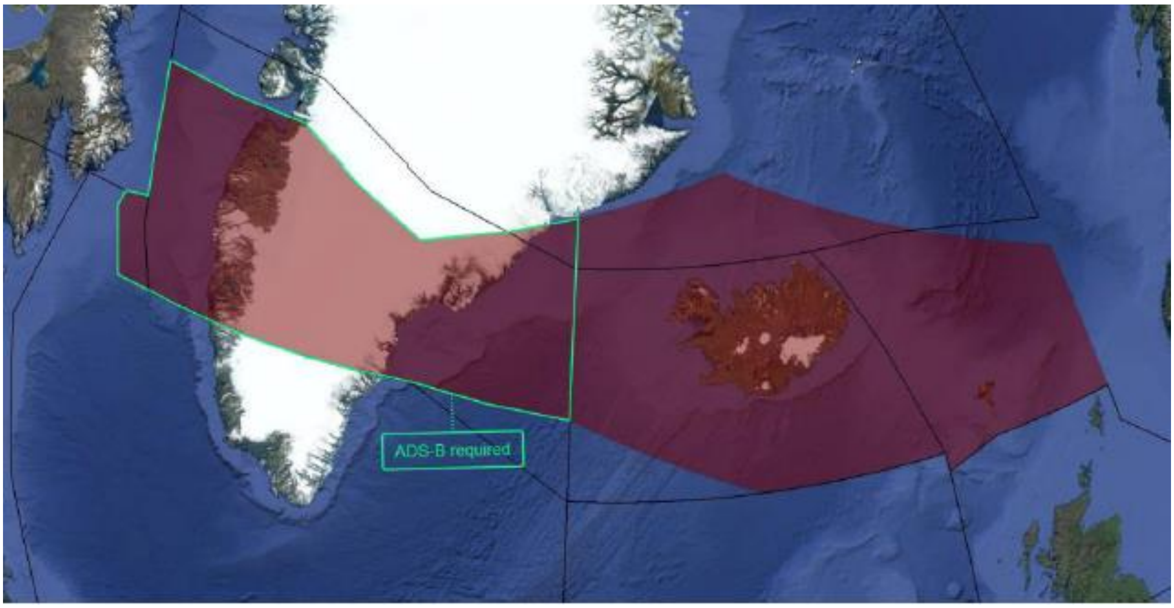
- Airspace north of 80° North;
- New York Oceanic East flight information region (FIR);
- Airspace where an ATS surveillance service is provided by means of radar, multilateration and/or ADS-B, coupled with VHF voice communications as depicted in State Aeronautical Information Publications (AIP), provided the aircraft is suitably equipped (transponder/ADS-B extended squitter transmitter) (see Note 1 below).

Certain categories of flights may be allowed to plan and operate through the mandated airspace with non-equipped aircraft, namely non-equipped flights that file STS/HUM or STS/MEDEVAC (in Item 18 of the flight plan. (Depending on the tactical situation at the time of flight, however, such flights may not receive an ATC clearance which fully corresponds to the requested flight profile).

9.3.0.3.1 Airspace excluded from the DLM

Airspace excluded from the DLM includes: -

a) Iceland-Greenland Corridor



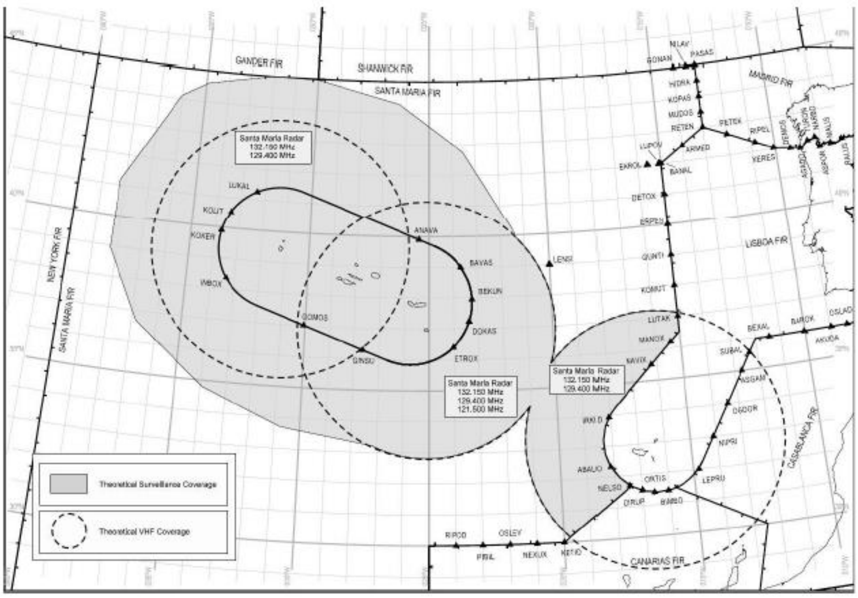
ADS-B is required west of 30W.

For planning purposes, this area is bounded by the following:

Northern boundary: 65N000W - 67N010W - 69N020W - 68N030W - 67N040W - 69N050W - 69N060W - BOPUT.

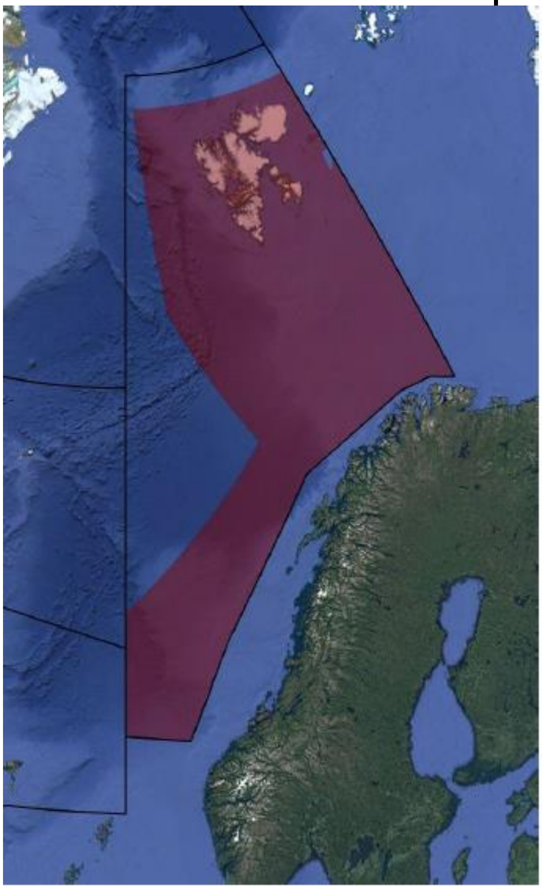
Southern boundary: GUNPA (61N000W) - 61N007W - 6040N010W - RATSU (61N010W) - 61N020W - 63N030W - 6330N040W - 6330N050W – EMBOK.

b) Azores Corridor



Traffic flying to/from Azores Islands is allowed to operate in the NAT HLA, when the oceanic portion of the planned route is contained inside the Santa Maria FIR ATS Surveillance airspace and VHF coverage, typically via MANOX, NAVIX or IRKID direct 350000N 0200000W or 360000N 0200000W direct Azores Islands, for aircraft equipped with SSR Mode S/ADS-B transponders.

c) Bodo Corridor



Aircraft need to be equipped with transponder/ADS-B extended squitter transmitter.

For flight planning purposes, the following coordinates can be used to define the ATS surveillance airspace within Bodø OCA:

6645N 00000E - 7110N 01140E - 7500N 00430E - 8100N 00130E - 8100N 03000E - 7100N 03000E - 7120N 02800E - 7120N 02500E - 7000N 01500E - 6545N 00700E - 6303N 00403E - 6315N 00000E - (6645N 00000E).

9.3.1 NAT HLA Operational Equipment Requirements

9.3.1.1 Timekeeping

Longitudinal separations between subsequent aeroplanes following the same track (in-trail) and between aeroplanes on intersecting tracks in the NAT HLA Airspace are assessed in terms of differences in ATAs/ETAs at common waypoints. The longitudinal separation minima currently used in the NAT HLA Airspace are thus expressed in clock minutes. The maintenance of in-trail separations is aided by the application of the Mach Number Technique (see paragraph 5.4). However, aeroplane clock errors resulting in waypoint ATA errors in position reports can lead to an erosion of actual longitudinal separations between aeroplanes. It is thus vitally important that the time-keeping device intended to be used to indicate waypoint passing times is accurate and is synchronised to an acceptable UTC time signal before commencing flight in NAT HLA Airspace.

Acceptable sources of an accurate time check are:

- GPS (Corrected to UTC) – Available at all times to those crews who can access time via approved on-board GPS (TSO-C129) equipment;
- WWV – National Institute of Standards (NIST - Fort Collins, Colorado). WWV operates continually H24 on 2500, 5000, 10,000, 15,000 and 20,000 kHz (AM/SSB) and provides UTC (voice) once every minute;
- CHU – National Research Council (NRC - Ottawa, Canada) - CHU operates continually H24 on 3330, 7335 and 14,670 kHz (SSB) and provides UTC (voice) once every minute (English even minutes, French odd minutes);
- BBC – British Broadcasting Corporation (United Kingdom). The BBC transmits on a number of domestic and world-wide frequencies and transmits the Greenwich time signal (referenced to UTC) once every hour on most frequencies, although there are some exceptions.

Note: NAT HLA operating procedures must include an accurate pre-flight time check.

As separation is achieved procedurally, tracks and speeds must be accurately maintained so that ETAs can be achieved. If the estimated time for the next position last reported to ATC is found to be in error by 3 minutes or more, a revised estimate must be transmitted.

9.3.1.2 Lateral Navigation

There are two navigational requirements for aeroplanes planning to operate in NAT HLA. One refers to the navigation performance that should be achieved, in terms of accuracy. The second refers to the need to carry standby equipment with comparable performance characteristics. Thus in order to receive approval of unrestricted operation in NAT HLA airspace an aeroplane must be equipped with the following:

Two fully serviceable Long Range Navigation Systems (LRNS). A single LRNS may be any one of the following:

- 1 x Inertial Navigation System (INS);
- 1 x Global Navigation Satellite System (GNSS);
- 1 x navigation system using the inputs from one or more Inertial Reference System (IRS) or any other sensor system complying with the NAT HLA requirement (e.g. GPS).

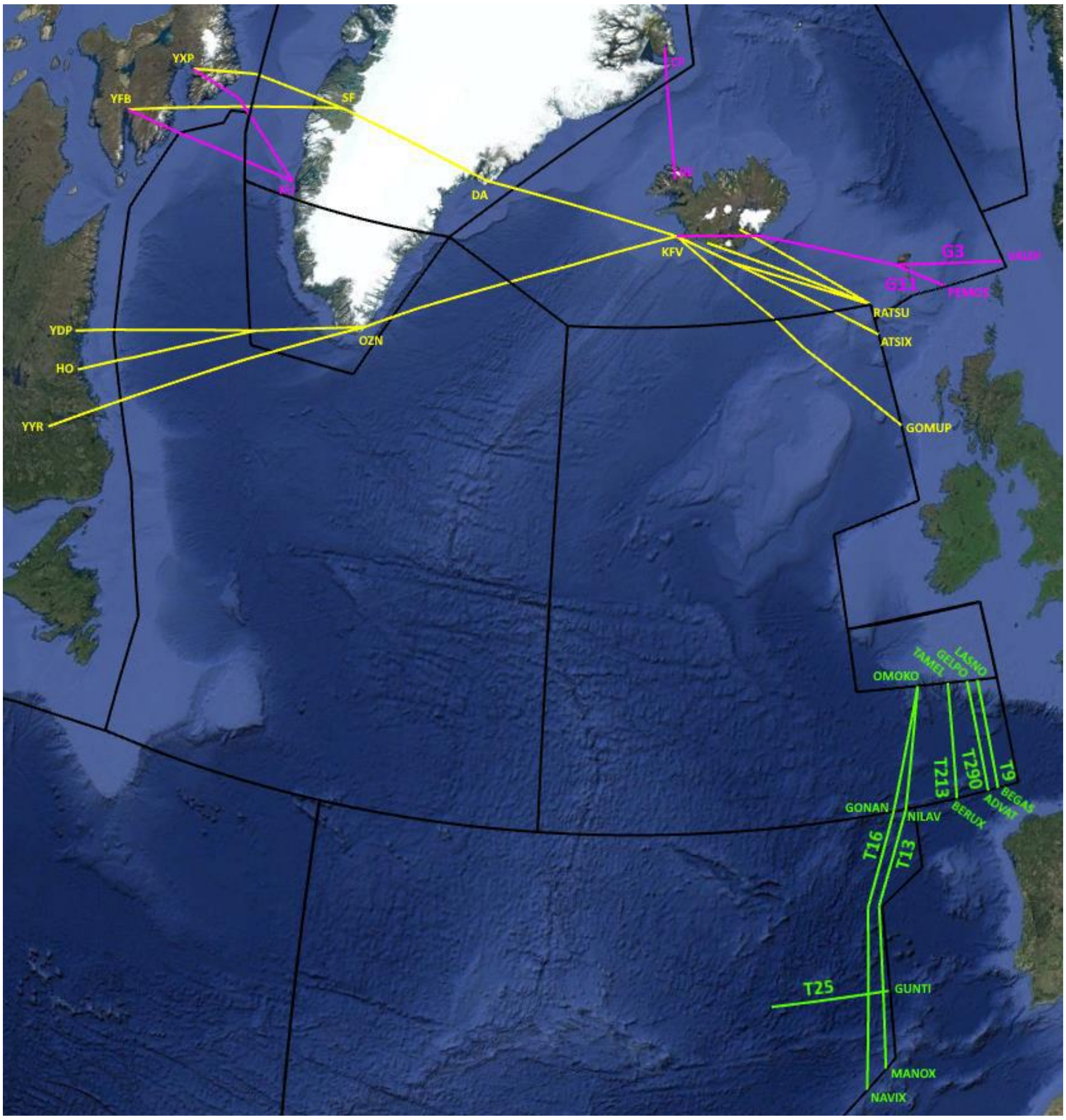
Each LRNS must be capable of providing the flight crew with a continuous indication of the aeroplane position relative to desired track.

9.3.1.3 Routes for Aeroplanes with Only One LRNS

A number of special routes have been developed for aeroplanes equipped with only one LRNS and carrying normal short-range navigation equipment (VOR, DME, ADF), which require to cross the North Atlantic between Europe and North America (or vice versa). It should be recognised that these routes are within NAT HLA Airspace, and that approval must be obtained prior to flying along them.

Though these routes are designed for use by aeroplanes that do not meet the normal requirements for full NAT HLA approval, they are also available for use by aeroplanes normally approved for unrestricted NAT HLA operations that have suffered a partial loss of navigation capability and have only a single remaining functional LRNS.

Detailed descriptions of these special routes, known as 'Blue Spruce Routes'. Other routes also exist within NAT HLA Airspace that may be flown by aeroplanes equipped with only a single functioning LRNS. These include routings between the Azores and the Portuguese mainland and/or the Madeira Archipelago, and also routes between Northern Europe and the Spanish, Canaries and Lisbon FIRs to the east of longitude 009° 01' W (viz.T9).



Refer to NAT HLA Doc 007 Chapter 3 for more details.

9.3.1.4 RVSM Requirements

Reduced Vertical Separation Minimum (RVSM) requirements apply throughout NAT HLA airspace, and additionally in the New York Oceanic FIR (WATRS area) west of 60ºW and south of 38°30'N, between FL 290 and FL410 (inclusive). Vertical separation may be reduced from 2,000 ft to 1,000 ft.

The normal equipment requirements for RVSM operations therefore apply and an altimeter cross-check is required both pre-flight and again before entering RVSM airspace. Refer to Part 1 Chapter 9.2.1.1 for RVSM Flight Planning Requirements

Note: ATC must be informed immediately if an altimetry system failure results in the aeroplane having less than the minimum equipment required for entry into RVSM airspace.

9.3.1.5 Special Arrangements for Non-RVSM Capable Aeroplanes

9.3.1.5.1 To Climb/Descend Through RVSM Levels

NAT HLA approved aeroplanes that are temporarily not RVSM capable may be permitted, subject to traffic, to climb/descend through RVSM levels in order to attain cruising levels above or below RVSM airspace. Flights should climb/descend continuously through the RVSM levels without stopping at any intermediate level and should "Report leaving" current level and "Report reaching" cleared level

Note: This provision contrasts with the regulations applicable for RVSM airspace operations in Europe, where aeroplanes not approved for RVSM operations are not permitted to perform such climbs or descents through RVSM levels.

Such aeroplanes are also permitted to flight plan and operate at FL430 either eastbound or westbound above NAT HLA Airspace.

9.3.1.5.2 Operating at RVSM Levels

ATC may provide special approval for an NAT HLA approved aeroplane that is temporarily not capable of meeting NAT HLA Airspace RVSM requirements, provided that the aeroplane:

a) Is on a delivery flight; or

b) Was RVSM approved but has suffered an equipment failure and is being returned to its base for repair and/or re-approval; or

c) Is on a mercy or humanitarian flight.

To receive such special approval a prior request must be obtained by contacting the initial Oceanic Area Control Centre (OAC), normally not more than 12 hours and not less than 4 hours prior to the intended departure time, giving as much detail as possible regarding acceptable flight levels and routings. Requested levels and/or routes may not always be available (especially when infringing active OTS systems). The special approval, if and when received, should be clearly indicated in Item 18 of the ICAO flight plan. The granting of any such approval does not constitute an oceanic clearance, which must be obtained from ATC, by the pilot, in the normal manner.

It must be noted that the provision of this service is intended exclusively for the purposes listed above and is not to be seen as a means of circumventing the RVSM approval process. A written justification must be provided for the request, upon completion of the flight plan, to the NAT Central Monitoring Agency (CMA).

9.3.1.6 Performance Monitoring

The horizontal (i.e. latitudinal and longitudinal) and vertical navigation performance of operators within NAT HLA Airspace is monitored on a continual basis. If a deviation is identified, follow-up action after flight is taken, both with the operator and the State of Registry of the aeroplane involved, to establish the cause of the deviation and to confirm the approval of the flight to operate in NAT HLA and/or RVSM Airspace. The overall navigation performance of all aeroplanes in the NAT HLA Airspace is compared to the standards established for the Region, to ensure that the relevant standards are being maintained.

9.3.2 The Organised Track Structure

9.3.2.0 General

As a result of passenger demand, time zone differences and airport noise restrictions, much of the North Atlantic (NAT) air traffic contributes to two major alternating flows: a westbound flow departing Europe in the morning, and an eastbound flow departing North America in the evening. The effect of these flows is to concentrate most of the traffic unidirectionally, with peak westbound traffic crossing the 30ºW longitude between 1130 UTC and 1900 UTC and peak eastbound traffic crossing the 30ºW longitude between 0100 UTC and 0800 UTC.

The flight levels normally associated with the OTS are FL 340 to FL 400 inclusive. These flight levels, and their use have been negotiated and agreed by the NAT ATS providers and are published as the Flight Level Allocation Scheme (FLAS). The FLAS also determines flight levels available for traffic routing partly or wholly outside of the OTS as well as flights operating outside of the valid time periods of the OTS; often referred to as "transition times'.

9.3.2.1 OTS Construction

The Oceanic Centre supervisor obtains the 'best time' routes for the day from the principal operators.

9.3.2.1.0.1 OTS Construction During Peak Traffic Periods

For peak traffic periods, ATC select a primary, and three or more other tracks which parallel the primary at not less than 60nm separation.

Shanwick is responsible for nominating tracks for the period 1130 UTC – 1900 UTC when they are predominantly Westbound, and these will be alphabetically identified 'A', 'B', 'C', etc. from N to S. ATC will only publish those flight levels required to meet anticipated demand. However, other levels can be made available if requested, and the fact that a specific flight level is not published for a particular Track does not necessarily mean that it cannot be made available on request.

From 0100 UTC – 0800 UTC when most of the traffic flow is Eastbound, the responsibility for track nomination lies with Gander who will identify tracks as 'Z', 'Y', 'X', etc. from S to N. The time periods are times at 30ºW. In all cases the hours of validity will be specified on the NAT Track Message.

Examples of westbound and eastbound Organised Tracks can be found in Part 1 Chapter 9.3.2.1.3 & Part 1 Chapter 9.3.2.1.5 respectively.

Note: During peak flow periods the Mach Number Technique is applied (refer to Part 1 Chapter 9.3.2.3).

9.3.2.1.0.2 OTS Construction During Non-Peak Traffic Periods

During periods where traffic levels permit, structural changes to the NAT OTS can occur.

As of March 1st, 2022 the OTS in the NAT region may no longer include Flight Level 330 or below. The removal of FL330 and below as planned OTS altitudes will allow operators to have greater planning flexibility and create more route options for heavier aircraft and those with lower service ceilings.

The ability to file more optimized random routes, without the constraints of the OTS imposed rules at higher altitudes, should lead to increased fuel savings as operators can fly the routings and speeds they desire. This should also have the added benefit of reducing flight times and subsequently carbon emissions.

As operators enjoy this added flexibility, there are both planning and operational considerations operators need to remember.

9.3.2.1.0.2.1 OTS during Non-Peak Traffic Periods Planning Considerations

- Apply Correct Longitude Crossing Rules

  When planning a flight on a random route at levels FL330 and below, waypoints will need to be planned so that 10-deg. of longitude (20°W, 30°W, 40°W, etc.) are crossed at whole or half degrees of latitude.

- Ensure Field 15 Of Your ICAO Flight Plan Is Filled Out Correctly

  Flights that are planned on random routes but eventually join an organized track at a defined point of that published track are still handled as a random route. The route must be clearly indicated in field 15 of the ICAO flight plan and the actual track letter (such as NAT A for example) of the track you plan to join, should not be used in the route string.

- Plan Fuel For Assigned Flight Levels

  When including a level change on your flight plan you must keep in mind that this is a request only, and not a guarantee. Approval of flight level change requests are entirely dependent on traffic, weather and availability. Therefore, adequate fuel should be considered in the event the request is not granted.

9.3.2.1.0.2.2 OTS during Non-Peak Traffic Periods Operational Considerations

- OTS Messages Are Still Required

  Even if the flight is not planned in the OTS, a copy of the NAT track message must still be carried on-board the aircraft, including any amendments.

- You Still Need Datalink

  The removal of planned tracks at FL330 does not remove the requirement for the flight to comply with the Data Link Mandate which is in effect between FL290 and FL410 inclusive. When flying within these bands in the NAT HLA region the aircraft must have approval to use FANS 1/A+ (PBCS) from the IOMAR.

9.3.2.1.1 OTS Track Message

OTS tracks are notified to operators in the form of a Track Message. Examples are available below and are taken from NAT Doc 007. Since the track structure changes daily, it is important to ensure that the Track Message relates to the correct date. Track Messages must be carried on-board all flights operating in NAT HLA airspace during the relevant periods.

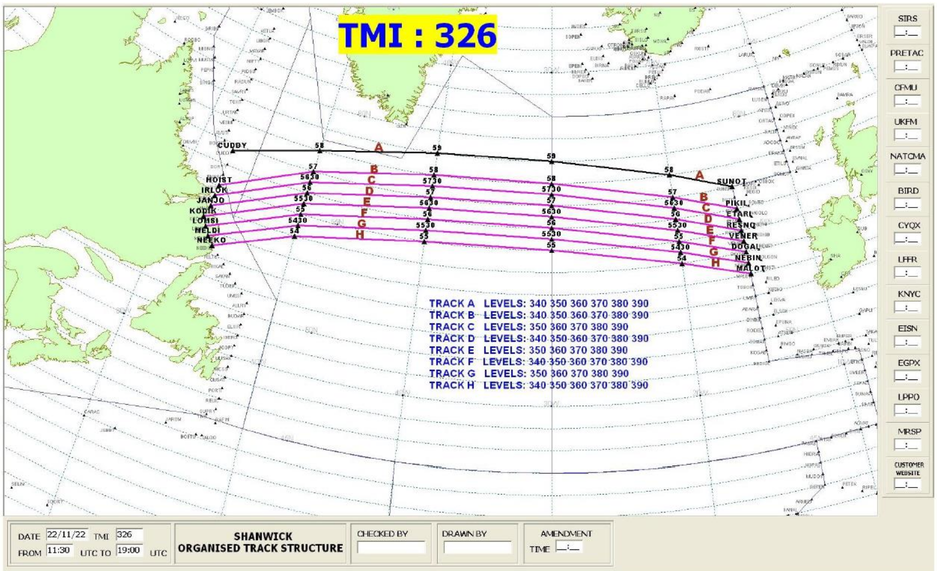
It should be appreciated, however, that use of OTS tracks is not mandatory. Aeroplanes may fly on random routes which remain clear of the OTS, or may fly on any route that joins or leaves an outer track of the OTS. There is also nothing to prevent an aeroplane from planning a route which crosses the OTS. However, in this case, whilst ATC will make every effort to clear random traffic across the OTS at published levels, re-routes or significant changes in flight level from those planned are very likely to be necessary during most of the OTS traffic periods.

9.3.2.1.2 Example of Westbound Bound Track Message

```
ZCZC OLG068 2020190FF EGZZOWXX EGZZOXXX
082009 202019 EGGXZOZX
(NAT-1/3 TRACKS FLS 310/390 INCLUSIVE
APR 09/1130Z TO APR 09/1900Z
PART ONE OF THREE PARTS-
A ERAKA 60/20 62/30 63/40 63/50 MAXAR
EAST LVLS NIL
WEST LVLS 350 360
EUR RTS WEST NIL
NAR NIL -
B GOMUP 59/20 61/30 62/40 52/50 PIDSO
EAST LVLS NIL WEST LVLS 350 360 380
EUR RTS WEST NIL
NAR NIL -
C SUNOT 58/20 60/30 61/40 61/50 SAVRY
EAST LVLS NIL
WEST LVLS 340 360 380
EUR RTS WEST NIL
NAR NIL -
END OF PART ONE OF THREE PARTS)
FF EGZZOWXX EGZZOXXX
082009 202020 EGGXZOZX
(NAT-2/3 TRACKS FLS 310/390 INCLUSIVE
APR 09/1130Z TO APR 09/1900Z
PART TWO OF THREE PARTS-
D PIKIL 57/20 57/30 56/40 NEEKO
EAST LVLS NIL
WEST LVLS 340 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL -
E RESNO 56/20 56/30 55/40 53/50 RIKAL
EAST LVLS NIL
EST LVLS 340 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL -
F VENER 5530/20 5530/30 5430/40 5230/50 SAXAN
EAST LVLS NIL
WEST LVELS 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL -
G DOGAL 55/20 55/30 54/40 52/50 TUDEP
EAST LVLS NIL
WEST LVLS 340 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL -
END OF PART TWO OF THREE PARTS)
72 202021FF EGZZOWXX EGZZOXXX
082010 202021 EGGXZOZX
```

```
(NAT-3/3 TRACKS FLS 310/390 INCLUSIVE
APR 09/1130Z TO APR 09/1900Z
PART THREE OF THREE PARTS-
H MALOT 54/20 54/30 53/40 51/50 ALLRY
EAST LVLS NIL
WEST LVLS 340 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL -
REMARKS.
1. TMI IS 099 OPERATORS ARE REMINDED TO INCLUDE
THE TMI NUMBER AS PART OF THE OCEANIC CLEARANCE
READ BACK.
2. SEND RCL 90-30 MINUTES PRIOR TO OCEANIC
ENTRY POINT.
3. PBCS OTS LEVELS 350-390. PBCS TRACKS AS
FOLLOWS
TRACK E
TRACK F
TRACK G
END OF PBCS OTS
4. INCLUDE THE MAX LEVEL IN RCL. IF NO MAX
LEVEL IS PROVIDED THE RCL LEVEL WILL BE
CONSIDERED HIGHEST ACCEPTABLE FL THAT CAN BE
MAINTAINED AT THE OCEANIC ENTRY POINT.
5. CLEARANCEE MAY DIFFER FROM THE FLIGHT PLAN,
FLY THE CLEARANCE.
6. STRATEGIC LATERAL OFFSET PROCEDURE (SLOP)
SHOULD BE USED FOR ALL OCEANIC CROSSINGS. LEFT
SLOP IS PROHIBITED.
7. 30 MINUTES AFTER ENTERING NAT AIRSPACE OR
AFTER LEAVING
SURVEILLANCE AREA, USE CODE 2000 ON
TRANSPONDER.
8. NAVIGATION ERRORS CAN BE PREVENTED BY THE
USE OF PROPER FMS WAYPOINT PROCEDURES.
9. ADS-C AND CPDLC ARE MANDATED FOR LEVELS 290-
410 IN NAT AIRSPACE.
10. UK AIP ENR 2.2.4.2 PARA 5.2 STATES THAT NAT
OPERATORS SHALL FILE PRM.
11. OPERATORS SHOULD REFERENCE NAT DOC 007
CHAPTERS 8 AND 13 FOR SPECIFIC NAT OCEANIC
PROCEDURES
12. DATA LINK EQUIPPED FLIGHTS NOT LOGGED ON TO
DOMESTIC AIRSPACE, PRIOR TO ENTERING THE
SHANWICK OCA, MUST INITIATE A LOGON TO EGGX 10
- 25 MINS PRIOR TO OCA ENTRY.-
END OF PART THREE OF THREE PARTS)
```

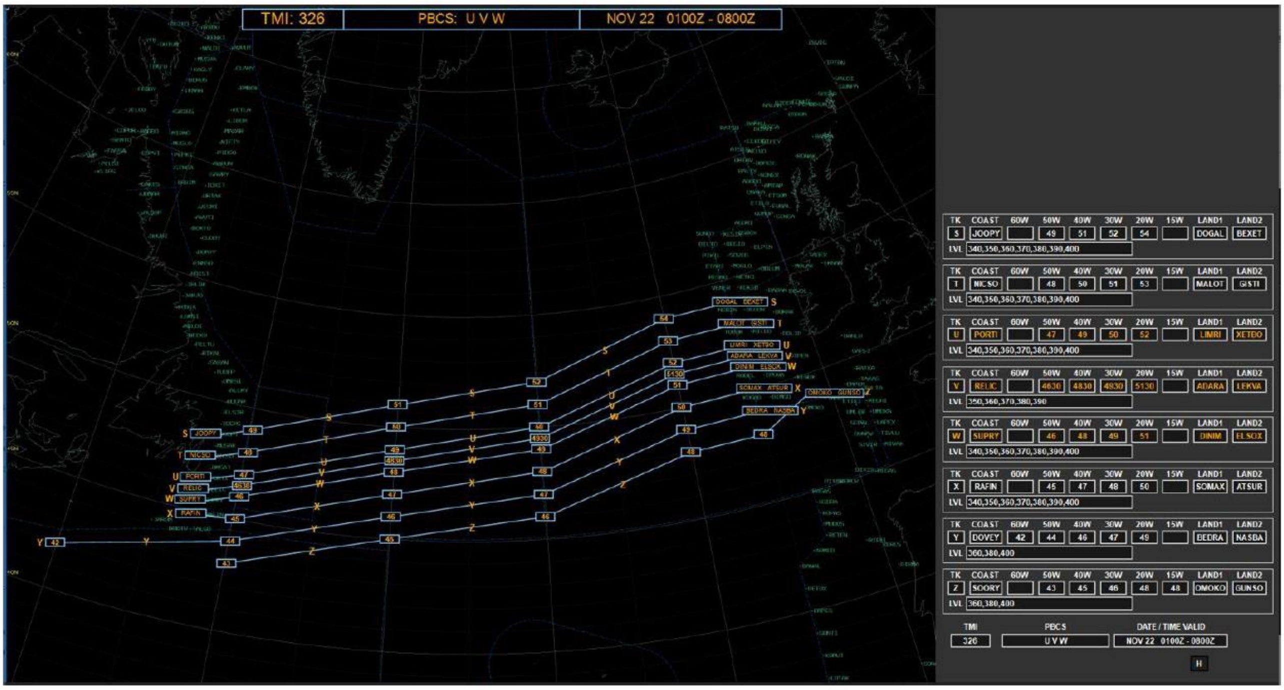
9.3.2.1.3 Example of Daytime Westbound OTS



9.3.2.1.4 Example of Night-Time Eastbound Track Message

```
DD CYZZENAT
021302 CZQXZQZX
(NAT - 1 / 3 TRACKS FLS 320 / 400 INCLUSIVE
NOV 03/0100Z TO NOV 03/0800Z
PART ONE OF THREE PARTS -
U JANJO 56/50 58/40 59/30 58/20 SUNOT KESIX
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL NAR N685A N683A-
V LOMSI 55/50 57/40 58/30 57/20 PIKIL SOVED
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N625A N621A-
END OF PART ONE OF THREE PARTS)
DD BIRDZQZZ
021302 CZQXZQZX
(NAT - 2 / 3 TRACKS FLS 320 / 400 INCLUSIVE
NOV 03/0100Z TO NOV 03/0800Z
PART TWO OF THREE PARTS -
W MELDI 5430/50 5630/40 5730/30 5630/20 ETARI
MOGLO
EAST LVLS 350 360 370 380 390
WEST LVLS NIL
EUR RTS EAST NIL
NAR N597A N587A-
X NEEKO 54/50 56/40 57/30 56/20 RESNO NETKI
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N561A N555A-
Y RIKAL 53/50 55/40 56/30 55/20 DOGAL BEXET
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N511A N495C-
END OF PART TWO OF THREE PARTS)
DD BIRDZQZZ
021303 CZQXZQZX
(NAT - 3 / 3 TRACKS FLS 320 / 400 INCLUSIVE
NOV 03/0100Z TO NOV 03/0800Z
PART THREE OF THREE PARTS -
Z TUDEP 52/50 54/40 55/30 54/20 MALOT GISTI
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N453A N435A-
REMARKS:
1. TMI IS 099 OPERATORS ARE REMINDED TO
INCLUDE THE TMI NUMBER AS PART OF THE OCEANIC
CLEARANCE READ BACK.
2. SEND RCL 90-60 MINUTES PRIOR TO OCEANIC
ENTRY POINT.
3. PBCS OTS LEVELS 350-390. PBCS TRACKS AS
FOLLOWS
TRACK E
TRACK F
TRACK G
END OF PBCS OTS
4. INCLUDE THE MAX LEVEL IN RCL. IF NO MAX
LEVEL IS PROVIDED THE RCL LEVEL WILL BE
CONSIDERED HIGHEST ACCEPTABLE FL THAT CAN BE
MAINTAINED AT THE OCEANIC ENTRY POINT.
5. CLEARANCEE MAY DIFFER FROM THE FLIGHT PLAN,
FLY THE CLEARANCE.
6. STRATEGIC LATERAL OFFSET PROCEDURE (SLOP)
SHOULD BE USED FOR ALL OCEANIC CROSSINGS. LEFT
SLOP IS PROHIBITED.
7. 30 MINUTES AFTER ENTERING NAT AIRSPACE OR
AFTER LEAVING SURVEILLANCE AREA, USE CODE 2000
ON TRANSPONDER.
8. NAVIGATION ERRORS CAN BE PREVENTED BY THE
USE OF PROPER FMS WAYPOINT PROCEDURES.
9. ADS-C AND CPDLC ARE MANDATED FOR LEVELS
290-410 IN NAT AIRSPACE.
10. CANADIAN AIP ENR 7.1.7 STATES THAT NAT
OPERATORS SHALL FILE PRM.
11. OPERATORS SHOULD REFERENCE NAT DOC 007
CHAPTERS 8 AND 13 FOR SPECIFIC NAT OCEANIC
PROCEDURES
12. DATA LINK EQUIPPED FLIGHTS NOT LOGGED ON
TO DOMESTIC AIRSPACE, PRIOR TO ENTERING THE
SHANWICK OCA, MUST INITIATE A LOGON TO EGGX 10
- 25 MINS PRIOR TO OCA ENTRY.-
END OF PART THREE OF THREE PARTS)
```

9.3.2.1.5 Example of Night-Time Eastbound OTS



9.3.2.1.6 OTS Transition Periods

It is recommended that random flights planning to cross 30ºW eastbound within the hour preceding the onset of the day track system, or planning to cross 30ºW westbound within the hour preceding the onset of the night track system, flight plan to join a track of the OTS at or beyond 30ºW in accordance with the flight levels published in the NAT Track Message, or flight plan to remain clear of the OTS.

9.3.2.2 Performance Based Separation Minima (PBSM) on the OTS

Performance based separation minima of 42.6km (23 NM) lateral, 5 minutes and (30 NM) / 93km (50 NM) longitudinal predicated on Performance Based Communication and Surveillance (PBCS) and PBN in accordance with ICAO Doc 4444 Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM) were implemented in the ICAO NAT Region. Operators should consult the AIS of relevant NAT Provider States for the detailed application of these separation minima in each of the NAT OCAs.

a) The 42.6km (23 NM) lateral separation minimum is implemented by applying 42.6km (23 NM) lateral spacing through whole and half degrees of latitude between NAT Organized Track System (OTS) tracks between flight level (FL) 350-390 (inclusive), except when the OTS occurs in the New York East OCA.

b) OTS tracks spaced using 42.6km (23 NM) lateral separation minima at any point will be designated as PBCS tracks and will be uniquely identified in Remark 3 of the Track Message. See Section 4 (Flight Planning Provisions).

c) A PBCS track will either be:

- A whole degree PBCS track or
- A half degree PBCS track (e.g. 54 degrees-30 minutes NORTH latitude 20 degrees WEST longitude).

Note: there will be no combination of whole and half degrees of latitude within any single OTS track.

9.3.2.2.1 Errors Associated with Oceanic Clearances

Errors associated with oceanic clearances fall into several categories of which the most significant are ATC System Loop errors and Waypoint Insertion errors.

9.3.2.2.1.1 Communication Errors

A communication error is any error caused by a misunderstanding between the flight crew and the controller regarding the assigned flight level, speed, or route to be followed. Such errors can arise from: incorrect interpretation of the NAT track message by dispatchers; errors in coordination between OACCs; or misinterpretation by flight crews of oceanic clearances or re-clearances. Errors of this nature, which are detected by ATC from flight crew position reports will normally be corrected. However, timely ATC intervention cannot always be guaranteed, especially as it may depend on the use of third-party relayed HF, GP/VHF or SATVOICE communications.

9.3.2.2.1.2 Waypoint Insertion Errors

Experience has shown that many of the track-keeping errors in the NAT HLA occur as a result of flight crews programming the navigation system(s) with incorrect waypoint data. These are referred to as Waypoint Insertion Errors. They frequently originate from:

i) Failure to observe the principles of checking waypoints to be inserted in the navigation systems, against the cleared route;

ii) Failure to load waypoint information correctly; or

iii) Failure to cross-check on-board navigation systems.

Many of the navigation error occurrences are the product of one or more of the foregoing causes. It is therefore extremely important that flight crew double check each element of the oceanic clearance on receipt, and at each waypoint, since failure to do so may result in inadvertent deviation from cleared route and/or flight level.

9.3.2.2.2 Eligibility for PBCS on the OTS

Operators are eligible to flight plan to operate on published PBCS Tracks provided the aircraft is authorised by the IOMAR for:

a) RNP 4; and

b) FANS 1/A+ (PBCS) with an RCP of 240 and RSP of 180.

Operators are reminded that they must indicate their aircraft and flight crew capabilities (e.g. RNP, RNAV, RCP240 and RSP180 authorization, RVSM, FANS 1/A data link, ADS- B and NAT HLA approval) in the flight plan. Separation criteria and safety improvement initiatives in the NAT region are made available to all appropriately equipped flights based on filed flight plan information. This also supports planning for future initiatives by providing more accurate information regarding the actual capabilities of the fleet operating in the ICAO NAT region.

9.3.2.2.3 Aircraft not Eligible for PBCS on the OTS

Aircraft not eligible for performance base separation may be permitted to: -

- Infringe PBCS tracks at FL350 - FL390 (inclusive) at only one point (including Oceanic Entry / Exit Point) i.e. cross but not join an OTS PBCS track, and;
- Climb or descend through levels FL350 – FL390 on a PBCS track provided the climb or descent is continuous.

Note: such clearances will only be permitted on a tactical basis.

9.3.2.3 Mach Number Technique

The term 'Mach Number Technique' is used to describe a technique whereby subsonic turbojet aeroplanes operating successively along routes within the OTS are cleared by ATC to maintain appropriate Mach Numbers for a relevant portion of the en-route phase of their flight.

The principal objective of the use of the Mach Number Technique is to achieve improved utilisation of the airspace on long route segments where ATC has no means, other than position reports, of ensuring that the longitudinal separation between successive aeroplanes is not reduced below the established minimum. Practical experience has shown that when two or more turbojet aeroplanes, operating along the same route at the same flight level, maintain the same Mach number, they are more likely to maintain a constant time interval between each other than when using other methods. This is due to the fact that the aeroplanes concerned are normally subject to approximately the same wind and air temperature conditions, and minor variations in speed, which might increase and decrease the spacing between them, tend to be neutralised over long periods of flight.

Note: It is important to recognise that the maintenance of longitudinal separations depends upon the assumption that the ATC assigned Mach numbers maintained by all aeroplanes are True Mach numbers. Pilots must therefore ensure that any required corrections to Indicated Mach are taken into account when complying with the True Mach number specified in the ATC clearance.

9.3.2.3.1 Procedures

The ATC clearance includes the assigned (True) Mach number which is to be maintained. It is therefore necessary that information on the desired Mach number be included in the ATC flight plan. ATC uses Mach number together with pilot position reports to calculate estimated times for significant points along track. These times provide the basis for longitudinal separation between aeroplanes and for co-ordination with adjacent ATC units.

ATC will try to accommodate requested or flight planned Mach numbers when issuing Oceanic Clearances. It is rare that ATC will assign a Mach number more than 0.01 faster or 0.02 slower than that requested. The prescribed longitudinal separation between successive aeroplanes flying a particular track at the same flight level is established over the oceanic entry point. Successive aeroplanes following the same track may be assigned different Mach numbers, but these will be such as to ensure that prescribed minimum separations are assured throughout the oceanic crossing. Intervention by ATC thereafter should normally only be necessary if an aeroplane is required to change its Mach number due to conflicting traffic or to change its flight level.

It is, however, important to recognise that the establishment and subsequent monitoring of longitudinal separation is totally reliant upon aeroplanes providing accurate waypoint passing times in position reports. It is therefore essential that pilots conducting flights in NAT HLA Airspace utilise accurate clocks and synchronise these with a standard time signal, based on UTC, prior to entering NAT HLA Airspace (refer to Part 1 Chapter 9.3.1.1).

In the application of Mach Number Technique, flight crew must adhere strictly to their assigned True Mach Numbers unless a specific re-clearance is obtained from the appropriate ATC unit. However, as the aeroplane weight reduces it may be more fuel-efficient to adjust the Mach number. Since the in-trail and crossing track separations between individual aeroplanes are established on the basis of ETAs passed to, or calculated by, ATC, it is essential that ATC approval is requested prior to effecting any change in cruise Mach number. Such approval will be given if traffic conditions permit. If an immediate temporary change in the Mach number is essential, e.g. due to turbulence, ATC must be notified as soon as possible.

Pilots with experience of flying in oceanic airspaces other than the North Atlantic may be familiar with a procedure in those areas which permits pilots to unilaterally elect to change their cruising Mach number by up to 0.02M, without prior ATC approval. This is not the case in the North Atlantic NAT HLA airspace.

Pilots should maintain their last assigned Mach Number during step-climbs in oceanic airspace. If, due to aeroplane performance, this is not feasible, ATC should be advised at the time of the request for the step climb.

After leaving oceanic airspace, pilots must maintain their assigned Mach number in domestic controlled airspace unless and until the appropriate ATC unit authorises a change.

9.3.3 Flight Planning Requirements

9.3.3.1 Routes

During the period of OTS operation, flights should normally be planned to follow a North Atlantic (NAT) Track.

Note: This is not mandatory, a random track may be filed, but ATC may re-clear the flight along a NAT Track.

Flights south of 70ºN, and predominantly East/West should normally flight plan so that specific ten degrees lines of longitude (20ºW, 30ºW etc.) are crossed at whole degrees of latitude, and generally northbound or southbound aeroplanes should normally flight plan so that specific parallels of latitude spaced at five degree intervals (65ºN, 60ºN, etc.) are crossed at whole degrees of longitude.

If the flight is planned to operate along the whole length of one of the organised tracks, the intended organised track should be defined in Item 15 of the ATC flight plan using the abbreviation "NAT" followed by the relevant code letter. The accumulated estimated elapsed time (EET) from take-off to either the OCA entry point for westbound flights, or the commencement point of the NAT Track for eastbound flights, must be shown in Item 18 of the Flight Plan.

The Remarks section of the Track Message identifies two core tracks, on which to flight plan or fly in the altitude band FL360-390 inclusive, the aeroplane must be equipped with and operating CPDLC and ADS-C (FANS 1/A) refer to Part 1 Chapter 9.3.0.3.

During the hours of validity of the OTS, operators are encouraged to flight plan as follows (keeping in mind equipment requirements for operations on PBCS tracks and within DLM airspace):

- In accordance with the OTS; or
- Along a route to join or leave an outer track of the OTS; or
- On a random route to remain clear of the OTS, either laterally or vertically.

Nothing in the paragraph above prevents operators from flight planning through/across the OTS. While ATC will make every effort to clear random traffic across the OTS at published levels, re-routes or significant changes in flight level are likely to be necessary during most of the OTS traffic periods.

Note: A route constructed using only part of a NAT Track is a random route and 'Abbreviated Read-back of Clearances', described below, does not apply.

For flights conducted wholly or partly outside the OTS, accumulated estimated elapsed times from take-off to significant points en-route must be specified in Item 18 of the flight plan. For all flights intending to operate within NAT HLA airspace for any portion of their flight, the letter "X" should be inserted after the letter "S" in Item 10 of the ATC flight plan, indicating that the flight is certified as being in compliance with the NAT HLA and, additionally, the letter "W" should be inserted in the same field to indicate that the operation is RVSM approved.

For turbojet aeroplanes, the Mach number planned to be used for each portion of the flight in the NAT region should be specified in Item 15 of the flight plan.

9.3.3.2 Briefing

To help minimise the likelihood of a Gross Navigational Error (GNE) or large height deviations, at the planning stage pilots should ensure that they are fully briefed on current conditions, to include NOTAMS (e.g. forecast turbulence in RVSM airspace) and route and meteorological information (e.g. ETP locations and weather reports and forecasts for alternate airports). Pilots must be familiar with the significance of all the information on the operational flight plans and carry out basic cross-checks of fuel, winds and groundspeeds.

9.3.4 ATC Clearances

9.3.4.0 General

Oceanic Clearances are required for all flights within NAT controlled Airspace (at or above FL55). Flight crew should request Oceanic Clearances from the ATC unit responsible for the first OCA within which they wish to operate, following the procedures and the time-frame laid down in the appropriate commercially available airways manual.

Such clearances, although in most cases obtained some time before reaching the Oceanic entry point, are applicable only from that entry point. It is recommended that pilots should request their Oceanic Clearance at least 40 minutes prior to the Oceanic entry point ETA and, if requesting an OTS track, should include the next preferred alternative.

When requesting an oceanic clearance, the pilot should notify ATC of the maximum acceptable flight level possible at the boundary, taking into account that a climb to the assigned oceanic flight level must be achieved prior to entering oceanic airspace and normally whilst the aeroplane is within radar coverage. The pilot should also notify ATC of any required change to the oceanic flight planned level, track or Mach number as early as practicable after departure to assist ATC in pre-planning optimum airspace utilisation.

9.3.4.1 Obtaining Oceanic Clearance

Various methods of obtaining an Oceanic Clearance include:

- Use of published VHF clearance delivery frequencies;
- By HF communications to the Oceanic Area Control Centre (at least 40 minutes before boundary/entry estimate);
- A request via domestic or other ATC agencies;
- By data link, when in a suitable area and when arrangements have been made to request and receive clearances using on-board equipment (ACARS).

At some airports situated close to oceanic boundaries, the Oceanic Clearance must be obtained before departure (e.g. from Prestwick, Shannon, Glasgow, Dublin, Belfast, Edinburgh, Bristol, Gander, Goose Bay, and St. Johns). Indeed on the east side of the NAT this will apply to departures from all Irish aerodromes, all UK aerodromes west of 2° 30'W and all French aerodromes west of 0° longitude.

If an aeroplane that would normally be RVSM and/or NAT HLA approved encounters a critical in-flight equipment failure whilst en-route to the NAT Oceanic Airspace, or at dispatch is unable to meet the MEL requirements (if applicable) for RVSM or NAT HLA approval on the flight, the flight crew must advise ATC of the situation at initial contact when requesting Oceanic Clearance.

Note: After obtaining and reading back the clearance, pilots should monitor the forward estimate for oceanic entry, and if this changes by 3 minutes or more, the pilot must pass a revised estimate to ATC.

If any of the route, flight level or Mach number in the clearance differs from that flight planned, requested or previously cleared, attention may be drawn to such changes when the clearance is delivered (whether by voice or by data link). Pilots should pay particular attention when the issued clearance differs from the Flight Plan.

Note: If the entry point of the oceanic route on which the flight is cleared differs from that originally requested and/or the oceanic flight level differs from the current flight level, the pilot is responsible for requesting and obtaining the necessary domestic re-clearance to ensure that the flight is in compliance with its Oceanic Clearance when entering oceanic airspace.

If pilots have not received their Oceanic Clearance prior to reaching the Shanwick OCA boundary, they must contact Domestic ATC and request instructions to enable them to remain clear of Oceanic Airspace whilst awaiting such Clearance. This is not the case for other NAT OCAs, into any of which flights may enter whilst pilots are awaiting receipt of a delayed Oceanic Clearance.

Pilots should always endeavour to obtain Oceanic Clearance prior to entering these other NAT OCAs; however if any difficulty is encountered the pilot should not hold while awaiting Clearance unless so directed by ATC. In such circumstances, pending receipt of the Oceanic Clearance, the aeroplane should continue to maintain the flight level cleared by the current control authority.

When ATC clearances or re-clearances are being obtained or received, both flight crew members should be wearing their headset and monitoring the appropriate frequency. The inferior clarity of loud-speakers has, in the past, caused errors during receipt.

9.3.4.1.1 Format of Voice Oceanic Clearance Messages

Oceanic clearances delivered via voice in the NAT Region will normally have the following format:

"OCEANIC CLEARANCE [WITH A <list of ATC info>]. <ATC unit> CLEARS <A/C callsign> TO <clearance limit>, VIA <route>, FROM <entry point> MAINTAIN <level> [<speed>] [.<free text>]"

Note: Fields in [ ] are optional. In particular when the delivered clearance conforms with the "as filed" or "as requested" clearance (RCL) the Element [WITH A <list of ATC info>] is omitted.

The following <list of ATC info> will advise a difference in the clearance from the filed or requested details. It will normally be in accordance with the table below:

Condition	**List of ATC info**	**#**
The controller changes, deletes or adds a waypoint other than the entry point.	REROUTE	1
Flight level in the clearance message is not the same as the flight level in the RCL.	LEVEL CHANGE	2
Speed in the clearance message is not the same as the speed in the RCL.	SPEED CHANGE	3
The first waypoint in the clearance message is not the same as in the RCL.	ENTRY POINT CHANGE	4
The controller changes the clearance limit.	CLEARANCE LIMIT CHANGE	5

Multiple elements in the "<list of ATC info>" will normally be separated with the word "AND".

9.3.4.1.2 Delivery Method for Oceanic Clearance Messages Delivered Via Voice

In the first contact the Controller/Radio Operator will alert the pilot to the intention to deliver an Oceanic Clearance, so that the pilot can be prepared to accept and copy the detail. When the clearance to be delivered (CPL) differs in any way from the filed/requested flight plan (RCL) the controller/radio operator will denote in this first contact which of the elements have been changed. After the pilot responds with his/her readiness to receive the detailed clearance, the controller/radio operator will provide the details of the clearance in the format described above.

Example exchange:

1. Controller/radio operator:

    "DLH458- OCEANIC CLEARANCE WITH A LEVEL CHANGE AND SPEED CHANGE."

    Pilot:

    "GO AHEAD."

2. Controller/radio operator:

    "REYKJAVIK OAC CLEARS DLH458 TO CYVR, VIA GUNPA 65/10 69/20 71/30 72/40 73/60 MEDPA, FROM GUNPA MAINTAIN F340 M083"

REVISIONS/AMENDMENTS

When delivering any subsequent Revisions/Amendments to previous delivered clearances which include changes to the level and/or route and/or speed the controller/radio operator will utilise the following format and will provide a "heads-up" to the pilot on first contact, as to which elements are being revised.

9.3.4.1.3 Format of an Oceanic Clearance Revision Delivered Via Voice

"AMENDED <change> CLEARANCE. <ATC unit> CLEARS <A/C callsign>, <clearance>" where <change> can be one or more of the following:

LEVEL;

ROUTE;

SPEED.

Multiple <change> elements will normally be separated with the word "AND".

9.3.4.1.4 Delivery Method for an Oceanic Clearance Revision delivered via voice

1. Controller/radio operator:

    "DLH458- AMENDED LEVEL AND SPEED CLEARANCE."

    Pilot:

    "GO AHEAD."

2. Controller/radio operator:

    "REYKJAVIK OAC CLEARS DLH458, CLIMB TO F350, MAINTAIN M082, REPORT LEAVING, REPORT REACHING"

9.3.4.1.5 CPDLC Route Clearances

CPDLC Route Clearance Uplinks

CPDLC route clearance uplinks allow the flight crew to LOAD the CPDLC route clearance uplink directly into the FMS without having to manually enter waypoints possibly introducing navigational errors. All ANSPs in the NAT are progressing to have full functionality soon.

As per ICAO Doc 10037 GOLD Manual there are 4 possible CPDLC route clearance uplinks that can be used as described in the table below:

CPDLC Route Clearance Uplink	GOLD Description	Route Discontinuity
UM74 / RTEU-2	PROCEED DIRECT TO [position]*	No
UM79 / RTEU-6	CLEARED TO [position] VIA [route clearance]	Yes if [position] is not part of FMS flight plan
UM80 / RTEU-7	CLEARED [route clearance]	Entire FMS routing is replaced
UM83 / RETU-9	AT [position] CLEARED [route clearance]	After [position] entire FMS routing is replaced

Flight crews should ensure that the CPDLC route clearance uplink properly "loads" before sending WILCO.

There has been flight crew misunderstanding on some aircraft for those CPDLC uplinks that contain [route clearance]. The "details" of the [route clearance] are not displayed to the flight crew until they LOAD the uplink into the FMS. For example, prior to loading the CPDLC uplink UM79 / RTEU-6, the display to the flight crew is "CLEARED TO [position] VIA ROUTE CLEARANCE. This has been misinterpreted to mean "Cleared directly to the position" and thus not abiding by the "route clearance" which may contain several other waypoints.

To mitigate the display ambiguity, flight crews should always LOAD the CPDLC uplink first to ensure proper load and to be able to verify the routing on the FMS before sending WILCO and executing the clearance.

Weather data (winds and temperature) may be lost after executing the CPDLC route clearance uplink. Flight crews should replace the data as required to ensure proper ADS-C reporting.

Flight crews should revert to voice if in doubt about any CPDLC uplink.

9.3.4.2 Examples of Requests for Clearance

A "standard" request for clearance might be as follows:

"Jetair 865 request Oceanic Clearance. Estimating 56N010W at 1131. Request Mach decimal eight zero, Flight Level three five zero, able Flight Level three six zero, second choice Track Charlie".

If the request includes a change to the filed ATC flight plan, the request should be as follows:

"Jetair 142 request Oceanic Clearance. Estimating 55N010W at 1147. Request Mach decimal eight zero, Flight Level three four zero. Now requesting Track Charlie, able Flight Level three six zero, second choice Track Delta".

9.3.4.3 Contents of Clearances

9.3.4.3.1 Full Clearance

The issuance and the full read back of an oceanic clearance including track co-ordinates is the standard requirement and is always required if the clearance is received on HF. It may be expected, therefore, that the flight crew of any aeroplane cleared by Shanwick OAC on random routings in the

NAT Region will receive a clearance, and be required to read back the clearance, including the co-ordinates of each waypoint.

When a full clearance is issued it includes:

- Clearance Limit, which will normally be the destination aerodrome;
- Cleared routing designated by:
    - i) Oceanic entry point;
    - ii) Co-ordinates at each 10° longitude;
    - iii) Oceanic exit point.
- Cleared flight level;
- Cleared Mach Number;
- If the aeroplane is designated to report MET information en-route, the phrase "SEND MET REPORTS".

Gander and Reykjavik OACs may, however, issue clearances for random routings which specify "via flight plan route". Nevertheless, in all circumstances regarding random route clearances, flight crew are required to read back the full track coordinates of the flight plan route, from the oceanic entry point to the exit point.

9.3.4.3.2 Abbreviated Clearance

An abbreviated clearance is issued by ATC when clearing an aeroplane to fly along the whole length of a NAT Track. When an abbreviated clearance is issued it includes:

- Clearance Limit, which will normally be the destination aerodrome;
- Cleared track specified as "TRACK" plus code letter;
- Cleared flight level(s);
- Cleared Mach Number;
- If the aeroplane is designated to report MET information en route, the phrase "SEND MET REPORTS".

Note: The NAT Track includes oceanic entry and exits points.

An example might be as follows:

"Jetair 865 is cleared to Toronto via Track Bravo, from 56N010W maintain Flight Level three five zero, Mach decimal eight zero".

The flight crew will confirm that they are in possession of the current NAT Track message by using the Track Message Identification number (including any appropriate alpha suffix) in the read-back of the Oceanic Clearance, as follows:

"Jetair 865 is cleared to Toronto via Track Bravo, from 56N010W maintain Flight Level three five zero, Mach decimal eight zero. TMI 283 alpha"

Note: TMI is spoken as "TEE EMM EYE".

If the TMI number is included in the read-back there is no requirement for the pilot to read back the NAT Track co-ordinates even if the cleared NAT Track is not the one which was originally requested. If any doubt exists as to the TMI, the pilot should request the complete track co-ordinates from the OAC. Similarly, if the pilot cannot correctly state the TMI, the OAC will read the cleared NAT Track coordinates in full and request a full read back of those co-ordinates.

9.3.4.3.3 Oceanic Clearances for Eastbound Flights Subsequently Entering the EUR or NAM Regions

Oceanic Clearances issued to most flights in this category are strategic clearances intended to provide a safe separation for each flight, from oceanic entry to oceanic track termination point only. Should a pilot receive a clearance on a track other than originally flight planned, special caution should be exercised to ensure that the co-ordinates of the assigned track and of the associated landfall and domestic routings are fully understood and correctly inserted into the FMC. Appropriate cross-checks should be carried out.

In all cases when an en route re-clearance is requested, the pilot should ensure that the revised ATC clearance includes the new routing from the oceanic exit point to the first landfall point or coastal fix. If at the time of being given a clearance or re-clearance the pilot has any doubt, details should be checked with the ATC unit issuing the clearance/re-clearance.

Oceanic Clearances for Flights Originating from the NAM, CAR or SAM Regions and Entering NAT HLA Airspace via the New York OCA

The following information was correct at the time of this publication, therefore please always refer to the latest ICAO Doc 007 for the latest information.

There are three elements to an oceanic clearance: Route, Level, and Speed (if required). These elements serve to provide for the three basic elements of separation: lateral, vertical, and longitudinal.

Specific information on how to obtain oceanic clearance from each NAT OACC is published in State AIPs. Various methods of obtaining oceanic clearances include:

a) Use of published VHF clearance delivery frequencies;

b) By HF communications to the OACC through the appropriate radio station (in accordance with specified timeframes

c) A request via domestic or other ATC agencies;

d) By data link, when arrangements have been made to request and receive clearances using on-board equipment (ACARS). Detailed procedures for its operation may vary. Gander, Shanwick, Santa Maria and Reykjavik OACCs provide such a facility and the relevant operational procedures are published in national AIPs and also as NAT OPS Bulletins which are available for download from the ICAO Paris website. New York OACC uses the FANS 1/A CPDLC function to uplink oceanic clearances to all aircraft utilising CPDLC For aeroplanes planning to enter the NAT via the New York OCA from the NAM, CAR or SAM regions, the IFR clearance to destination received at the departure aerodrome from Air Traffic Control constitutes the Route portion of the Oceanic Clearance. Once airborne, and prior to entry into the NAT, aeroplanes will be assigned a Mach number and an Altitude by the FAA prior to NAT entry.

Note: For the purpose of this procedure ”complete route” is defined as any route clearance with a clearance limit of the aeroplane’s destination.

Example: on a flight from Santo Domingo (MDSD) to Madrid (LEMD), Santo Domingo ACC issues a clearance with a complete route; later, San Juan Center issues the aeroplane a clearance to its requested altitude and Mach number. At this point, all three required elements (route, Mach number and flight level) have been received and the flight has an Oceanic Clearance. A subsequent change to any element(s) of the Oceanic Clearance does not alter the others

The only exception to this procedure is for aeroplanes entering the New York Oceanic CTA from the Piarco ACC. For aeroplanes that enter the New York Oceanic CTA from the Piarco ACC, Piarco ACC will issue all three elements of the Oceanic Clearance prior to entry into the New York Oceanic CTA.

In cases where aeroplanes have been cleared via a North Atlantic Organised Track (NAT OTS), the Track Message Identification (TMI) number will be confirmed prior to reaching the NAT OTS entry fix.

If any difficulty is encountered obtaining the elements of the Oceanic Clearance, the pilot should not hold while awaiting a Clearance unless so instructed by ATC. The pilot should proceed on the cleared route into NAT HLA Airspace and continue to request the Clearance elements needed.

9.3.4.4 Clearances Including Variable Flight Level

Oceanic clearances for most NAT flights are of a strategic nature, whereby flights are allocated a conflict-free route and profile from coast-out to landfall. Although such strategic clearances normally specify a single flight level for the entire crossing, clearances which include variable flight level may be requested and granted, traffic permitting. Clearance requests for a variable flight level may be made by voice or CPDLC.

Within the NAT, on occasion when traffic permits, aircraft are cleared for a cruise climb or to operate within a block of flight levels. The operational difference between cruise climbs and block of flight levels is in accordance with the following:

- Cruise climb: Only climb or maintain a level, NEVER DESCEND;
- Block of flight levels: Climb and/or descend freely within the assigned block of flight levels.

A cruise climb should be requested when a flight crew wants to operate with a "flexible" vertical profile and gradually climb as the aircraft weight decreases and the optimum flight level increases. A block of flight levels should be requested when the flight crew wants to operate with a flexible vertical profile and the aircraft's altitude will vary up or down due to factors such as turbulence or icing.

ATC will still make the most efficient use of airspace with the block of levels by adjusting the clearance as levels are cleared. For cruise climb, levels below the aircraft are automatically released as the aircraft climbs.

9.3.4.5 Local Clearance Procedures

9.3.4.5.1 Westbound Clearances

When flying westbound, flight crew should request the oceanic clearance from the ATS unit responsible for the first oceanic area within which they wish to operate not more than 90 minutes and not less than 30 minutes flying time from the oceanic boundary.

Early information of ETA and flight level at the Oceanic boundary is of extreme importance to ATC for planning purposes. Therefore, aeroplanes departing from the UK or from airports on the western coastline of Europe should call for clearance from Shanwick on VHF as soon as possible after take-off, keeping in mind the 90 – 30 minute rule mentioned above. If unable to contact Shanwick on VHF, clearance should be requested on HF.

9.3.4.5.2 Eastbound Clearances

Between 2330 UTC and 0530 UTC, Gander clearance delivery procedures require flights (in addition to monitoring the appropriate control sector frequency) to contact "Gander Clearance Delivery" not more than 90 minutes and not less than 50 minutes flying time from the oceanic boundary for their oceanic clearance.

Clearance delivery frequencies and locations are published daily in the eastbound Track Message.

Note: To reduce VHF radio transmissions during these hours, the control sector will not normally issue instructions for pilots to contact Oceanic Clearance Delivery, nor is there a requirement for pilots to notify the control sector that oceanic clearance has been received.

9.3.5 Operational and Navigation Procedures

9.3.5.0 General

The aeroplane navigation systems necessary for flying in NAT HLA Airspace are capable of high standards of performance. However it is essential that stringent cross-checking procedures are employed, both to ensure that these systems perform to their full capabilities and to minimise the consequences of equipment failures and possible human errors.

Modern aeroplane navigation systems, using GNSS/GPS and/or IRS/INS are very accurate and reliable, but however sophisticated or mature a system is, it is still essential that stringent navigation and cross-checking procedures are maintained if Gross Navigation Errors (GNEs) are to be avoided. A GNE within NAT Airspace is defined as a deviation from cleared track of 10 nm or more. Some of these errors are detected by means of long range radars as aeroplanes leave oceanic airspace. Other such errors may also be identified through the scrutiny of routine position reports from aeroplanes, and all reported navigation errors in North Atlantic airspace are thoroughly investigated.

There are various references in this material to two pilots; however when carried, a third crew member should be involved in all cross-check procedures to the extent practicable.

Note: A re-clearance scenario is the prime cause of most navigational errors.

9.3.5.0.1 Accurate Timekeeping

Proper operation of a correctly functioning LRNS will ensure that the aeroplane follows its cleared track. ATC applies standard separations between cleared tracks and thereby assures the safe lateral separation of aeroplanes.

However, longitudinal separations between subsequent aeroplanes following the same track and between aeroplanes on intersecting tracks are assessed in terms of differences in ETAs/ATAs at common waypoints. Aeroplane clock errors resulting in position report time errors can therefore lead to an erosion of actual longitudinal separations between aeroplanes.

Note: It is vitally important that, prior to entry into the NAT HLA Airspace, the time reference system to be used during the flight is accurately synchronised to UTC and that the calculation of waypoint ETAs and the reporting of waypoint ATAs are themselves always referenced to this system.

For authorised sources of accurate time checks refer to Chapter 9.3.1.1.

9.3.5.0.2 Documentation

It is important that navigation data provided to crews in the form of charts, flight plans, master documents, track messages, etc. are presented in a format suitable for error-free use in the cockpit environment. A significant proportion of navigation errors result from the use of incorrect or misinterpreted data. To minimise the problem, source data must be clearly legible under the worst cockpit lighting conditions.

9.3.5.0.2.1 The Master Document

One copy of the Operational Flight Plan (Computer Flight Plan) is to be nominated as the Master Document to be used for navigation purposes on the flight deck. This would normally be that of the Pilot Monitoring (PM). The nomination of a Master Document does not, however, preclude other flight crew from maintaining their own navigation log.

Misuse of the Master Document can result in GNEs occurring, and it is essential that the following procedures are invariably and rigorously followed.

All navigational information on the Master Document must be checked against the best available prime source data. When a re-route is necessary, it is recommended that a new Master Document is prepared for the changed portion of the flight. If the original Master Document is to be used, the old waypoints should be clearly crossed out and the new ones entered in their place.

When receiving an oceanic clearance, the flight crew member responsible (normally the PM) will record the clearance on the Master Document as it is received, and the other flight crew member(s) will cross-check the receipt and read-back. All waypoint co-ordinates should be read back in detail, adhering strictly to standard ICAO phraseology, except where abbreviated clearance procedures make this unnecessary (refer to Part 1 Chapter 9.3.4.3.2).

9.3.5.0.2.2 Position Plotting

A simple plotting chart provides a visual presentation of the intended route which, otherwise, is defined only in terms of navigational co-ordinates. Plotting the intended route on such a chart may reveal errors and discrepancies in the navigational co-ordinates which can then be corrected immediately, before they reveal themselves in terms of a deviation from the ATC cleared route. As the flight progresses, plotting the aeroplane's position on this chart can also serve the purpose of a navigation cross-check. This is achieved by plotting the aeroplane's position approximately 10 minutes after passing each waypoint, noting the co-ordinates and time on the chart and comparing the result with the intended track.

However, for aeroplanes with Navigation Displays (ND) capable of displaying at least two waypoints (i.e. with a maximum screen range of 400 nm or more), the pictorial presentation of the aeroplane ND in Map mode with a suitable scale selected, together with a careful check of the tracks and distances displayed by the FMC against the CFP can render a plotting chart unnecessary in normal circumstances.

Note: In the event of a re-clearance, however, the use of a plotting chart becomes essential in order to gain general situational awareness and for more specific requirements, such as ensuring that the new route remains within the approved ETOPS rule distance.

Crews must ensure that they correctly copy the re-clearance, reprogramme (and execute) the FMC, update the Master Operational Flight Plan (OFP) and complete the plotting chart. The FMC cross-checks for the re-clearance should include distance and track checks between the new waypoints.

9.3.5.1 Pre-Flight Procedures

9.3.5.1.1 RNP Approval Status

In order for an aircraft to be cleared to fly in airspace where a particular RNP authorization is required, or take advantage of any preferred handling provided to RNP aircraft, the aircraft's RNP approval status must be accurately reflected in Item 18 of the ATC flight plan. Flight crews shall also verify that the corresponding RNP value is entered in the Flight Management Computer, either by default or through manual input, in order to enable aircraft navigation system monitoring and alerting against the most stringent oceanic RNP capability filed in the ATC flight plan

9.3.5.1.2 Navigation Systems

9.3.5.1.2.1 Initial Insertion of Present Position

Two fundamental principles concerning the operation of an IRS are:

- That it needs to be accurately aligned before flight;

- That the actual position of the aeroplane, at alignment, is set into the system.

If either of these principles is violated, system errors will be introduced. These errors can be corrected whilst the aeroplane is on the ground, but it is not possible to adequately recover from them whilst the aeroplane is in flight.

Correct insertion of the initial position must therefore be checked before inertial systems are aligned, and the position should be recorded on the Master Document. Particularly in the vicinity of the Greenwich Meridian or near to the Equator, care should be taken to ensure that the co-ordinates inserted are correct (i.e. E/W or N/S).

Subsequent checks of the present position and of the inertial velocity outputs (e.g. ground speed registering zero) should be carried out independently by both pilots during the pre-flight checks and again just before the aeroplane is moved. Any discrepancies should be investigated.

Note: On GPS-equipped aeroplanes, there is still a requirement to input the ramp position in order to align the IRS. This position should then be compared with the GPS position.

The GPS position should be within 30 metres of the published ramp position. If the GPS position is more than 100 metres from the published ramp position, then the cause should be investigated. If sufficient satellites are in view the most likely causes are GPS receiver error, atmospheric interference, or, incorrect ramp co-ordinates.

9.3.5.1.2.2 System Alignment

The alignment of inertial systems must be completed and the equipment put into navigation mode prior to releasing the parking brake at the ramp. To ensure that there is adequate time for the initial alignment, the inertial systems should be put into the align mode as soon as practicable

9.3.5.1.2.3 GNSS (GPS) Systems

As with all LRNS operations, GPS LRNS operations must be approved by the State of the operator (or the State of Registry for International General Aviation operations) as part of the NAT HLA operational approval. When both the LRNSs required for unrestricted NAT HLA operations are GPSs the approval of their operation will include the requirement to carry out Pre-Departure Satellite Navigation Prediction Programme (RAIM). When only one of the two LRNSs required is a GPS, or for multi-sensor navigation systems,

The following specify the numbers of satellites required:

a) Four satellites are required to determine 3-D position;
b) For Receiver Autonomous Integrity Monitoring (RAIM) purposes, five satellites are required to detect the presence of a single faulty satellite;
c) For Fault Detection and Exclusion (FDE) purposes, six satellites are required to identify a faulty satellite and exclude it from participating in further navigation solution calculations.

9.3.5.1.2.4 Loading of Waypoints

Before loading any waypoints into the route in the FMC, the normal check of the database currency should be conducted.

The manual entry of waypoint data into the navigation systems must be a co-ordinated operation by two persons, working in sequence and independently: one should key in and insert the data, and subsequently the other should recall it and confirm it against source information.

Note: It is not sufficient for one crew member just to observe or assist another crew member inserting the data.

As a minimum, the ramp position of the aeroplane, plus at least two additional waypoints, or, preferably, all the waypoints relevant to the flight should be loaded while the aeroplane is at the ramp. However, it is more important initially to ensure that the first en-route waypoint is inserted accurately. Appendix J gives detailed guidance on the avoidance of waypoint insertion errors.

9.3.5.1.2.5 Flight Plan Check

The purpose of this check is to ensure complete compatibility between the data in the Master Document and the calculated output from the navigation systems.

The check is conducted independently by each flight crew member as follows:

- Select the heading reference to TRUE;
- Check the Initial True Track (ITT) and leg distance displayed on the FMC for each leg between waypoints on the NAT HLA portion of the flight against those shown on the Master Document;
- Indicate on the Master Document that the check has been made by placing a tick (✓) against the ITT and distance for each leg; and then
- Return the heading reference to MAGNETIC.

Note: If there is a lengthy domestic portion of the flight before oceanic airspace, the Flight Plan Check may be delayed until after the oceanic clearance has been obtained.

9.3.5.2 Before Take-Off

Whilst there are no NAT HLA-specific procedures in this flight phase, it is important that all the normal navigation checks take place. Of particular importance is the check that the aeroplane position is updated at the start of the take-off roll.

9.3.5.3 En-route

9.3.5.3.1 Flight Deck Management

When reviewing the causes of navigation errors the NAT Central Monitoring Agency (CMA) has noted that numerous operator reports make reference to crew breaks in their explanation of the circumstances of the error. In all dimensions, errors are more likely to occur where a clearance or re-route, speed or level change has been communicated to a crew and either not been actioned completely, or has been incorrectly or incompletely processed before a relief crew member has started duty. Operators' SOPs are generally consistent in regard to the importance of properly handing over, and taking control, and if adopted with due diligence, would forestall the development of an error. However, human factors often confound the best laid SOPs, and distraction or human failings can contribute to the omission of all, or a part of, the process handed over by the departed crew member for subsequent action. Flights requiring crew augmentation, particularly ultra long-haul flights, present specific issues as regards crew relief. With the requirement to have the aeroplane commander and the designated co-pilot on duty for critical stages of the flight e.g. take-off and landing, sometimes crew changes then occur during times when critical information is being received such as oceanic clearances or conditional clearances and/or company communications such as re-dispatch etc. It is imperative that during these crew changes, a thorough handover briefing takes place so that the incoming crew is aware of all clearances and requirements for the segment of the flight, especially those involving conditional re-clearances such as a change of level at specific points or times.

Strict adherence to all the above procedures should minimise the risk of error. However, flight deck management should be such that one pilot is designated to be responsible for flying the aeroplane whilst the other pilot carries out any required amendments to documentation and reprogramming of the navigation systems – appropriately monitored by the pilot flying the aeroplane, as and when necessary.

If during flight the autopilot is disconnected (e.g. because of turbulence), care must be taken when the navigation steering is re-engaged to ensure that the correct procedure is followed. If the system in use sets specific limits on automatic capture, the across-track indications should be monitored to ensure proper recapture of the programmed flight path/profile.

Where crews have set low angles of bank, perhaps 10° or less, say for passenger comfort considerations, it is essential to be particularly alert to possible imperceptible departures from cleared track.

9.3.5.3.2 In Domestic Airspace

During flight in domestic airspace, the performance of the navigation system should be carefully monitored. On non-GPS equipped aeroplanes, the possibility of a 'map shift' is greater and the aeroplane's position should be checked against ground-based navigation aids whilst they are still in range.

If any failures of navigation equipment have occurred, a check must be made to determine that the aeroplane still meets the requirements for flight in NAT HLA airspace.

Obtain the oceanic clearance as soon as possible, but not more than 90 minutes before reaching the oceanic entry point (refer to Part 1 Chapter 9.3.4.1).

In view of the importance of following the correct track in oceanic airspace, it is advisable at this stage of flight that, if carried, a third pilot or equivalent crew member should check the clearance waypoints which have been inserted into the navigation system, using source information such as the track message or data link clearance if applicable.

If the aeroplane is cleared by ATC on a completely different track from that planned, a new Master Document should be prepared showing the details of the cleared track. Overwriting of the existing flight plan is only practical where only one or two waypoints are different, such as may be the case when planning a Random Track.

For this purpose, a blank pro-forma Master Document should be carried with the flight documents. One flight crew member should transcribe track and distance data from the appropriate reference source onto the new Master Document, and this should be checked by another crew member using the technique described in Part 1 Chapter 9.3.2.3. If necessary, a plotting chart may be used on which to draw the new track in order to enhance situational awareness. The new document(s) should be used for the oceanic crossing.

If the subsequent domestic portion of the flight corresponds to that contained in the original flight plan, it should be possible to revert to the original Master Document at the appropriate point.

The ETA for the oceanic Entry Point should be carefully monitored and updated to ATC when required. It is important to anticipate direct routings and flight crew should consider pre-empting ATC by requesting a routing direct to the Entry Point and updating the ETA that results. Doing so early can also provide the best opportunity to tactically manage the appropriate arrival time at the Entry Point.

Check the weather at the nominated en-route alternates, especially if conducting Extended Range (ER) Operations, refer to Part 3 Chapter 3, and be prepared to adopt an alternative course of action should the weather be below operating minima.

9.3.5.3.3 Entering NAT HLA Airspace and at Each Oceanic Waypoint

9.3.5.3.3.1 Entering NAT HLA Airspace

Approaching the Entry Point, flight crew should proceed as follows:

- Set the cleared Mach number in the FMC;

- Set the Heading Reference to TRUE.

9.3.5.3.3.2 Crossing Waypoints

At the oceanic Entry Point and at each successive waypoint in NAT HLA airspace, the following procedure should be adopted:

- Just prior to the waypoint, check there is no discontinuity in the FMC flight plan and that the next displayed waypoint corresponds with that on the Master Document;
- At the waypoint, check that the FMC and ND displayed distances to the next waypoint agree with the Master Document and confirm that the aeroplane turns in the correct direction and takes up a new track appropriate to the leg to the next waypoint;
- Complete a fuel check;
- Transmit a Position Report to ATC.

The Position Report at the Entry Point is usually transmitted on long-range VHF. Thereafter, all Position Reports will be made by HF until reaching VHF coverage again before landfall.

Thirty minutes after the Entry Point, the transponder should be selected to squawk A2000 until being assigned another code by the controlling authority before landfall.

However, because of the limited time spent in the NAT HLA, when flying on route Tango 9 or Tango 290 the change from the last assigned domestic code to Code 2000 should be made Northbound 10 minutes after passing BEGAS or ADVAT and Southbound 10 minutes after passing LASNO or GELPO.

Note: This procedure does not affect the use of the special purpose codes (7500, 7600 and 7700) in cases of unlawful interference, radio failure or emergency.

9.3.5.3.3.3 Communications

The carriage of HF communications equipment is mandatory for flights in NAT HLA airspace. Aeroplanes with only VHF communications equipment available should plan their route outside the OCAs and ensure that they remain within VHF coverage of appropriate ground stations throughout the flight.

Extended range VHF is used for OCA communications where practicable. This is particularly relevant to eastbound flights entering the OTS structure at the New York Oceanic boundary.

9.3.5.3.3.3.1 HF Voice Communications

The NAT HLA is covered by HF/RT networks or 'families'. Family NAT 'D', for example, is for northern routes outside the organised track system. Other families divide aeroplanes registered East or West of Longitude 30ºW, and frequencies for a particular family are the same for all participating stations (New York, Gander, Shanwick, Santa Maria etc.). Dual position reports can be passed, therefore, by prefixing the message with the phrase "COPY (ATCU name)".

It is important to understand that the person you talk to on HF is not the controller but only a radio operator. He is not able to negotiate a clearance with you and there will be a delay in issuing any clearance requested as the request has to be passed to the controller first.

When using HF communications, and even when using ADS and/or CPDLC, pilots should maintain a listening watch on the assigned frequency, unless SELCAL is fitted, in which case they should carry out the following sequence of actions:

- Provide the SELCAL code in the flight plan; (any subsequent change of aeroplane for a flight will require passing the new SELCAL information to the OAC);
- Check the operation of the SELCAL equipment, at or prior to entry into Oceanic airspace, with the appropriate aeradio station.

Note: This SELCAL check must be completed prior to commencing a SELCAL watch.

- Thereafter maintain a SELCAL watch.

It is important to note that it is equally essential to comply with the foregoing SELCAL provisions even if SATCOM Voice or ADS/CPDLC are being used for routine air/ground ATS communications. This will ensure that ATC has a timely means of contacting the aeroplane.

On entering oceanic airspace, usually after transmitting the Position Report at the Entry Point, flights will be given a Primary and Secondary HF frequency. As soon as practical, contact should be made on HF and a SELCAL check obtained. If this is successful, advise ATC that a SELCAL watch is being maintained on the frequency. Headsets may be removed.

121.5 MHz must be guarded continuously, and the air-to-air frequency 123.450 MHz provides useful communications between aeroplanes.

9.3.5.3.3.3.2 VHF Voice Communications

Radio stations are also responsible for the operation of VHF outlets. North Atlantic flights may use these facilities for all regular and emergency communications with relevant OACCs, except that VHF Channel 128.360 may not be used for routine communication on routes Tango 9 and Tango 290. Such facilities are especially valuable in the vicinity of Iceland, Faroes and Greenland since VHF is not as susceptible to sunspot activity as HF. Outlets are situated at Prins Christian Sund, which is operated by Gander Radio, and at Kangerlussuaq (Sondrestrom), Kulusuk, several locations in Iceland and the Faroes, via Iceland Radio.

It is important for the pilot to appreciate that when using VHF, these communications are with an aeradio station and the pilot is not in direct contact with ATC. However Direct Controller / Pilot Communications can be arranged, if necessary, via patch-through on some VHF frequencies.

Note: The carriage of HF communications equipment is mandatory for flight in the Shanwick OCA. Aeroplanes with only VHF communications equipment should plan their route outside the Shanwick OCA and ensure that they remain within VHF coverage of appropriate ground stations throughout the flight. Details of communication requirements are published in State AIPs and ICAO publications.

9.3.5.3.3.3.3 SATCOM Voice Communications

SATCOM ATS air/ground voice communication may now be used for any routine, non-routine or emergency communications throughout the NAT Region. State AIPs contain the necessary telephone numbers and/or short-codes for air-initiated call access to aeradio stations and/or direct to OACs. Since oceanic traffic typically communicate with ATC through aeradio facilities, a SATCOM call made due to unforeseen inability to communicate by other means should be made to such a facility rather than the ATC Centre, unless the urgency of the communication dictates otherwise.

MEL remarks for HF systems may provide significant relief for SATCOM-equipped aeroplanes, thereby making the requirement for the carriage of fully serviceable/redundant HF communications equipment much less of an issue.

Note: Pilots electing to use SATCOM voice as an alternative to HF voice communications remain responsible for operating SELCAL or maintaining a listening watch on the assigned HF frequency.

9.3.5.3.3.3.4 Data Link Communications

Data link communications are gradually being introduced into the NAT environment for position reporting (via ADS and CPDLC and also via FMC WPR through ACARS) and for other air/ground ATS exchanges (using CPDLC).

On first contact with the initial aeradio station, crews of participating aeroplanes should expect to receive the instruction "VOICE POSITION REPORTS NOT REQUIRED".

Note: Refer to Part 1 Chapter 9.3.0.3. AIS publications of the NAT ATS Provider States should be consulted to determine the extent of current implementation in each of the North Atlantic OCAs.

When operating CPDLC, the aircraft data link system provides indication to flight crews of any degraded performance which results from a failure or loss of connectivity. The flight crew should then notify the ATS unit of the failure as soon as practicable. Timely notification is essential to ensure that the ATS unit has time to assess the situation and apply a revised separation standard, if necessary.

Similar to SATVOICE usage, flight crews electing to use Data link communications for regular ATS communications in the ICAO NAT region remain responsible for operating SELCAL (including completion of a SELCAL Check), or maintaining a listening watch on the assigned HF frequency outside VHF coverage.

Flights equipped with CPDLC and /or ADS-C should ensure that the data link system is logged on to the appropriate OACC. This applies even when the aircraft is provided with ATS Surveillance services. With the introduction of PBCS separation, establishing and maintaining a data link connection becomes even more important since an active data link connection is one of the requirements for the application of the separation. CPDLC provides communication redundancy and controllers will in many cases use CPDLC for communication even though the flight crew is maintaining a listening watch on the assigned DCPC VHF frequency. ADS-C furthermore enables ATC to perform route conformance monitoring for downstream waypoints.

Conditional clearances require special attention. A conditional clearance is an ATC clearance given to an aeroplane with certain conditions or restrictions such as changing a flight level based on a UTC time or a specific geographic position. The following is an example of a scenario where a CPDLC conditional clearance was given to a crew. The crew subsequently failed to comply with the time restriction, but reported leaving its flight level, thereby enabling the controller to catch the error.

At approximately 1133 UTC a CPDLC message composed of the following uplink message elements (UM) was sent to the flight:

REFERENCE	INSTRUCTION
UM19	"Maintain F370"
UM21	"At 1205 Climb to and Maintain F380"
UM128	"Report Leaving F370"
UM129	"Report Level F380"

The expected WILCO response was received by the OAC. At approximately 1134 UTC, a CPDLC message composed of the following downlink message element (DM) from the aeroplane was received by the OAC:

REFERENCE	MESSAGE
DM28	"Leaving F370"

The air traffic controller took immediate action to confirm the flight level and to issue a clearance via voice for the flight to expedite climb to a flight level that ensured vertical separation.

Note: The receipt of the "Leaving F370" message enabled prompt action to correct this error.

a) Upon receipt of a CPDLC uplink message, it is important for both pilots to independently and silently read and verify the clearance;

b) It is important to note that the CPDLC uplink message may be more than 1 page in length. Review the entire message carefully, in the correct order, before taking any action. It may be helpful to print the message;

c) Both pilots should resolve any questions that they may have regarding the clearance with each other, and if necessary with ATC, prior to initiating any action. If unable to fully understand the CPDLC clearance, pilots should revert to backup voice communication;

d) Pilots should not use voice to verify that an up-linked CPDLC message has been received or to inquire if a down-linked data link message has been received by the ATS provider;

e) Crews should be cautious with CPDLC clearances (message sets) that are delayed;

f) Crews should be cautious with clearances when communicating via CPDLC and HF radio simultaneously. CPDLC is the primary communication means when it is operating. The clearance is received from that [CPDLC] source only;

g) Crews should avoid using the free-text method;

h) Crews should be sure that HF SELCAL is working even when CPDLC is functioning properly – do a SELCAL check prior to oceanic entry and at each Oceanic Control Area (OCA) boundary.

9.3.5.3.3.3.5 Use of Air-to-Air VHF Facility 123.450 MHz and Emergency Frequency 121.5 MHz

The frequency 121.5 MHz should be continuously monitored by all aeroplanes operating in the NAT Region so as to be prepared to offer assistance to any other aeroplane advising an emergency situation.

An air-to-air VHF frequency has been established for world-wide use when aeroplanes are out of range of VHF ground stations which utilise the same or adjacent frequencies. This frequency, 123.450 MHz, is intended for pilot-to-pilot exchanges of operationally significant information.

Note: 123.450 MHz is not to be used as a 'chat' frequency.

Establish communications with and alert nearby aircraft by broadcasting, at suitable intervals on 121.5 MHz (or, as a backup, on the inter-pilot air-to-air frequency 123.450 MHz) and where appropriate on the frequency in use: aircraft identification, the nature of the distress condition, intention of the person in command, position (including the ATS route designator or the track code, as appropriate) and flight level.

123.450 MHz may be used to relay position reports via another aeroplane in the event of an air-ground communications failure. The frequency may also be used by pilots to contact other aeroplanes when needing to co-ordinate offsets required in the application of the Strategic Lateral Offset Procedures (SLOP).

If necessary, initial contact for relays or offset co-ordination can be established on 121.5 MHz; although great care must be exercised should this be necessary, in case it is being used by aeroplane experiencing or assisting with an on-going emergency. Therefore, in order to minimise unnecessary use of 121.5 MHz, it is recommended that aeroplanes additionally monitor 123.450 MHz when flying through NAT airspace.

9.3.5.3.3.3.6 Position Reporting and Other Messages

Air-Ground messages in the NAT MNPSA are categorised as follows:

a) Position Report;

b) Request Clearance;

c) Revised Estimate;

d) Miscellaneous.

The format of a Position Report is as follows:

a) The word "POSITION";
b) Flight identification (Callsign);
c) Present position;
d) Time over present position;
e) Present flight level;
f) Next position;
g) ETA for next position;
h) Next subsequent position.

For example:

"POSITION, Jetair 865, 52N20W 1236, FL 340, 53N30W 1330, 53N40W next"

Note: The position co-ordinates are spoken as "five two north, two zero west" etc. and the times as "one two three six" etc.

The format of a Request Clearance communication is as follows:

a) The words "REQUEST CLEARANCE";
b) Flight identification (Callsign);
c) Requested Mach No., flight level or route;
d) Clarifying information.

For example:

"REQUEST CLEARANCE, Jetair 865, requesting flight level 370, due turbulence"

Note: Pilots must always report to ATC as soon as possible on reaching any new cruising level.

The format of a Revised Estimate communication is as follows:

a) The words "REVISED ESTIMATE";
b) Flight identification (Callsign);
c) Next position;
d) Revised estimate for next position;
e) Further information.

For example:

"REVISED ESTIMATE, Jetair 865, 56N 50W 1440"

The Miscellaneous Category is used for to pass information or make a request in plain language that does not conform to the content of other message formats. No message designator is required.

9.3.5.3.3.3.7 "When Able Higher" (WAH) Reports

The provision of WAH reports advises ATC of the time or position that a flight will be able to accept the next higher level allowing controllers to more effectively utilise their airspace and provide aircraft more fuel efficient profiles. A WAH report should be provided by all flights when entering the Santa Maria OCA. Provision of WAH reports on entering other NAT OCAs is optional or they may be requested by any OACC.

Note: Information thus provided of the aeroplane's future altitude 'ability' will not automatically be interpreted by ATC as an advance 'request' for a step-climb. Should the flight crew wish to register a request for one or more future step-climbs, this may be incorporated in the WAH report by appropriately substituting the word "Request" for the word "Able".

CAUTION: ATC acknowledgement of a WAH report (and any included requests) is NOT a clearance to change altitude.

9.3.5.3.3.3.8 Meteorological Reports

Some aeroplanes flying in the NAT HLA (MNPS)A are required to report MET observations of wind speed and direction plus outside air temperature. Any turbulence encountered should also be included in these reports. From among the aeroplanes intending to operate on the organised track system, OACs designate those which will be required to report routine meteorological observations at, and midway between, each prescribed reporting point. The designation is made by the OAC when issuing the Oceanic Clearance using the phrase "SEND MET REPORTS", and is normally made so as to designate one aeroplane per track at approximately hourly intervals.

Flight crew flying routes which are partly or wholly off the OTS should include routine MET observations with every prescribed report. The midpoint observation should be recorded then transmitted at the next designated reporting point. The format to be used for the reporting of such additional observations must be by reference to the latitude (degrees and minutes) and longitude (degrees only) for the intermediate mid-point.

For example:

"Jetair 865, 56N40W 1811, FL 380, 57N30W 1856, 57N20W next. Minus 57, 280/70. Minus 57, 290 / 80 5630N45W."

Note: The wind direction and speed is spoken as "two eight zero diagonal seven zero" etc.

9.3.5.3.3.4 Routine Monitoring

There are a number of ways in which the autopilot may unobtrusively become disconnected from the steering mode. Therefore, regular checks should be made of correct engagement with the navigation system.

The selection of FMC display is at the discretion of the flight crew, but a display of the active route and flight progress that includes track deviation information is useful, along with vertical navigation information when available.

The navigation displays (NDs) should be selected to the maximum range possible so that the largest numbers of waypoints are in view, thus enhancing situational awareness. If available, display the alternate aerodromes.

The Equal Time Point(s) should be plotted on the Plotting Chart (if used), but they MUST NOT be entered as a waypoint in the active route in the FMC. Doing so will cause the aeroplane to fly off-track between the two waypoints between which the ETP is situated.

Continue to monitor the weather at nominated and other suitable en-route alternates.

9.3.5.3.3.5 Strategic Lateral Offset Procedure (SLOP)

Distributing aircraft laterally and equally across all available positions adds an additional safety margin and reduces collision risk. SLOP is now a standard operating procedure for the entire NAT region and flight crews are required to adopt this procedure as is appropriate. In this connection, it should be noted that:

- Strategic lateral offsets, and those executed to avoid wake turbulence, are to be made to the right of a route or track;
  - In relation to a route or track, an aircraft may fly offsets right of centreline up to a maximum of 2 NM; and there are three positions that an aeroplane may fly: centreline, 1 or 2 nm right;
  - Offsets are not to exceed 2 nm right of centreline nor are they to be made to the left of track.

The intent of this procedure is to reduce risk (and thus to increase the safety margin) by distributing aeroplane laterally and equally across the three available positions. In this connection, pilots must take account of the following:

- Aeroplanes without automatic offset programming capability within the FMC must fly the centreline;
- Aircraft able to perform offsets in tenths of nautical mile should do so as it contributes to risk reduction ;
- Flight crew should use whatever means are available (e.g. TCAS, communications, visual acquisition, GPWS) to determine the best flight path to fly;
- Any aeroplane overtaking another aeroplane is to offset within the confines of this procedure, if capable, so as to create the least amount of wake turbulence for the aeroplane being overtaken;
- For wake turbulence purposes, flight crew are also to fly one of the three positions described above and never offset to the left of centreline nor offset more than 2 nm right of centreline;
- Pilots may apply an offset outbound at the oceanic entry point and must return to centreline prior to the oceanic exit point unless otherwise authorised by the appropriate ATS authority or directed by the appropriate ATC unit.

Note: It is recognised that the pilot will use his / her judgement to determine the action most appropriate to any given situation and has the final authority and responsibility for the safe operation of the aeroplane.

The use of air-to-air channel, 123.450 MHz, may be used to co-ordinate the best wake turbulence offset option. Flight crew may apply an offset outbound at the oceanic entry point but must return to centreline at the oceanic exit point.

Aeroplanes transiting radar-controlled airspace e.g. Bermuda, are to remain on their established offset positions.

There is no ATC clearance required for this procedure and it is not necessary that ATC be advised; position reports are to be based on the current ATC clearance and not the exact co-ordinates of the offset position.

The standard SLOP procedures are designed to provide safety enhancements for both uni-directional and bi-directional flows. On bi-directional routes a LEFT offset will INCREASE collision risk rather than decrease it. There are areas in the NAT Region where bi-directional traffic flows are routinely used, and there are times when opposite direction traffic may be encountered in any part of the Region. Pilots must therefore recognise that LEFT offsets from the cleared track centre-line must not be adopted.

After the introduction of RVSM and before the adoption of SLOP, a NAT offsetting procedure was promulgated for wake-turbulence avoidance. This procedure allowed both right and left offsets to be flown. The procedure was developed primarily with a view to the unique traffic flows of the NAT OTS, where uni-directional traffic occupied every flight level from FL310 to FL390. That procedure is no longer in place. The avoidance of wake turbulence (even in the OTS) can be accomplished effectively within the confines of the SLOP procedures, as specified above. Pilots should communicate with the other aeroplanes involved to co-ordinate a pair of mutual offsets from within the allowed three options, in order to mitigate any wake-turbulence issue.

9.3.5.3.4 Approaching Landfall

When the aeroplanes is within range of land-based navigation aids, and the crew is confident that these aids are providing reliable navigation information, consideration should be given to updating the LRNSs. Automatic updating of the LRNSs from other navigation aids should be closely monitored, and before entry into airspace where different navigation requirements have been specified (e.g. RNAV 5 in European B-RNAV airspace), crews should use all aids (including VORs and DMEs) to confirm that the in-use navigation system is operating to the required accuracy. If there is any doubt regarding system accuracy, the appropriate ATC unit should be informed.

Other required crew actions are as follows:

- Obtain the domestic clearance;
- Check the appropriate route is programmed in the navigation system;
- Return the Heading Reference to MAGNETIC;
- Adjust the cruising Mach number to that required in domestic airspace.

9.3.5.4 Post-Flight Procedures

At the end of each flight, an evaluation of accuracy of the aeroplane's navigation systems should be carried out. Equipment operating manuals specify maxima for radial errors before a system is considered to be unserviceable. For inertial systems these are in the order of 2 nm per hour. One method used to determine radial error is to input the shutdown ramp position; in other systems error messages are output giving differences between raw inertial reference positions and computed radio navigation updated positions. The aeroplane type-specific operating manual should specify the method to be used.

9.3.6 Contingency Procedures

9.3.6.1 Unable to Maintain Level

The following procedures are intended for aeroplanes unable to maintain assigned level due to:

- Weather (for example severe turbulence);
- Aeroplane performance (engine) problems;
- Pressurisation failure.

They are applicable primarily when rapid descent, turn-back, or diversion to an alternate aerodrome is required. The pilot's judgement will determine the specific sequence of actions taken, having regard to the prevailing circumstances.

Any aeroplane unable to continue flight in accordance with its ATC clearance should obtain a revised clearance prior to initiating any action using the distress (MAYDAY) or urgency (PAN) prefix as appropriate.

If prior clearance cannot be obtained before action is required, the aeroplane should broadcast its position (including the ATS Route designator or the Track Code as appropriate) and its intentions, at frequent intervals on 121.5 MHz (with 123.450 MHz as a back-up frequency) pending an ATC clearance being obtained at the earliest possible time. Until a revised clearance is obtained the specified NAT in-flight contingency procedures should be carefully followed, please always refer to ICAO Doc 4444 at the latest revision for details.

In general terms, the aeroplane should be flown at a flight level and/or on a track where other aeroplanes are least likely to be encountered. Maximum use of aeroplane lighting should be made and a good look-out maintained. ACAS information should be used to assist in sighting proximate traffic.

9.3.6.1.1 Specific Procedures

The general concept of NAT in-flight contingency procedures is to leave the assigned track by turning 30° right or left, if above FL410 climb or descend 1,000ft; if below FL410 climb or descend 500ft or, if at FL410, climb 1,000ft or descend 500ft, while acquiring a track laterally offset by 5 nm from the assigned track. The direction of the turn should be determined by the position of aeroplanes relative to any organised tracks, levels allocated, the direction to the alternate aerodrome and terrain.

If unable to maintain the assigned flight level, minimise any descent whilst turning to acquire the 5 nm offset. A subsequent flight level should be selected which differs by 1,000ft from those normally used if above FL410, or by 500ft if below FL410.

Once established on a parallel, same direction track or route offset by 9.3 km (5.0 NM), either:

a) Descend below FL 290, and establish a 150 m (500 ft) vertical offset from those flight levels normally used, then proceed as required by the operational situation or if an ATC clearance has been obtained, proceed in accordance with the clearance; or
b) Establish a 150 m (500 ft) vertical offset (or 300 m (1000 ft) vertical offset if above FL 410) from those flight levels normally used, and proceed as required by the operational situation, or if an ATC clearance has been obtained, proceed in accordance with the clearance.

Before diverting across the flow of adjacent traffic expedite any climb or descent to a flight level not used by majority of NAT traffic (i.e. above FL410 or below FL285).

9.3.6.2 HF Communications Failure

There is an underlying premise in 'normal' radio communications failure procedures that they are for use when a single aeroplane suffers an on-board communications equipment failure. Within the NAT Region and some adjacent domestic airspace (e.g. Northern Canada), where HF voice is primarily used for air-ground ATC communications, ionospheric disturbances resulting in poor radio propagation conditions can also interrupt these communications.

While it is impossible to provide guidance for all situations associated with an HF communications failure, it is, however, important to differentiate between two distinct circumstances:

- An on-board communications equipment failure, resulting in an individual aeroplane losing HF communications with ATC;
- The occurrence of poor HF propagation conditions (commonly referred to as 'HF Blackouts'), which can simultaneously interrupt HF air-ground communications for many aeroplanes over a wide area.

In the case of an on-board communications equipment failure, even though ATC loses contact with that aeroplane, it can anticipate that aeroplane's actions and, if necessary modify the profiles of other aeroplanes in the same vicinity in order to maintain safe separations.

However, the occurrence of poor HF propagation conditions can simultaneously interrupt HF air/ground communications for many aeroplanes over a wide area and ATC may then be unable to make any interventions to assure safe traffic separations. An HF blackout will impact the ability of ATC to ensure the safe separation of all traffic. Hence, even if using other than HF for regular communications with ATC, pilots should still exercise appropriate caution when HF blackout conditions are encountered.

The following procedures are intended to provide general guidance for aeroplanes operating in, or proposing to operate in, the NAT Region which experience a communications failure.

9.3.6.2.1 Specific Procedures

If an aeroplane experiences a two-way ATC communications failure, the flight crew should:

- Squawk Code A7600 with Mode C;
- If equipped, an aeroplane should use SATCOM to contact the responsible aeradio station;
- If the aeroplane is not equipped with SATCOM, the pilot should attempt to use VHF to contact any (other) ATC facility or another aeroplane and inform them of the difficulty and request that they relay information to the ATC facility with whom communications are intended;
- The air-to-air VHF frequency, 123.450 MHz, may be used to relay position reports via another aeroplane;

Note: The emergency frequency 121.5 MHz should not be used to relay regular communications, but since all NAT traffic is required to monitor the emergency frequency, it may be used in these circumstances to establish initial contact with another aeroplane and then request transfer to the inter-pilot frequency for further contacts.

- In view of the traffic density in the NAT Region, pilots of aeroplanes experiencing a two-way ATS communications failure should broadcast regular position reports on the air to air frequency (123.450 MHz) until such time as communications are re-established.

If the HF communications equipment failure occurs or HF Blackout conditions are encountered after entering the NAT HLA, the flight should proceed in accordance with the last received and acknowledged Oceanic Clearance, including level and speed, to the last specified oceanic route point (normally landfall) by which time VHF communications are likely to have been established and the clearance will be amended or confirmed.

9.3.6.2.2 Summary

- Equipment Failure before receiving an Oceanic Clearance:
  - ➢ Divert or fly the flight plan route, speed and initial planned oceanic level to landfall;
- Blackout encountered (in an HF communications domestic ATC environment) before receiving an Oceanic Clearance:
  - ➢ Continue at Domestic cleared level and follow flight planned route and speed to landfall;
- Equipment Failure or Blackout after receiving an Oceanic Clearance:
  - ➢ Fly that clearance to landfall.

9.3.6.3 Navigation Equipment Failure

For unrestricted operation in NAT HLA an aeroplane must be equipped with a minimum of two fully serviceable LRNSs. NAT HLA approved aeroplanes that have suffered any equipment failures that result in only a single LRNS remaining serviceable may still be flight planned and flown through the NAT HLA, but only on the 'Blue Spruce' routes established for this purpose (see Appendix A).

After take-off, if abnormal navigation indications relating to navigation systems occur, they should be analysed to discover their cause. Unless the flight can proceed safely using alternative approved navigation sources only, the commander should consider landing at the nearest appropriate aerodrome to allow the problem to be fully investigated, using technical assistance if necessary. Under no circumstances should a flight continue into oceanic NAT HLA with unresolved navigation system errors, or with errors which have been established to have been caused by inertial platform misalignment or initial data input error.

The following procedures are applicable to aeroplanes with 2 LRNS. Specific procedures apply depending on where in the flight profile the failure occurs.

9.3.6.3.1 One System Fails Before Take-Off

The options are:

a) Delay departure until a repair is possible;

b) Obtain a clearance above or below NAT HLA;

c) Plan the flight on the special routes known as the 'Blue Spruce Routes', which have been established for use by aeroplanes suffering partial loss of navigation capability (refer to Part 1 Chapter 9.3.1.3).

9.3.6.3.2 One System Fails Before the OCA Boundary is Reached

The options are:

a) Land at a suitable aerodrome before the boundary or return to the aerodrome of departure;

b) Divert via one of 'Blue Spruce Routes';

c) Obtain a re-clearance above or below NAT HLA.

9.3.6.3.3 One System Fails After the OCA Boundary is Crossed

Once the aeroplane has entered oceanic airspace, the flight should normally continue in accordance with the oceanic clearance already received, appreciating that the reliability of the total navigation system has been significantly reduced. The commander should however:

- Assess the prevailing circumstances (e.g. performance of the remaining system, remaining portion of the flight in NAT HLA, etc.);
- Prepare a proposal to ATC with respect to the prevailing circumstances (e.g. request a clearance above or below NAT HLA, turn-back, obtain a clearance to fly along one of the 'Blue Spruce Routes', etc.);
- Advise and consult with ATC as to the most suitable action;
- Obtain an appropriate re-clearance prior to any deviation from the last acknowledged oceanic clearance.
- When the flight continues in accordance with its original clearance (especially if the distance ahead within NAT HLA is significant), the flight crew should begin a careful monitoring programme:
- To take special care with the operation of the remaining system bearing in mind that routine methods of error checking are no longer available;
- To check the main and standby compass systems frequently against the information which is still available;
- To check the performance of the remaining equipment and, if doubt arises regarding its performance and/or reliability, the following procedures should be considered:
    i) Attempting visual sighting of other aeroplanes or their contrails, which may provide a track indication;
    ii) Calling ATC for information on other aeroplanes adjacent to the aeroplane's estimated position and/or calling on VHF to establish contact with such aeroplanes

(preferably same track/level) to obtain from them information which could be useful (e.g. drift, groundspeed, wind details etc.)

9.3.6.3.4 The Remaining System Fails After Entering NAT HLA Airspace

The flight crew should:

- Immediately notify ATC;
- Make best use of procedures specified in paragraph 9.3.1.3 relating to attempting visual sightings and establishing contact on VHF with adjacent aeroplanes for useful information;
- Keep a special look-out for possible conflicting aeroplanes, and make maximum use of exterior lights;
- If no instructions are received from ATC within a reasonable period, consider climbing or descending 500 feet, broadcasting action on 121.5 MHz and advising ATC as soon as possible.

Note: This procedure also applies when a single remaining system gives an indication of degradation of performance, or neither system fails completely, but the system indications diverge widely and the defective system cannot be determined.

9.3.6.3.5 Complete Failure of Navigation Computers

A characteristic of the navigation computer system is that, though the computer element might fail and thus deprive the aeroplane of steering guidance and the indication of position relative to cleared track, the basic outputs of the IRS (LAT/LONG, Drift and Groundspeed) may be left unimpaired.

In the event of complete navigation computer failure, first actions should be:

- Advise ATC;
- Unless ATC give other specific instructions, consider climbing/descending 500 ft, broadcast intentions on 121.5 MHz and 123.450 MHz, and advise ATC as soon as possible.
- Actions to minimise the effects of a total navigation computer system failure might be as follows:
- Draw the cleared route on a suitable plotting chart and extract mean true tracks between waypoints;
- Use the basic IRS/GPS outputs to adjust heading to maintain mean track and to calculate ETAs;
- At intervals of not more than 15 minutes plot position (LAT/LONG) on the chart and adjust heading to regain track.

9.3.6.4 Deviations Due to Severe Weather

If the aircraft is required to deviate from track or route to avoid adverse meteorological conditions and prior clearance cannot be obtained, an ATC clearance shall be obtained at the earliest possible time. Until an ATC clearance is received, the pilot shall take the following actions:

a) If possible, deviate away from an organized track or route system;

b) Establish communications with and alert nearby aircraft by broadcasting, at suitable intervals: aircraft identification, flight level, position (including ATS route designator or the track code) and intentions, on the frequency in use and on 121.5 MHz (or, as a backup, on the inter-pilot air-to-air frequency 123.450 MHz);

c) Watch for conflicting traffic both visually and by reference to ACAS (if equipped);

   Note: If, as a result of actions taken under the provisions of b) and c), the pilot determines that there is another aircraft at or near the same flight level with which a conflict may occur, then the pilot is expected to adjust the path of the aircraft, as necessary, to avoid conflict.

d) Turn on all aircraft exterior lights (commensurate with appropriate operating limitations);

e) For deviations of less than 9.3 km (5 NM) from the originally cleared track or route remain at a level assigned by ATC;

f) For deviations greater than or equal to 9.3 km (5 NM) from the originally cleared track or route, when the aircraft is approximately 9.3 km (5 NM) from track or route, initiate a level change in accordance with the table below;

g) If the pilot receives clearance to deviate from cleared track or route for a specified distance and, subsequently, requests, but cannot obtain a clearance to deviate beyond that distance, the pilot should apply a 300 ft vertical offset from normal cruising levels in accordance with the table below before deviating beyond the cleared distance.

h) When returning to track or route, be at its assigned flight level when the aircraft is within approximately 9.3 km (5 NM) of the centre line; and

i) If contact was not established prior to deviating, continue to attempt to contact ATC to obtain a clearance. If contact was established, continue to keep ATC advised of intentions and obtain essential traffic information.

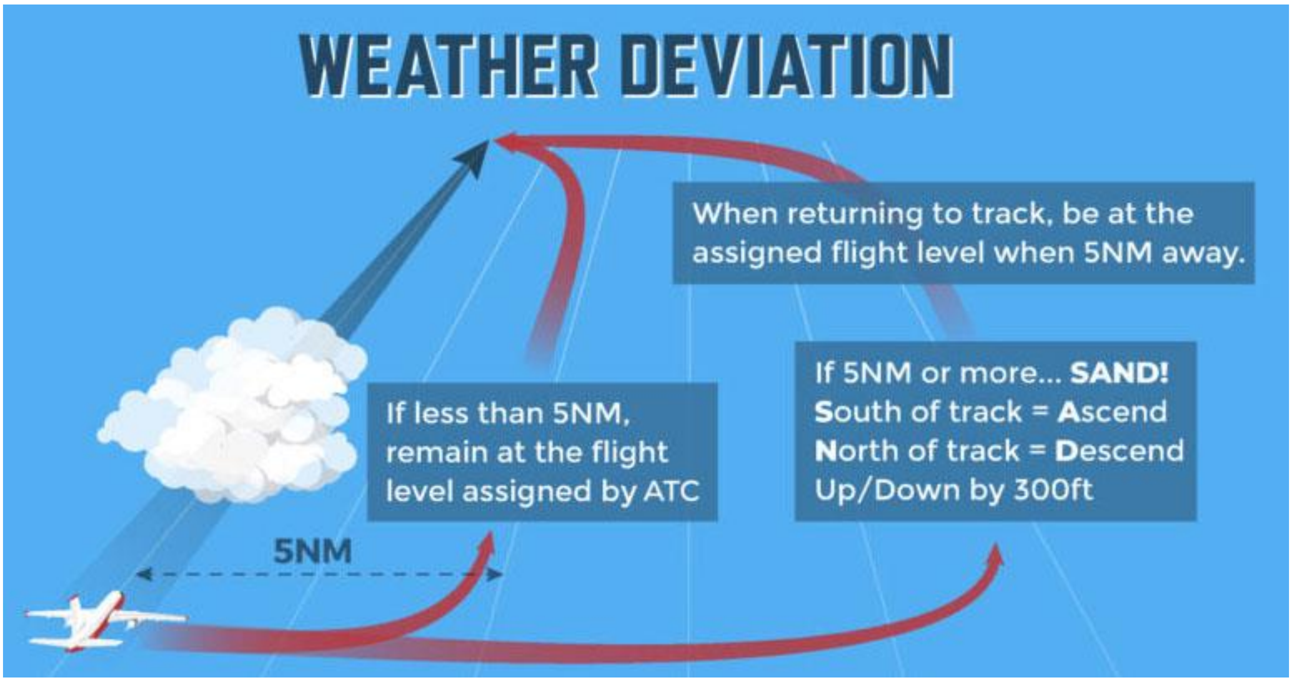
- If flying generally eastbound (i.e. a magnetic track of 000° to 179°) and deviating left (i.e. north) of track then descend 300 ft; or, if deviating right (i.e. south) of track then climb 300 ft.

- If flying generally westbound (i.e. a magnetic track of 180° to 359°) and deviating left (i.e. south) of track then climb 300 ft; or, if deviating right (i.e. north) of track then descend 300 ft.

The following Tables summarise:

TRACK (EASTBOUND)	DEVIATIONS > 10 nm	LEVEL CHANGE
000°-179° magnetic	LEFT of TRACK	DESCEND 300 ft
000°-179° magnetic	RIGHT of TRACK	CLIMB 300 ft

TRACK (WESTBOUND)	DEVIATIONS > 10 nm	LEVEL CHANGE
180°-359° magnetic	LEFT of TRACK	CLIMB 300 ft
180°-359° magnetic	RIGHT of TRACK	DESCEND 300 ft



ATC must be informed when the weather deviation is no longer required, or when a weather deviation has been completed and the aeroplane has returned to the centre line (or previously adopted SLOP offset) of its cleared route.

9.3.6.5 ACAS/TCAS Alerts and Warnings

9.3.6.5.1 Reporting Resolution Advisories (RAs)

All Resolution Advisories (RAs) should be reported to ATC both verbally as soon as practicable, and also, in writing, to the Controlling Authority after the flight has landed.

9.3.6.5.2 Possible Traffic Alerts (TAs) Resulting from ATC Use of the 5 minutes GNSS Climb/Descent Through Procedure

TCAS registers targets up to 40 nm. Depending upon OAT/ambient air density, a Mach of about 0.85 equates to a TAS of approximately 480 kts, or 8 nm per minute. Since the longitudinal separation standard employed in the North Atlantic is 10 minutes, pilots would consequently not normally expect their TCAS to register targets at the same level, whether these are in trail, crossing, climbing or descending through their level. However, since January 2009, some NAT ATC units are utilising a procedure which permits ATC to clear an aeroplane to climb or descend through the level of another aeroplane, with as little as 5 minutes longitudinal separation, provided that both aeroplanes are using GNSS (GPS) for position determination and reporting. Many NAT aeroplanes request and are cleared at lesser Mach Numbers than M0.85. An in-trail separation of five minutes between two aeroplanes flying at M0.80 and experiencing a headwind component of 30 KTS (not unusual for westbound NAT flights) will equate to approximately 35 nm. Furthermore, depending upon the rounding/truncating protocols used by pilots, FMS and/or ATC Flight Data Processing Systems (for 'minutes and seconds' to 'minutes'), a nominal 5 minutes separation can in fact be close to an actual 4 minutes (it can, of course, also be 6 minutes). In such a circumstance the actual longitudinal separation could be less than 30 nm. In these cases TCAS may register targets.

The rule allowing ATC to use this procedure includes a caveat that the climb or descent needs to be undertaken within 10 minutes of the time that the second aeroplane in the pair has passed a common reporting point. Consequently, the pilot of an aeroplane cleared for a climb or descent of more than a single flight level should be alerted to the possibility of a potential TCAS alert by the controller's use of the conditional phrase "BY" or "AT OR BEFORE" in the clearance received.

However, the pilot of the 'passive participant' aeroplane of the 5 minutes separated pair, if it is the following aeroplane, could be presented with a 'pop-up' TCAS target without such a warning.

The bulletin announcing the introduction of this procedure in the North Atlantic includes the following instruction:

"If there is any concern regarding the proximity of another aeroplane, flight crews must not hesitate to clarify the situation and take appropriate action to ensure the safety of the flight."

However, given the air/ground communications methods employed in the NAT, the pilot may not receive a response to such a request for "clarification" prior to the other aeroplane passing its flight level. Nevertheless, even at these separations, RAs are not anticipated and it is not expected that pilots will consider deviating from their clearance as "appropriate action".

9.3.7 Monitoring and Reporting

9.3.7.1 Horizontal Navigation Errors

Operators are required to investigate all occurrences of GNEs (errors of 25 nm or greater), and it is imperative, whether these are observed on ground radar, via ADS reports or by the flight crew, that the cause(s) of track deviations be established and eliminated. Therefore, it will be necessary to keep complete in-flight records so that an analysis can be carried out.

Operators' documentation must provide all the information required to reconstruct any flight, if necessary, some weeks later. Specific requirements could include:

- Details of the initial position inserted into the Flight Management System, IRS or INS equipment plus the original flight planned track and flight levels;
- All ATC clearances and revisions of clearance;
- All reports (times, positions, etc.) made to ATC;
- All information used in the actual navigation of the flight: including a record of waypoint numbers allocated to specific waypoints, plus their associated ETAs and ATAs;
- Comments on any problems (including those concerning navigation) relating to the conduct of the flight, plus information about any significant discrepancies between IRS/INS displays, other equipment abnormalities and any discrepancies relating to ATC clearances or information passed to the aeroplane following ground radar observations;
- Detailed records of any contingency manoeuvres/procedures undertaken by the pilot;
- Sufficient information on accuracy checks to permit an overall assessment of performance. Records of terminal (i.e. residual) errors and of checks made against navigation facilities immediately prior to entering oceanic airspace; details of any manual updates made to IRS/INS units;
- Where available, navigational and performance data contained in the aeroplane's flight data recorders.

9.3.7.2 Height-Keeping Errors

The vertical navigation performance of operators within NAT HLA Airspace is monitored on a continual basis by the NAT CMA. Such monitoring includes both measurement of the technical height keeping accuracy of RVSM-approved aeroplanes and assessment of collision risk associated with all reported operational deviations from cleared levels.

All identified operational situations or errors which lead to aeroplanes deviating from ATC cleared levels are subject to thorough investigation. Follow-up action after flight is taken with the operator of the aeroplanes involved, to establish the reason for the deviation or cause of the error and to confirm the approval of the flight to operate in NAT HLA and RVSM Airspace. Operational errors, particularly those in the vertical plane, can have a significant effect on risk in the system. For their safety and the safety of other users, crews are reminded of the importance of co-operating with the reporting OAC in the compilation of appropriate documentation including the completion of an 'Altitude Deviation Report Form' (see NAT Doc 007 Attachment 2 for details).

9.3.7.3 Monitoring of ACAS/TCAS Performance

ACAS/TCAS can have a significant effect on ATC. Therefore, there is a continuing need to monitor the performance of ACAS/TCAS in the developing ATM environment. or other significant ACAS/TCAS event, All Resolution Advisories (RAs) should be reported to ATC:

a) Verbally, as soon as practicable; and

b) In writing, to the Controlling Authority, after the flight has landed, using the necessary procedure and forms, including, when appropriate, the 'Altitude Deviation Report Form'

Aeroplane operators should submit a Form 30 Occurrence Report (see also Part 1 Chapter 9.3.6.5.1).

9.3.8 NAT HLA Training Syllabus

Flight crews who are required to operate in NAT HLA airspace are required to undergo additional training. Elements of NAT HLA training should be conducted during:

- Conversion Training;
- Route Competence Training;
- Recurrent Ground and Refresher Training;

9.3.8.1 NAT HLA Ground Training

NAT HLA Ground Training should include the following topics:

- Extent and scope of NAT HLA airspace;
- Operational approval and aeroplane system requirements for flight in NAT HLA Airspace including:
  1) Navigational requirements for unrestricted NAT HLA operations;
  2) Longitudinal navigation;
  3) Lateral navigation;
  4) Routes and arrangements for aeroplanes not appropriately equipped.
- The Organised Track System (OTS):
  1) Construction;
  2) The NAT Track Message;
  3) OTS changeover periods.
- Other routes and route structures within or adjacent to NAT HLA airspace:
  1) "Blue Spruce" routes;
  2) "Tango" routes;
  3) North American routes (NAR);
  4) Oceanic transition areas.
- Flight planning;
- Oceanic ATC clearances;

- Communications and position reporting;
- Application of Mach number technique.
- NAT HLA operations and navigation, including:
  1) General procedures:
     i) Accurate time check;
     ii) The use of a master document;
     iii) Position plotting;
     iv) Step-climb.
  2) Pre-flight procedures:
     i) Navigation system initiation;
     ii) GNSS systems.
  3) In-flight procedures:
     iii) Oceanic clearance;
     iv) Entering NAT HLA airspace;
     v) Routine monitoring;
     vi) Chart plotting including Equal Time Point (ETP) or Critical Point (CP)
     vii) Leaving oceanic airspace.
  4) Special in-flight procedures:
     i) CPDLC Route Clearance Uplinks;
     ii) Strategic Lateral Offset Procedure (SLOP);
     iii) Avoidance of distractions from monitoring;
     iv) Use of True Track;
     v) Deliberate Deviations from Track;
  5) Post-flight procedures;
  6) Horizontal navigation performance monitoring.
- RVSM operations in NAT HLA airspace, including:
  1) Pre-flight checks;
  2) Preparing for entry into RVSM airspace;
  3) Flying in RVSM airspace;
  4) Equipment failures and contingency procedure;
  5) Vertical navigation performance monitoring.
- Procedures in the case of navigation equipment failure or degradation, including:
  1) Detection of failures;
  2) Partial and/or complete loss of navigational capability.
- Contingency procedures, including:
  1) General procedures;
  2) Severe weather;

3) Wake turbulence;
4) ACAS alerts.

9.3.8.2 Route Competence Training and Qualification

Flight in NAT HLA airspace requires a Route Competence qualification for both commanders and co-pilots. The qualification must be obtained during an actual flight in NAT HLA airspace.

9.3.8.3 Recurrent Training

Though there is no specific requirement for recurrent NAT HLA training, operators shall ensure flight crew undergo NAT HLA ground refresher training at regular intervals.

NAT HLA operations should be included in aeroplane/STD training whenever possible and Line Oriented Flying Training (LOFT) is a particularly suitable vehicle.

9.3.9 Flight Preparation Checklist for Pilots not Current in NAT HLA Airspace Operations

This sub-chapter is designed to assist pilots who may lack current experience of operating in NAT HLA Airspace to prepare for planning such flights.

- Confirm aircraft has operational approval from the IOMAR (refer to Operations Specification Certificate) required for intended flight, i.e. RVSM, NAT HLA and RNAV10/RNP 4?
- Confirm ATC Flight Plan is correctly filed including the required equipment/approval status:-
  - Field 10a must include 'R' (PBN), 'W' (RVSM), 'X' (NAT HLA).
  - Field 10a must also identify the communications capabilities e.g. 'J2' – 'J7' (FANS 1/A) and 'P1' – 'P9' (RCP specification).
  - Field 10b must identify the surveillance capabilities e.g. ADS-B and 'D1' of 'G1' (ADS-C (FANS 1/A))
  - Field 18 must denote the appropriate PBN specification, e.g. PBN/A1 (RNAV 10) or PBN/L1 (RNP 4) and if FANS 1/A+ approved, SUR/XXX where XXX equals the RSP specification (usually 180).
- If the intended route follows an organised track: -
  - Is the aircraft approved for FANS 1/A or FANS 1/A+ (PCBS), and
  - Do you have a copy of the valid track message, including when applicable, any 'TMI Alpha Suffixed' changes to it? (Bear in mind that the OTS changes every 12 hours).
- Ensure you are familiar with the Mach Number Technique?
- Have you had an accurate time check referenced to UTC, and is the system you will be using on the flight deck for NAT HLA operation also accurately referenced to UTC? Is this time accuracy going to be maintained for the planned duration of the flight?
- If using GPS, have you checked the latest NOTAMs regarding the serviceability of GPS satellites and have you performed a Satellite Navigation Availability Prediction Programme analysis?
- If flying via the special 'Blue Spruce Routes', have you checked the serviceability of your one remaining LRNS and of your short range navigation systems plus the ground navigation aids which you will use?

- If flying a non-HF equipped aeroplane, is your route approved for VHF only?
- If flying other than on the special routes, are you sure that both your LRNSs are fully operational?
- Have you planned ahead for any actions you might need to take should you suffer a failure of one LRNS?
- Are you sure that both your primary altimetry systems and at least one altitude alerter and one autopilot are fully operational?
- Are you familiar with the required procedures for flight at RVSM levels?

Note: If, as a pilot, you have any doubt about your answers to these questions, it may be necessary for you to consult with the operator or consult with the IOMAR.

9.3.10 Avoiding Errors in the NAT Region

Since 1977, when the MNPS rules were introduced, careful monitoring procedures have provided a good indication both of the frequency with which navigation errors occur and their causes. Their frequency is low: only one flight in around ten thousand commits a serious navigation error. However, because of the accuracy and reliability of modern navigation systems, the errors which do occur are most often seen to be as a result of aircrew error.

This section is intended to help air operators transiting North Atlantic oceanic airspace avoid making commonly observed operational errors. These include Gross Navigation Errors (lateral deviations of 10 NM or more in the North Atlantic), Large Height Deviations (300 feet or more) and Erosion of Longitudinal Separation. The following recommendations, resources, and tips may be useful in preventing these errors and should be addressed in initial and recurrent ground training. The Sample Oceanic Checklist (NAT OPS Bulletin 2017-005) and the Global Operational Data Link Document (ICAO Doc 10037, GOLD Manual) are both excellent references for oceanic flying. Additional recommendations address General considerations when operating in the North Atlantic, Flight Planning, and SLOP', also

- 'Crews should be familiar with CPDLC loadable route clearance uplink messages and to respond to "CONFIRM ASSIGNED ROUTE" messages properly using automated prompts not free text.'
- 'Ensure all flight crew members are briefed on details of route amendments.'
- 'Carefully manage the Master Flight Plan Document, especially when there is a route amendment. Many errors involve flying the operator-filed route, rather than the ATC-cleared route.'
- 'Operators should flight plan to avoid turbulence and convective activity. Coordinate with ATC early for weather deviations to reduce the need to execute published weather deviation procedure.'
- 'Review climb and descent clearances carefully: some conditional clearances start with "MAINTAIN FL XXX," and then describe the condition. Also, be sure to understand the meaning of "AT" and "BY".'

"AT" means:

*"After passing" when referring to a **position**, or*

*"Not before" when referring to a **time**.*

BY" means:

*"Before passing" when referring to a **position**, or*

*"Not later than" when referring to a **time**.*

It is therefore essential that crews do not take modern technology for granted. They should at all times, especially during periods of low workload, guard against complacency and over-confidence, by adhering rigidly to approved cockpit/flight deck procedures which have been formulated over many years, in order to help stop operational errors from being an inevitability.

This sub-chapter lists some of the errors that have been recorded in the NAT during recent years. Also the NATSPG commissioned the UK National Air Traffic Services to produce an updated interactive DVD ROM, "Track Wise", which highlights many of the common errors and discusses their causes. The DVD ROM additionally contains general information on Air Traffic Control in the North Atlantic Region.

9.3.10.1 Operational Height Errors

9.3.10.1.1 Common Causes of Operational Height Errors

The most common height errors are caused by:

- Executing an un-cleared climb; e.g. the crew of an aeroplane entering Reykjavik OCA from Edmonton FIR encountered HF Blackout conditions prior to reaching the Reykjavik OCA boundary and before receiving an Oceanic Clearance. During the subsequent more than two hours of flight in the NAT HLA, the crew executed two step-climbs before re-establishing contact with ATC.
- Aeroplanes following an ATC clearance are assured of separation from other potentially conflicting traffic. In HF Blackout conditions if an aeroplane unilaterally changes level, ATC has no means to advise or intervene with other traffic and separation can no longer be assured. In such a circumstance, if a climb without ATC clearance is imperative then this should be treated as a contingency and the appropriate track offset of 15 nm should be flown.
- Misinterpreting an ATC acknowledgement of a request as a clearance; e.g. a crew requested a step-climb from Shanwick OAC using HF Voice through the Shannon aeradio station. The radio operator acknowledged the request to the aeroplane and forwarded it to the Shanwick controller for review and action. The crew interpreted the radio operator's acknowledgement as an approval of the request and immediately executed the step-climb. The controller subsequently denied the request due to conflicting traffic with inadequate longitudinal separation at the requested higher level. The requesting aeroplane had reached the new level and therefore violated separation minima before receiving the denial. Similar incidents have occurred during NAT CPDLC trials when crews have misinterpreted a technical acknowledgement of a data link request for an ATC approval.
- It is important that crews understand all HF voice oceanic communications such as position reports or flight crew requests go through a radio operator. The radio operator is not an air traffic controller. Radio operators must relay all reports and requests to ATC for approval and processing. The pilot read-back to the radio operator MUST be verbatim. Radio operators usually maintain a continuous air-ground communication watch on more than one single frequency therefore it is useful for flight crews to state the frequency used when placing the initial call to the radio station.
- Crews should understand proper responses for CPDLC messages, especially ones being used more frequently in the NAT, such as:
    a) "CLEARED TO {position} VIA ROUTE CLEARANCE" or "CLEARED ROUTE CLEARANCE." Some cockpits display the uplinked points only when "LOAD" is selected. Once LOAD is selected and the crew confirms it loads properly and is acceptable, they should select "ACCEPT/WILCO" followed by "EXECUTE/INSERT" to activate the amended route in the FMS. It is vital to understand the menu hierarchy and how to load CPDLC clearances.

b) "CONFIRM ASSIGNED ROUTE." Ensure the entire oceanic route is loaded in the FMS before responding to this message. Use the automated response, not free-text.

Conditional clearances sent via CPDLC require special attention. The following is typical scenario where a CPDLC "future execution" conditional clearance is misapplied.

At approximately 1133Z the following CPDLC message was sent to the flight:

```
MAINTAIN FL370
AT 1205 CLIMB TO AND MAINTAIN FL390 CLIMB TO REACH FL390 BY 1215
REPORT LEVEL FL390
```

The expected WILCO response was received by the controller.

At approximately 1134Z, the controller received a Level Range Deviation Event ADS-C notification, indicating a climb inconsistent with the clearance. Shortly thereafter, the controller received a "LEVEL FL390" message.

This scenario often results in violating the minimum standard separation between aircraft.

- When CPDLC is unavailable and air/ground ATS communications are via a third party (whether radio operator or data link service provider) crews must be aware that acknowledgements of requests do not constitute approval.
- Not climbing or descending as cleared; e.g. a crew was cleared for a climb to cross 4030W at FL350. The crew misinterpreted the clearance and took it to mean climb to cross 40°N 30°W (instead of 40° 30'W) at FL350.

  While this was caused by a seemingly ambiguous clearance, crews must be on their guard and should resolve any questions that they have regarding the clearance prior to initiating any action. If crews do not fully understand the CPDLC clearance, or the clearance is unexpected, such as a flight level (FL) change without having requested one, they should revert to voice communication.
- Crews should be aware of the risks of non-compliance with a clearance, or with a restriction within a clearance. A significant number of height deviations have been reported where an aeroplane had been cleared to change level after the next route waypoint and has done so immediately or has been cleared to change level immediately and had not done so until a later time. Both cases can very easily result in the loss of safe separation with other traffic. Such instances are often, but by no means exclusively, associated with misinterpretation of CPDLC message sets (a crew training/familiarity issue) whereby the words AT or BY are interpreted differently from their intended meaning. This is a problem particularly (but not exclusively) with crew members whose first language is not English. It is compounded in the cases of languages which have no directly equivalent words to differentiate between AT or BY, or perhaps use the same word for each (this is apparently true of a number of European languages, for example). The dangers associated with misinterpretation of conditional clearances must be appreciated. If an aeroplane climbs or descends too soon or too late it is almost inevitable that it will lose separation with the other traffic that was the reason for the condition being applied by ATC.
- Not following the correct contingency procedures; e.g. following an engine failure a crew descended the aeroplane on track rather than carrying out the correct contingency procedures.
- Particularly when flying in the OTS, crews must appreciate that there is a significant likelihood of conflict with other aeroplanes at lower levels unless the appropriate contingency offset procedure is adopted.
- Entering the NAT HLA at a level different from that contained in the received Oceanic Clearance; e.g. a crew flying through Brest FIR at FL310 en route to the Shanwick OCA boundary received an oceanic clearance for FL330. The crew requested a climb from Brest but it had not been received when the aeroplane reached the Shanwick boundary. The crew

elected to continue into the NAT HLA at FL310. Separation was immediately lost with a preceding aeroplane at that flight level.

- Crews are responsible for requesting and obtaining any domestic ATC clearance necessary to climb (or descend) to the initial flight level specified in their received Oceanic Clearance, prior to reaching the oceanic boundary. While adjacent ACCs generally use their best endeavours to get an aeroplane to its oceanic level before the boundary, it must be recognised that entry into NAT HLA at the cleared oceanic level is entirely the responsibility of the crew. It does appear from the relative frequency of this type of error that this is not widely understood. It should also be appreciated that such requests must be made sufficiently early to allow the domestic ATC unit time to respond.
- An occasional error is to fly at one (un-cleared) level and report at the (different) cleared level; e.g. the crew of a major airline reported at FL360 (the cleared level) all the way across the ocean but were in fact flying at FL350!! They had been cleared to cross 40°W at FL360 and correctly entered the cleared level into the FMC but did not execute the command prior to 40°W. During position reporting the aeroplane level was reported by reference to the FMC altitude hold box.
- Without SSR ATC must rely upon crew position report data to plan for the safe separation of all traffic. If any such data is in error, actual separations can be compromised.
- It is important to note that on some aircraft displays the CPDLC uplink message may be more than 1 page in length (requires "paging" through the display). Review the entire message carefully before taking any action. Flight crews may choose to print the message, but the display message on the appropriate flight deck display is the controlling document.

  NOTES:

  1) Page acknowledgements may be unique to the avionics installed in a particular aircraft. For example, on some installations, crews cannot ACCEPT/WILCO until the last page of a message is reviewed, while in other installations, ACCEPT/WILCO may be allowed on the first page.
  2) Corruptions of the CPDLC message could occur when printed and the printout may not contain an exact copy of the displayed CPDLC message with required reliability.

9.3.10.2 Lateral Navigation Errors

9.3.10.2.1 Common Causes of Lateral Navigation Errors

The most common causes of Gross Navigational Errors (GNEs), in approximate order of frequency, have been as follows:

- Having already inserted the filed flight plan route co-ordinates into the navigation computers, the crew have been re-cleared by ATC, or have asked for and obtained a re-clearance, but have then omitted to re-programme the navigation system(s), amend the Master Document or update the plotting chart accordingly. There should only be one Master Flight Plan Document on the flight deck. It should be labeled "Master" and should always reflect the current cleared route of flight.
- A mistake of one degree of latitude has been made in inserting a forward waypoint. There seems to be a greater tendency for this error to be made when a track, after passing through the same latitude at several waypoints (e.g. 57°N 50°W, 57°N 40°W, 57°N 30°W) then changes by one degree of latitude (e.g. 56°N 20°W). Other circumstances which can lead to this mistake being made include receiving a re-clearance in flight;
- The autopilot has been inadvertently left in the heading or de-coupled mode after avoiding weather, or left in the VOR position after leaving the last domestic airspace VOR. In some cases, the mistake has arisen during distraction caused by SELCAL or by some flight deck warning indication;

- An error has arisen in the ATC Controller/Pilot communications loop, so that the controller and the crew have had different understandings of the clearance. In some cases, the pilot has heard not what was said, but what he/she was expecting to hear.
- A route amendment [issued via ACARS (ATC/ROUTE AMENDMENT), Voice, or CPDLC] is often a contributing factor to navigational errors. Crews must ensure they correctly copy the route amendment, reprogram (and execute) the FMS (or Long Range Navigation System, LRNS), update the Master Flight Plan Document and update the plotting chart. The FMS route verification should include track and distance checks on legs with new waypoints in the amended route.
- Crews must fly the route amendment (and not the filed flight plan). The pilot in command should ensure that details of the route amendment are recorded on the Master Flight Plan Document, and that all crew members are aware of any changes. With augmented crews, a disciplined and detailed changeover briefing with reference to the Master Flight Plan Document is vital.

  NOTES:

  1) NAT Doc 007, Chapter 8, contains guidance on use of a Master Flight Plan Document;
  2) Track and distance tables are available commercially for every ten degrees of longitude. Alternatively, it may be possible to obtain (from dispatch) or create (using an Electronic Flight Bag application) an updated operational flight plan, to verify new tracks and distances in the FMS.

9.3.10.2.2 Rare Causes of Lateral Navigation Errors

To illustrate the surprising nature of things which can go wrong, the following are examples of some extremely rare faults which have occurred:

- The latitude/longitude co-ordinates displayed near the gate position at one international airport were wrong;
- Because of a defective component in one of the INS systems on an aeroplane, although the correct forward waypoint latitude was inserted by the crew (51°) it subsequently jumped by one degree (to 52°);
- The aeroplane was equipped with an advanced system with all the co-ordinates of the waypoints of the intended route already in a database; the crew assumed that these co-ordinates were correct, but one was not;
- When crossing longitude 40°W westbound the Captain asked what co-ordinates he should insert for the 50°W waypoint and was told “48 50”. He wrongly assumed this to mean 48°50'N at 50°00W (when it really meant 48°N 50°W) and, as a result, deviated 50 nm from track;
- The flight crew had available to them the correct co-ordinates for their cleared track, but unfortunately the data which they inserted into the navigation computer was from the company flight plan, in which an error had been made;
- At least twice since 1989, longitude has been inserted with an error of magnitude of times 10; e.g. 100°W instead of 10°W, or 5°W instead of 50°W. Because of low angles of bank, the aeroplane departed from track without the crews being aware, and both lateral and longitudinal separations with other aeroplanes were compromised;
- A crew based at and usually operating from London Heathrow was positioned at London Gatwick for a particular flight. One pilot inadvertently loaded the Heathrow co-ordinates into the INS, instead of those for Gatwick. This initialisation error was only discovered when the aeroplane had turned back within the NAT after experiencing a GNE;
- The pilot of a flight departing from the Caribbean area input the wrong departure aerodrome coordinates prior to departure. This error was discovered when deviation from cleared route seriously eroded separation with two other opposite direction aeroplanes.

9.3.10.3 Flight Deck Drills

There are some tasks on the flight deck which can safely be delegated to one member of the crew, but navigation using automated systems is emphatically not one of them, and the commander should participate in all navigation cross-check procedures. All such cross-checks should be performed independently by at least two pilots.

9.3.10.3.1 Initialisation Errors

Always return to the ramp and re-initialise inertial systems if the aeroplane is moved before the navigation mode is selected. If after getting airborne, it is found that during initialisation a longitude insertion error has been made, unless the crew thoroughly understand what they are doing, and have also either had recent training on the method or carry written drills on how to achieve the objective, the aeroplane should not proceed into NAT HLA Airspace, but should turn back or make an en route stop.

9.3.10.3.2 Waypoint Loading Errors

9.3.10.3.2.0 General

During the monitoring of navigation performance in the NAT HLA Airspace, a number of GNEs are reported.

1) Flight Plan vs. Clearance where flying, or intending to fly the planned route instead of the cleared route contributed in 53 (20%) of the events of 2018. In most cases (31 out of the 53), deviations did not actually occur as they were prevented by an ATCO.
2) ATC coordination where an error occurring during the coordination between two ATC sectors or ANSPs contributed in 38 (14%) of the events of 2018. In almost half of those cases, deviations did not actually occur as they were prevented by an ATCO.
3) Waypoint updating involving waypoint entry or deletion errors by flight crews contributed to 37 (14%) of the events of 2018.
4) Equipment, where the failure/malfunction of a ground-based, airborne, Data-Link or other equipment contributed in 35 (13%) of the events of 2018. This contributing issue affected equally LHDs and lateral deviations.
5) Non-adherences to ATC clearances in either the vertical or the lateral dimension contributed to 25 (10%) of the 2018 events.

9.3.10.3.2.1 Waypoint Loading

Before departure, at least two pilots should independently check that the following agree: operational flight plan, ICAO flight plan, track plotted on chart, and if appropriate, the track message. In flight, involve two different sources in the cross-checking, if possible. Do not be so hurried in loading waypoints that mistakes become likely, and always check waypoints against the current ATC clearance. Always be aware that the cleared route may differ from that contained in the filed flight plan. Prior to entering the NAT HLA ensure that the waypoints programmed into the navigation computer reflect the Oceanic Clearance received and not any different previously entered planned or requested route.

Adding additional waypoints to the active route, e.g., to depict Equal Time Points (ETPs), even if along the route, can produce nuisance out-of-conformance alerts on ground-based monitoring systems. Also, crew misunderstanding about these additional waypoints has occasionally led to pilot deviations from the cleared route.

It is strongly recommended that a plotting/orientation chart be used and procedures include a position check 10 minutes after each waypoint. Compare all waypoints on the chart against the

Master Flight Plan Document this would help in the early identification of errors before getting too far from track.

Consider making a simple use of basic DR Navigation as a back-up. Outside polar regions, provided that the magnetic course (track) is available on the flight log, a check against the magnetic heading being flown, plus or minus drift, is likely to indicate any gross tracking error.

Always remember that something absurd may have happened in the last half-hour. There are often ways in which an overall awareness of directional progress can be maintained; the position of the sun or stars; disposition of contrails; islands or coast-lines which can be seen directly or by using radar; radio navigation aids, and so forth. This is obvious and basic, but some of the errors which have occurred could have been prevented if the crew had shown more of this type of awareness.

If the crew suspects that equipment failure may be leading to divergence from cleared track, it is better to advise ATC sooner rather than later.

In conclusion, navigation equipment installations vary greatly between operators; but lessons learned from past mistakes may help to prevent mistakes of a similar nature occurring to others in the future.

9.3.10.4 Prevention of Track Deviations Due to Waypoint Insertion Errors

Waypoint insertion errors can be virtually eliminated if all operators/crews adhere at all times to approved operating procedures and cross-checking drills. These Standards and Procedures provide a considerable amount of guidance and advice based on experience gained the hard way, but it is quite impossible to provide specific advice for each of the many variations of navigation systems fit.

The following procedures are recommended as being a good basis for NAT HLA operating drills/ checks:

- Record the initialisation position programmed into the navigation computer. This serves two purposes:
    - i) It establishes the starting point for the navigation computations; and
    - ii) In the event of navigation difficulties it facilitates a diagnosis of the problem.
- Ensure that your flight log has adequate space for the ATC cleared track co-ordinates, and always record them. This part of the flight log then becomes the flight deck Master Document for:
    - i) Read back of clearance;
    - ii) Entering the route into the navigation system;
    - iii) Plotting the route on your chart.
- Plot the cleared route on a chart with a scale suitable for the purpose (e.g. Jeppesen, NOAA en route charts). This allows for a visual check on the reasonableness of the route profile and on its relationship to the OTS, other aeroplane tracks/positions, diversion aerodromes, etc.
- Plot your Present Position regularly on your chart. This may seem old-fashioned but, since the present position output cannot normally be interfered with and its calculation is independent of the waypoint data, it is the one output which can be relied upon to detect gross tracking errors. A position should be checked and preferably plotted approximately 10 minutes after passing each waypoint, and, if circumstances dictate, midway between waypoints, e.g. if one system has failed.
- Check the present, next and next plus one waypoint co-ordinates as shown on the Master Document against those in the steering CDU before transmitting position reports (in

performing these checks review the LRNS stored co-ordinates in expanded Lat/Long format (not abbreviated ARINC 424 format).

- Check the LRNS indicated magnetic heading and distance to the next waypoint against those listed on the Master Document.
- In NAT airspace where unnamed, half-degree of latitude waypoints are used, waypoint display labels can be misleading (minutes can be truncated or rounded) and/or the FMC can create a generic label). It's imperative that crews check the expanded coordinates of all oceanic waypoints. Custom waypoints in aircraft navigation databases for half-degree of latitude points should NOT use ARINC 424 paragraph 7.2.5 "Nxxyy" naming, but instead "Hxxyy" See NAT OPS Bulletin 2018-003, "Waypoint Insertion/Verification Special Emphasis Items

The procedures outlined above will assist in detecting any incipient gross errors, providing that the recorded/plotted cleared route is the same as that provided by the controlling ATS authority. If there has been a misunderstanding between the pilot and controller over the actual route to be flown (i.e. an ATC loop error has occurred), then the last drill above, together with the subsequent passing of the position report, will allow the ATS authority the opportunity to correct such misunderstanding before a hazardous track deviation can develop. The vast majority of instances of waypoint insertion errors occur when the ATC cleared oceanic route segment differs (partly or wholly) from that included in the filed flight plan or that requested by the pilot. Thorough and diligent checking and cross-checking, by more than one crew member, of the waypoints entered into the navigation computer, against the received Oceanic Clearance would eliminate most of these unnecessary and avoidable errors.

9.3.10.5 Accurate Speed

9.3.10.5.1 Maintain Assigned Mach Number

Most oceanic clearances include a specific Mach number. The increased emphasis on longitudinal separation requires crew vigilance in a separation based on assigned Mach. The requirement is to maintain the true Mach which has been assigned by ATC, In most cases, the true Mach is the indicated Mach. Some aeroplanes, however, require a correction factor.

Operations without an assigned fixed speed (OWAFS) were implemented in July 2019. This implementation allows ATC to issue the clearance RESUME NORMAL SPEED after oceanic entry that allows the flight crew to select a cost index (ECON) speed instead of a fixed Mach number with the condition that ATC must be advised if the speed changes by plus or minus Mach .02 or more from the last assigned Mach number.

Note: Until being cleared to RESUME NORMAL SPEED, crews must ensure they fly the assigned Mach.

9.3.10.6 Lessons to be Learned

Never relax or be casual in respect of cross-check procedures. This is especially important towards the end of a long night flight.

Avoid casual R/T procedures. A number of GNEs have been the result of a misunderstanding between pilot and controller as to the cleared route and/or flight level. Adhere strictly to proper R/T phraseology and do not be tempted to clip or abbreviate details of waypoint co-ordinates.

Make an independent check on the gate position. Do not assume that the gate co-ordinates are correct without cross-checking with an authoritative source. Normally one expects coordinates to be to the nearest tenth of a minute. Therefore, ensure that the display is not to the hundredth, or in minutes and seconds. If the aeroplane is near to the Zero Degree E/W (Greenwich) Meridian, remember the risk of confusing east and west.

Before entering Oceanic Airspace make a careful check of LRNS positions at or near to the last navigation facility – or perhaps the last but one.

Never initiate an on-track un-cleared level change. If a change of level is essential and prior ATC clearance cannot be obtained, treat this situation as a contingency and execute the appropriate contingency offset procedure, when possible before leaving the last cleared flight level. Inform ATC as soon as practicable.

Do not assume that the aeroplane is at a waypoint merely because the alert annunciator so indicates. Cross-check by reading present position.

Crews must be alert for similar sounding named oceanic waypoints (e.g. PITAX versus BERUX). Also, crews should note that oceanic tracks often contain two subsequent named waypoints (e.g., DOGAL BEXIT).

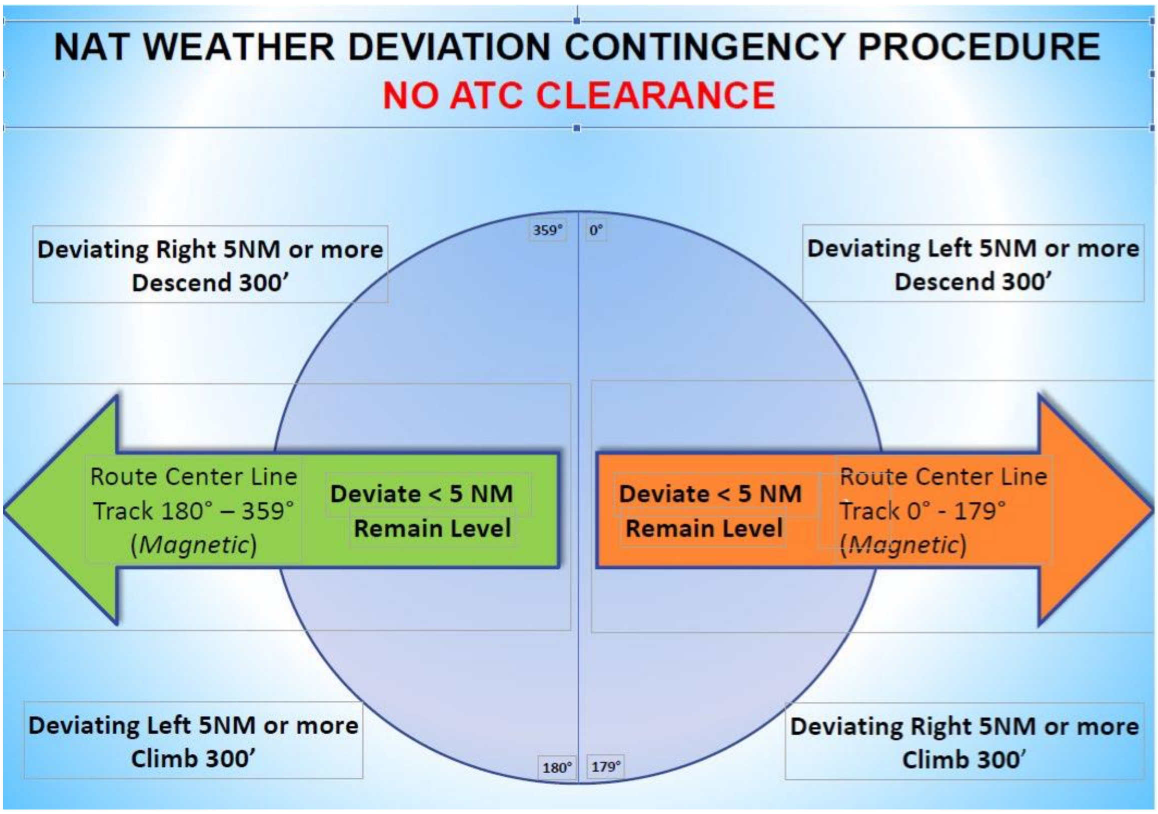
When providing position reports via voice, crews must notify a revised estimate to ATC if a previously notified estimate is found to be in error by 3 minutes or more (see Annex 2 and ICAO Doc 7030). Accurate position reports are essential to procedural air traffic control.

NOTE: Time restrictions issued by ATC must be strictly adhered to. A restriction is issued to ensure required spacing between two aircraft is maintained.

Crews are reminded that the NAT contingency procedures that took effect March 2019 (NAT OPS Bulletin 2018-005_Rev01) include 5 NM lateral offset contingency procedures. This is now a global procedure published in NAT Doc 007, chapter 13, and in Chapter 15 of Procedures for Air Navigation – Air Traffic Management (PANS-ATM, Doc 4444).

Weather Deviation Procedures utilizing a vertical displacement of +/- 300 feet when reaching or exceeding 5 NM offset from the cleared track are likewise a global procedure, also published in chapter 13 of NAT Doc 007. It is important for pilots to understand that the ICAO published Weather Deviation Procedure is a contingency and should only be flown when an ATC clearance cannot be obtained. It is also important that pilots understand that any ATC clearance to deviate for weather should be done at the ATC-cleared altitude, without any vertical displacement.

NOTE: For weather deviations, even less than 5 NM, the pilot must request clearance from ATC. However, if ATC clearance cannot be obtained and a deviation becomes necessary, pilots must follow published ICAO Weather Deviation Procedures.



Keep Advising nearby aircraft at suitable intervals on 121.5/123.45, "Weather Deviation in-progress, position, FL and Intentions"

If more NM required, reference request from original cleared course

Once clear of weather, report "Clear of Weather, Request direct XXXXX and FL XXX"

If returning to original course, report "Clear of Weather, Returning to course"

When <5NM from original course, return to original cleared FL

When back on original course, report "Weather deviation complete. Back on course"

9.4 Operations in PBN Airspace

9.4.0 General

This sub-chapter is intended to provide guidance and information to the aircraft operator to provide an appropriate level of understanding of the concepts, procedures and limitations associated with the range of airspace types for which specific navigation approvals are required.

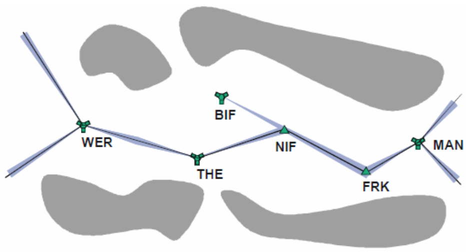
It describes the evolution of the concept of area navigation, originally based on fixed, ground-based radio aids, into Performance-based Navigation (PBN); the associated methods of specifying navigational performance requirements, and the way airspace volumes are designated to reflect such requirements. The navigational equipment currently available to meet the various PBN requirements is outlined.

Each type of airspace designation for which a specific approval is required is described, with the relevant aeroplane navigational equipment requirements and the associated operational and contingency procedures. Radiotelephony procedures specific to PBN operations are described.

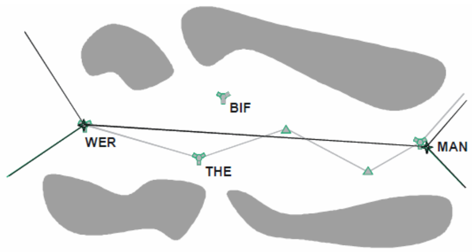
It is essential that operators understand that operations in PBN airspace may not be carried out unless a specific approval for that PBN (e.g. RNP 4; RNAV 1, etc.) has been issued by the IOMAR for the individual aircraft. Airworthiness and Operational criteria must be demonstrably satisfied before such approval can be issued; the fact that the associated navigational equipment is fitted and certified is not sufficient, and crew training is an essential element of the operational requirements for such approvals.

9.4.0.1 Area Navigation (RNAV)

Area Navigation (RNAV) is a method of navigation which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these.



Conventional Navigation



RNAV navigation

RNAV systems have evolved in a manner similar to conventional ground-based routes and procedures. A specific RNAV system was identified and its performance was evaluated through a combination of analysis and flight testing. For domestic operations, the initial systems used very high frequency omnidirectional radio range (VOR) and distance measuring equipment (DME) for estimating their position; for oceanic operations, inertial navigation systems (INS) were employed. These 'new' systems were developed, evaluated and certified. Airspace and obstacle clearance criteria were developed based on the performance of available equipment; and specifications for requirements were based on available capabilities. In some cases, it was necessary to identify the individual models of equipment that could be operated within the airspace concerned. Such prescriptive requirements resulted in delays to the introduction of new RNAV system capabilities and higher costs for maintaining appropriate certification. To avoid such prescriptive specifications of requirements, an alternative method for defining equipage requirements by specifying the performance requirements has been developed by ICAO. This method is called Performance-based Navigation (PBN).

Note: The term 'Area Navigation (RNAV)' can be used in a generic sense, but also includes specific RNAV operations that meet the definition of Performance-based Navigation.

9.4.0.2 Performance-Based Navigation (PBN)

The PBN concept specifies that RNAV system performance requirements be defined in terms of the accuracy, integrity, availability, continuity and functionality which are needed for the proposed operations in the context of a particular airspace concept. The PBN concept represents a shift from sensor-based to performance-based navigation. Performance requirements are identified in navigation specifications, which also identify the choice of navigation sensors and equipment that may be used to meet the performance requirements. These navigation specifications are defined at a sufficient level of detail to facilitate global interoperability and harmonization by providing specific implementation guidance for States and operators.

Under PBN, generic navigation requirements are defined based on operational requirements. Options may then be evaluated in respect of available technology and navigation services which could allow the requirements to be met. Within an airspace concept, PBN requirements will be affected by the communication, surveillance and ATM environments, the NAVAID infrastructure, and the functional and operational capabilities needed to meet the ATM application. PBN performance requirements also depend on what reversionary, non-RNAV means of navigation are available, and what degree of redundancy is required to ensure adequate continuity of functions.

PBN airspace specifications are not designed for a specific sensor, but according to a navigation specification (e.g. RNAV 1). The selection of the appropriate navigation specification is based on the airspace requirements, the available NAVAID infrastructure, and the equipage and operational capability of aircraft expected to use the route.

For example, where an airspace requirement is for RNAV 1 or RNAV 2, the available navigation infrastructure could be either basic GNSS or DME/DME/IRU to meet the specification, and aircraft could utilise either to conduct operations.

9.4.0.3 The differences between RNAV and RNP

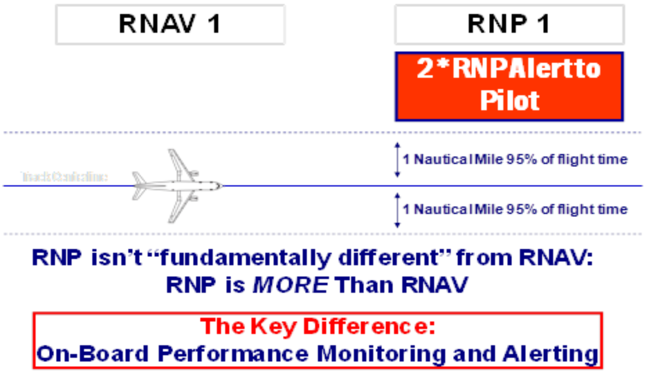
A PBN procedure, such as a terminal airspace SID or STAR or runway transition, may be described as either RNAV or RNP, each having differing airspace requirements in terms of surveillance, route spacing, obstacle assessment and ATC monitoring. From an aircraft perspective, the fundamental difference is that the RNP application requires the aircraft to have an On-board Performance Monitoring and Alerting capability (refer to Part 1 Chapter 9.4.0.7).

On the flight deck, examples of information provided to the flight crew for awareness of navigation system performance i.e. how well the aircraft is performing include "EPU", "ACTUAL", "ANP", "NSE", "PEE", and "EPE".

Examples of indications and alerts provided to the flight crew when the system has either exceeded an alert limit or else is unable to meet the requirements for monitoring the estimate of position, include "UNABLE RNP", "GPS PRIMARY LOST" or "NAV ACCUR DOWNGRAD" (on the Airbus), Loss of GNSS Integrity, etc.

Note: On today's aircraft there is no "named" On-Board Performance Monitoring and Alert in the flight crew compartment. The function is fulfilled through existing monitoring and alerting philosophies employed by the aircraft manufacturers in their navigation system design. Consequently, Flight Crew Operating Manuals typically refer to these existing alerts when describing the RNP capability of the aircraft.

Within the majority of Flight Management Systems with GNSS position updating or GNSS panel mounted navigator equipment, an algorithm provides the alerting if the navigation position is going to exceed two times the RNP navigation accuracy assigned to the route or instrument flight procedure. So even though the position updating to an RNAV system and an RNP system may meet the same navigation accuracy requirement, the RNP system can alert if that position estimate exceeds two times RNP, whereas the RNAV system cannot.



The alert on most aircraft only relates to the estimate of navigation position and not how the aircraft is tracking the defined path. This element of the requirement is placed on the flight crew and involves monitoring of the aircraft's Flight Technical Error (FTE), typically seen as lateral cross-track deviation. Depending on the RNP navigation accuracy specified, the aircraft may require FD or A/P engagement or a given CDI/MAP scaling if manually flown.

Note: Flight crew of aircraft with a lateral deviation display must ensure that lateral deviation scaling is suitable for the navigation accuracy associated with the route/procedure (e.g., full-scale deflection: +/-1 nm for RNP 1).

Flight crews are expected to maintain centrelines, as depicted by on-board lateral deviation indicators and/or flight guidance during all RNP 1 operations, unless authorised to deviate by ATC or under emergency conditions. For normal operations, cross-track error/deviation (the difference between the system computed path and the aircraft position relative to the path, i.e., FTE) should be limited to +/- ½ the navigation accuracy associated with the procedure (i.e., 0.5 nm for RNP 1). Brief deviations from this standard, such as overshoots or undershoots during and immediately after fly-by turns up to a maximum of one-times the navigation accuracy (i.e., 1.0 nm for RNP 1), are allowable.

Note: Some aircraft do not display or compute a path during fly-by turns, but are still expected to satisfy the above standard during intercepts following turns and on straight segments.

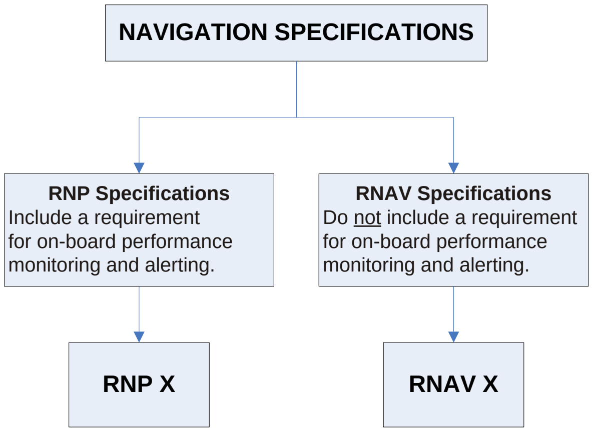
9.4.0.4 Navigation Specifications

A Navigation Specification specifies what performance is required of the RNAV system in terms of accuracy, integrity, availability and continuity; which navigation functionalities the RNAV system is required to have in order to meet the required performance; which navigation sensors must be integrated into the RNAV system in order to achieve the required performance, and the flight crew operational requirements in order to achieve the required performance from the aircraft and the RNAV system.

Under the concept of Performance Based Navigation, there are two kinds of area navigation specification:

RNAV X: A navigation specification designation that does not include a requirement for on-board performance monitoring and alerting;

RNP X: A navigation specification designation that includes requirements for on-board performance monitoring and alerting.



Note: For both RNP X and RNAV X, the expression 'X' refers to the lateral navigation accuracy in nautical miles that is expected to be achieved at least 95% of the flight time.

9.4.0.5 Approach Operations

For the Approach phase, navigation specifications cover all segments of the instrument approach. RNP specifications are designated using RNP as a prefix and an abbreviated textual suffix, e.g. RNP APCH or RNP AR APCH.

Note: There are no RNAV approach specifications.

9.4.0.6 Understanding RNAV and RNP Designations

In cases where navigation accuracy is used as part of the designation of a navigation specification, it should be noted that navigation accuracy is only one of the many performance requirements included in a navigation specification. For example, an RNAV 1 designation refers to an RNAV specification which includes a requirement for 1 nm navigation accuracy among many other performance requirements. Although the designation RNAV 1 may suggest that 1 nm (lateral) navigation accuracy is the only performance criterion to be met, this is not the case. Like all navigation specifications, the RNAV 1 specification includes all flight crew and airborne navigation system requirements.

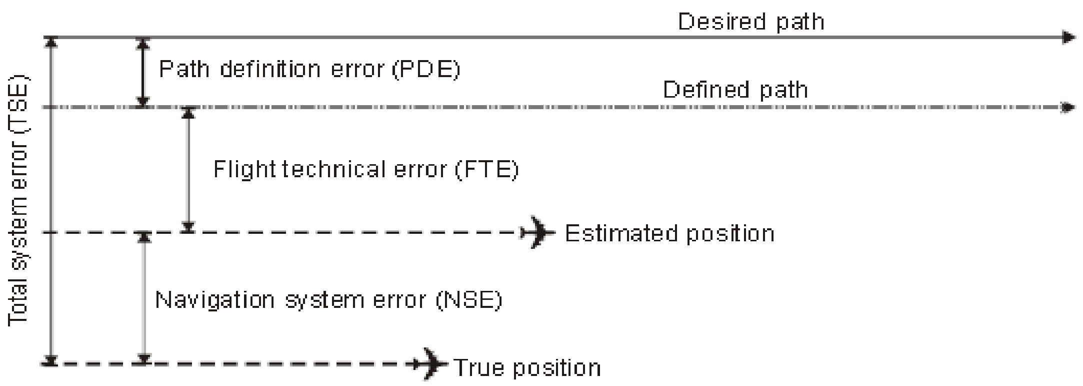
Because specific performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4). An aircraft approved to the more stringent accuracy requirements may not necessarily meet some of the functional requirements of the navigation specification having a less stringent accuracy requirement.

Note: The designations for navigation specifications are a short-hand title for all the performance and functionality requirements.

In the past, the United States and member States of the European Civil Aviation Conference (ECAC) used regional RNAV specifications with different designators. The ECAC applications (P-RNAV and B-RNAV) will continue to be used only within those States. Over time, ECAC RNAV applications will migrate towards the international navigation specifications of RNAV 1 and RNAV 5 respectively.

9.4.0.6.1 Navigation Performance Errors

Each aircraft operating in RNAV or RNP airspace must have Total System Error components in the cross-track and along track directions that are less than the RNP value for 95% of the flying time. Accuracy is defined relative to a geodetic path along the published route or defined procedure. The three error components that must be considered in complying with the accuracy requirement are the flight technical error (FTE), the Navigation System Error (NSE), and path definition error (PDE). PDE is generally negligible. The accuracy requirement must be met for the specific length of route.



9.4.0.6.1.1 Flight Technical Error (FTE)

FTE relates to the flight crew or autopilot's ability to follow the defined path or track, including any display system error (see paragraph 1.2.1.2). FTE can be monitored by the autopilot or flight crew procedures and the extent to which these procedures need to be supported by other means depends, for example, on the phase of flight and the type of operations. Such monitoring support could be provided by a map display.

Note: FTE is sometimes referred to as Path Steering Error (PSE).

9.4.0.6.1.2 Display System Error

Display System errors may include error components contributed by any input, output or signal conversion equipment used by the display as it presents either aircraft position or guidance commands (e.g., course deviation or command heading) and by any course definition entry device employed. For systems in which charts are incorporated as integral parts of the display, the display system error necessarily includes charting errors to the extent that they actually result in errors in controlling the position of the aircraft relative to a desired path over the ground. To be consistent, in the case of symbolic displays not employing integral charts, any errors in waypoint definition directly attributable to errors in the reference chart used in determining waypoint positions should be included as a component of this error. This type of error is virtually impossible to handle and in general practice, highly accurate, published waypoint locations are used to the greatest extent possible in setting up such systems to avoid such errors and reduce workload.

9.4.0.6.1.3 Path Definition Error (PDE)

PDE occurs when the path defined in the RNAV system does not correspond to the desired path; i.e. the path expected to be flown over the ground. Use of an RNAV system for navigation requires that a defined path representing the intended track is loaded into the navigation database. A consistent, repeatable path cannot be defined for a turn that allows for a fly-by turn at a waypoint, requires a fly-over of a waypoint, or occurs when the aircraft reaches a target altitude. In these cases, the navigation database contains a point-to-point desired flight path, but cannot account for the RNAV system defining a fly-by or fly-over path and performing a manoeuvre.

In contrast, when a Radius to Fix (RF) leg transition or Fixed Radius Transition (FRT) is used, as with some RNP specifications, a path can be defined and therefore PDE and FTE can be determined. Also, a deterministic, repeatable path cannot be defined for paths based on heading and the resulting path variability is accommodated in the route design.

In practice, PDE is negligible, and is not considered in the calculation of Total System Error (refer to Part 1 Chapter 9.4.0.6.1.5).

9.4.0.6.1.4 Navigation System Error (NSE)

NSE refers to the difference between the aircraft's estimated position and actual position.

Note: NSE is sometimes referred to as Positioning Estimation Error (PEE).

9.4.0.6.1.5 Total System Error (TSE)

Total System Error (TSE) is the system use error.

Mathematically, TSE = √ (NSE)2 + (FTE)2.

9.4.0.7 On-Board Performance Monitoring and Alerting

On-board performance monitoring and alerting is the main element which determines whether the navigation system complies with the necessary safety level associated with an RNP application; it relates to both lateral and longitudinal navigation performance.

On-board performance monitoring and alerting allows the flight crew to detect that the navigation system is not achieving, or cannot guarantee, the navigation performance required for the operation.

On-board performance monitoring and alerting capabilities fulfil two needs; one on board the aircraft and one within the airspace design. The assurance of airborne system performance is implicit for RNAV operations. Based upon existing airworthiness criteria, RNAV systems are only required to demonstrate intended function and performance using explicit requirements that are broadly interpreted. The result is that, while the nominal RNAV system performance can be very good, it is characterised by the variability of the system functionality and related flight performance. RNP systems, however, provide a means to minimise variability and assure reliable, repeatable and predictable flight operations.

On-board performance monitoring and alerting is concerned with the performance of the area navigation system, and it allows the flight crew to detect whether or not the RNP system satisfies the navigation performance required in the navigation specification. On-board performance monitoring and alerting relate to both lateral and longitudinal navigation performance.

'On-board' explicitly means that the performance monitoring and alerting is performed on board the aircraft and not elsewhere; e.g. by using a ground-based route adherence monitor or ATC surveillance. The monitoring element of on-board performance monitoring and alerting relates to FTE and NSE. Path definition error (PDE) is constrained through database integrity and functional requirements on the defined path, and is considered negligible.

'Monitoring' refers to the monitoring of the aircraft's performance as regards its ability to determine positioning error and/or to follow the desired path.

'Alerting' relates to monitoring. If the aircraft's navigation system does not perform well enough, the flight crew will be alerted.

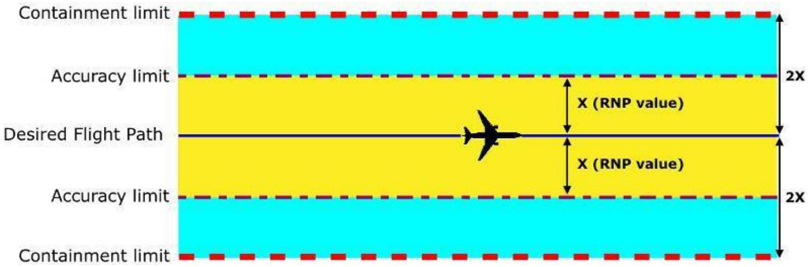
The monitoring and alerting requirements can be satisfied by:

- An airborne navigation system having an NSE monitoring and alerting capability (e.g. RAIM or Fault Detection and Exclusion (FDE) algorithms), plus a lateral navigation display indicator (e.g. CDI) enabling the crew to monitor the FTE. On the assumption that PDE is negligible, the requirement is satisfied because NSE and FTE are monitored, leading to a TSE monitoring; or
- An airborne navigation system having a TSE monitoring and alerting capability.

The net effect of the above is evident in TSE (see the Table that follows). In the Table, RNP X specifications which do not require Radius to Fix (RF) or Fixed Radius Transition (FRT) have much in common with RNAV specifications as regards PDE, since the desired path is not defined.

Error	RNAV Specification	RNP Specifications	
		RNP X Specification NOT Requiring RF or FRT	**RNP X Specification Requiring RF or FRT**
NSE (monitoring and alerting)	NSE only observed by pilot cross-checks; no alerting on position error.	Alerting on position accuracy and integrity.	
FTE (monitoring)	Managed by on-board system or crew procedure.	Managed by on-board system or crew procedure.	
PDE (monitoring)	Generally negligible; the desired path is not defined on fly-by, fly-over, and conditional turns.		Generally negligible; path defined on RF and FRT.
NET EFFECT ON TSE	TSE distribution not bounded. In addition, the wide variation in turn performance results in need for extra protection on turns.	TSE distribution bounded, but extra protection of the route needed on turns;	TSE distribution bounded; no extra protection of the route needed on turns if turns defined by RF or FRT.

9.4.0.7.1 "Containment"



Pilots familiar with RNAV concepts may be aware of the term 'containment'. In RNAV terms, 'containment' usually refers to the region within which the aircraft will have a 99.999% probability of not experiencing an alert, and therefore defines the width of the route that can be flown for the RNP value of the airspace concerned. The associated terms are 'containment value' and 'containment distance' and they relate to the airspace protection on either side of a RNAV ATS route.

The 'containment' width of a RNAV ATS route will be 2 X RNP value for the airspace concerned on either side of the route centreline. There will be a negligible risk of an aircraft reaching the edge of the route without receiving an alert.

However, the PBN concept uses the term 'on-board performance monitoring and alerting' instead of the term 'containment'. This is to avoid confusion between existing uses of 'containment' in various documents by different areas of expertise. For example, within PANS-OPS material, 'containment' refers to the region used to define the obstacle clearance, and the aircraft is expected to remain within or above that surface (regardless of alerting) with very high probability. So, the previous ICAO expressions of 'containment value' and 'containment distance' have been replaced by the navigation accuracy of TSE.

9.4.0.8 Accuracy and Track Guidance

9.4.0.8.1 System Accuracy

On large air transport aircraft, RNAV / RNP systems are typically certified as multi-sensor systems. The FMS position is usually based on a combination of the outputs from one, two or three Inertial Reference Systems (IRS), refined by inputs from other navigation sensors. Preference for use is given to the navigation sensor capable of providing the most accurate position. Before using a navigation sensor, the FMS performs a reasonableness check on the data.

Certification accuracy limits (FMS position) are:

UPDATING SOURCE	POSITION ACCURACY
GPS	100 metres
DME/DME	0.3 nm (depending on station geometry)
VOR/DME	1.0 nm (depending on distance from station)
IRS (multiple)	2.0 nm/hr drift after alignment

Note: Typical in-service accuracy is often better. The accuracy of an RNAV system is defined in terms of the Total System Error (TSE), which represents the difference between an aircraft's true position and the desired position (refer to Part 1 Chapter 9.4.0.6.1.5).

9.4.0.8.2 Track Guidance

Track guidance is normally provided by the RNAV system directly to the autopilot or to the pilot via the flight director / course deviation indicator. Where the aircraft is to be flown with the autopilot uncoupled to the RNAV system, the display of imminent changes in speed, heading or height is expected to be provided in sufficient time for the pilot to respond in a manner which will keep the aircraft within similar flight technical tolerances to that achieved with the autopilot coupled.

9.4.0.9 Aircraft Equipment

9.4.0.9.1 Position Determination Sensors

Aircraft RNAV equipment operates by automatically determining aircraft position from one or a combination of the following sensors, and the equipment has the means to establish and follow a desired path:

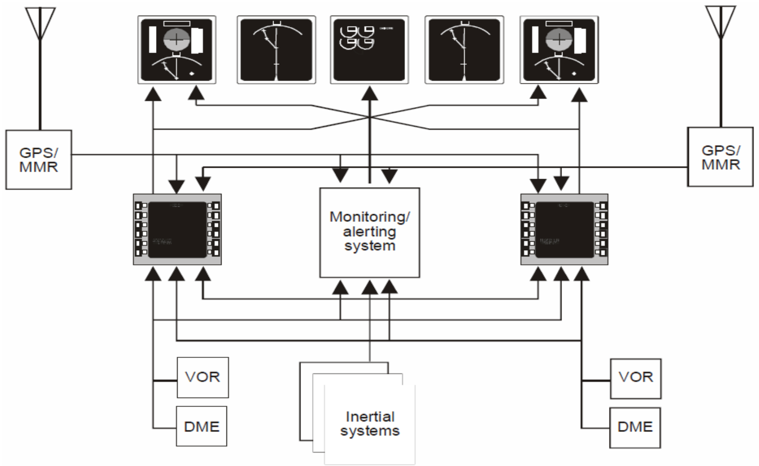
a) VOR/DME;

b) DME/DME;

c) INS or IRS;

d) GNSS (refer to Part 1 Chapter 9.4.0.9.2).

A typical complex multi-sensor avionic system architecture might be as follows:



The RNAV system may also be connected with other systems, such as autothrottle and autopilot / flight director, allowing more automated flight operation and performance management. Despite the differences in architecture and equipment, the basic types of functions contained in the RNAV equipment are common.

Both RNAV and RNP specifications (refer to [Part 1 Chapter 9.4.0.4]) include requirements for certain navigation functionalities. At the basic level, these functional requirements may include:

a) Continuous indication of aircraft position relative to track to be displayed to the pilot flying (PF) on a navigation display situated in his primary field of view;

b) Display of distance and bearing to the active (To) waypoint;

c) Display of ground speed or time to the active (To) waypoint;

d) Navigation data storage function;

e) Appropriate failure indication of the RNAV system, including the sensors.

More sophisticated navigation specifications include the requirement for navigation databases and the capability to execute database procedures.

9.4.0.9.2 Global Navigation Satellite System (GNSS)

Global Navigation Satellite Systems (GNSS) is the standard generic term for satellite navigation systems that provide autonomous geo-spatial positioning with global coverage. GNSS allows small electronic receivers to determine their location (longitude, latitude and altitude) to within a few metres using time signals transmitted along a line-of-sight by radio from satellites. Receivers calculate the precise time as well as position.

GNSS navigation services (i.e. position, velocity and time data) may be defined through the following elements:

a) Core Constellations

    i) Global Positioning System (GPS) that provides the standard positioning service (SPS);

    ii) Global Navigation Satellite System (GLONASS) that provides the Channel of Standard Accuracy (CSA) navigation signal;

b) GNSS Augmentation Systems:

i) Aircraft-based augmentation system (ABAS);

ii) Satellite-based augmentation system (SBAS);

iii) Ground-based augmentation system (GBAS);

The position information provided by GNSS is expressed in terms of the World Geodetic System – 1984 (WGS-84) geodetic reference datum. The time data provided by the GNSS to the user is expressed in a time scale that takes Universal Time Co-ordinated (UTC) as its reference.

9.4.0.9.2.1 GNSS Errors

The GNSS position, though extremely accurate, may be subject to errors as follows:

SOURCE	ERROR RANGE
Satellite clock	± 2 metres
Orbit error	± 2.5 metres
Ionospheric delays	±0 5 metres
Tropospheric delays	± 0.5 metres
Receiver noise	± 0.3 metres
Multipath	± 1 metre

9.4.0.9.2.2 Receiver Autonomous Integrity Monitoring (RAIM)

Receiver Autonomous Integrity Monitoring (RAIM) is a technique whereby the on-board GNSS receiver / processor determines the integrity of the GNSS navigation signals using only GNSS or GNSS signals augmented with barometric altitude. This determination is achieved by a consistency check among redundant measurements (pseudo-ranges). At least one satellite in addition to those required for navigation must be in view for the receiver to perform RAIM. Four satellites are required for navigation.

9.4.0.9.2.3 Predictive RAIM (P-RAIM)

It is a requirement of RNP APCH and RNP AR APCH final approach operations (refer to Part 2 Chapter 3.7 and Part 2 Chapter 3.8) (and for information regarding likely performance for other GNSS-based RNAV operations) that, prior to dispatch, a prediction of the number of satellites available within the constellation must be carried out. This is to ensure availability of navigational and integrity monitoring capability during the planned approach period. Predicted periods when fewer than five satellites will be visible are termed 'RAIM Holes'.

Whilst there are websites which can be used for this pre-flight planning function, the IOMAR is aware of the following:

- Eurocontol GNSS Performance Prediction Tool (whilst it has primarily European region coverage, other destinations may be added on request); and
- FAA Service Availability Prediction Tool (SAPT).

Note: RAIM predictions are included in briefing material as GNSS NOTAMs.

9.4.0.9.3 Navigation Database

A navigation database contains pre-stored information on NAVAID locations, waypoints, ATS routes and terminal procedures and related information. The RNAV system will use such information for flight planning and may also conduct cross-checks between sensor information and the database.

Part 2 Chapter 3 PBN Airspace Approvals identifies the Navigation Database requirements for each PBN airspace category.

9.4.0.10 PBN Airspace Category Table

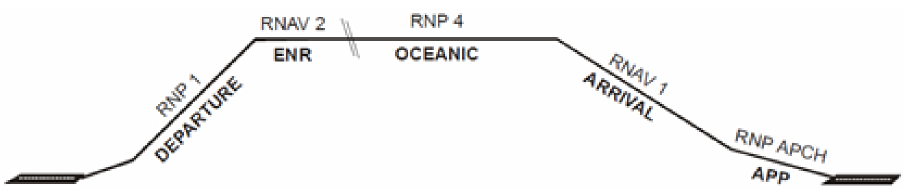
RNAV/RNP airspace is defined by the accuracy of the navigation to take place within it. The table below lists the types of RNAV/RNP airspace and operational locations (the numbers shown in the Table refer to the 95% accuracy requirements in nautical miles):

Navigation Specification	**Flight Phase**							
	En-Route Oceanic / Remote	**En-Route Continental**	**ARR**	**Approach Phase**				**DEP**
				INIT	**INT**	**FINAL**	**MISSED(1)**	
RNAV 10 (RNP 10)	10							
RNAV 5(2) (B-RNAV)		5	5					
RNAV 2		2	2					2
RNAV 1 (P-RNAV)		1	1	1	1		1	1
RNP 4	4							
RNP 2	2	2						
RNP 1(3)			1	1	1		1	1
RNP APCH (LNAV, LNAV/VNAV)				1	1	0.3	1	
RNP APCH (LPV, LP)				1	1	Angular	1 or 0.3 (initial straight MISAP)	
RNP AR APCH				1→0.1	1→0.1	0.3→0.1	1→0.1	

Notes:
(1) Only applies once 50 m (40 m, Cat H) obstacle clearance has been achieved after the start of climb.
(2) RNAV 5 is an en-route navigation specification which can be used for the initial part of a STAR outside 30 NM.
(3) The RNP 1 specification is limited to use on STARs, SIDs, the initial and intermediate segments of IAPs and the missed approach after the initial climb phase. Beyond 30 NM from the ARP, the accuracy value for alerting becomes 2 NM.

9.4.1.10.1 PBN Example

For any particular PBN operation, it is possible that a sequence of RNAV and RNP applications could be used. A flight could commence in using a RNP 1 SID, transit through en-route then oceanic airspace requiring RNAV 2 and RNP 4, respectively, and culminate with terminal and approach operations requiring RNAV 1 and RNP APCH, for example:



9.4.0.11 PBN Route Structures

Traditional airways and other routes were defined by tracks between geographic positions defined by radio navigation beacons. In PBN operations, the aircraft flies between geodetic waypoints or fixes that may, or may not, be co-located with radio navigation beacons, but which are not defined by them. Geodetic waypoints and fixes are defined by the WGS-84 system, which is a mathematical system for providing a datum.

9.4.0.11.1 Oceanic / Remote Routes

Oceanic / Remote airspace concepts are served by three navigation applications, RNAV 10, RNP 4 and RNP 2. These navigation applications rely primarily on GNSS to support the navigation element of the airspace concept. In the case of the RNAV 10 and RNP 2, no global standard of ATS surveillance service is specified. In the case of the RNP 4 application, FANS 1/A must be available.

Area	Navigation Application	Navigation Specification	Navaid Infrastructure	Comms	Surveillance
Oceanic	En-route ATS routes	RNAV 10	GNSS	Voice	Procedural
Oceanic	En-route ATS routes	RNP 4	GNSS	Voice Datalink (FANS 1/A)	Procedural
Oceanic	En-route ATS routes	RNP 2	GNSS	Voice Datalink (FANS 1/A)	Procedural
Oceanic	En-route ATS routes	RNAV 10	IRS	Voice Datalink (FANS 1/A)	Procedural
Remote	En-route ATS routes	RNAV 10	GNSS	Voice	Procedural
Remote	En-route ATS routes	RNP 4	GNSS	Voice Datalink (FANS 1/A)	Procedural
Remote	En-route ATS routes	RNP 2	GNSS	Voice Datalink (FANS 1/A)	Procedural
Remote	En-route ATS routes	RNAV 10	IRS	Voice Datalink (FANS 1/A)	Procedural

Note: *The navigation specification RNAV 10 was previously called RNP 10, despite the fact that no alerting function is required. Approvals for operation in airspace with an RNAV 10 specification will continue to be called RNP 10 approvals.*

9.4.0.11.2 Continental Routes

Continental en-route airspace concepts are supported by both RNAV and RNP applications. RNAV 5 is used in the Middle East (MID) and European (EUR) Regions. It is designated as B-RNAV (Basic RNAV) in Europe and RNP 5 in the Middle East. In the United States, an RNAV 2 application supports an en-route continental airspace concept.

Continental RNAV applications support airspace concepts which include radar surveillance and direct controller to pilot communication (voice).

Continental RNP 2 application is primarily intended in geographical areas with little or no NAVAID infrastructure, limited or no ATS surveillance and low to medium traffic density.

Navigation Specification	Navaid Infrastructure	Comms	Surveillance
RNAV 5	GNSS VOR/DME DME/DME	Voice	ATS Surveillance
RNAV 2 no IRS RNAV 1 with IRS RNAV 1 no IRS but with adequate DME	GNSS DME/DME	Voice	Procedural
RNP 2	GNSS	Voice Datalink (FANS 1/A)	Procedural

9.4.0.11.3 Terminal Arrival and Departure Routes

Existing terminal airspace concepts, which include arrival and departure routes, are supported by RNAV applications. These are currently used in the European (EUR) Region and the United States. The European terminal airspace RNAV application is known as Precision RNAV (P-RNAV). Although the P-RNAV specification shares a common navigation accuracy with RNAV 1, this regional navigation specification does not satisfy the full requirements of the ICAO RNAV 1 specification. The United States terminal airspace application formerly known as US RNAV Type B has been aligned with the PBN concept and is now called RNAV 1. RNP 1 has been developed primarily to support applications requiring greater route assurance and enhanced functionality such as Radius to Fix (RF).

Area	Navigation Application	Navigation Specification	Navaid Infrastructure	Comms	Surveillance
Terminal	SIDs, STARs Transitions	RNAV 2 without IRS RNAV 1 with IRS RNAV 1 without IRS but with adequate DME	GNSS DME/DME	Voice	ATS Surveillance
Terminal	SIDs, STARs Transitions	RNP 1	GNSS	Voice	Procedural
Terminal	SIDs, STARs Transitions	RNP 1 RNAV 1 with GPS only	GNSS DME/DME	Voice	ATS Surveillance

Note: When originally published, the RNP 1 navigation specification included the prefix “Basic” (Basic-RNP 1) because an Advanced RNP 1 specification was planned. Advanced RNP 1 evolved into the A-RNP specification, so the prefix “Basic” is no longer necessary.

9.4.0.11.4 Approach

Approach concepts cover all segments of an instrument approach, i.e. initial, intermediate, final and missed approach. They call for RNP specifications requiring a navigation accuracy of 0.3 nm or lower in the Final Approach Segment. Typically, three sorts of RNP applications are characteristic of this phase of flight:

a) New procedures to runways never served by an instrument procedure;
b) Procedures either replacing or serving as backup to existing instrument procedures based on different technologies;
c) Procedures developed to enhance aerodrome access in demanding environments.

The relevant RNP specifications are RNP APCH and RNP AR APCH (refer to Part 2 Chapter 3.7 and Part 2 Chapter 3.8 respectively).

Area	Navigation Application	Navigation Specification	Navaid Infrastructure	Comms	Surveillance
Approach	Approach	RNP APCH	GNSS	Voice	ATS Surveillance
Approach	Approach	RNP APCH	GNSS	Voice	Procedural
Approach	Approach	RNP AR APCH	GNSS	Voice	Procedural
Approach	Approach	RNP AR APCH	GNSS	Voice	ATS Surveillance

9.4.0.11.5 RNAV Waypoints and Fixes

The terms 'waypoint' and 'fix' can have different meanings depending on the context in which they are used. The term 'waypoint' is only used to define RNAV routes and flight paths of aircraft employing RNAV systems, while the term 'significant point' is used to describe a specific geographic location used in defining an ATS route or the flight path of an aircraft for other navigation and ATS purposes.

In some contexts, and particularly in the non-RNAV context, a waypoint can also be described as a 'fix'. This is especially the case in the terminal area where the initial approach fix (IAF), the intermediate fix (IF), the final approach fix (FAF) and the missed approach holding fix (MAHF) are commonly used terms.

In order to avoid confusion, the terms IAF, IF, FAF and MAPt have been adopted for use in both conventional and RNAV instrument approach definitions.

9.4.0.11.5.1 Strategic and Tactical Waypoints

A waypoint associated with an RNAV terminal procedure is known as a strategic or a tactical waypoint, depending upon the purpose that the waypoint serves.

A waypoint is always used to define the start and end of every RNAV route leg and may designate a change in course, and/or speed and/or altitude. The exception is with legs associated with conditional transitions, such as a turn above a certain altitude or a transition onto an ILS.

9.4.0.11.5.1.1 Strategic Waypoints

A strategic waypoint is a waypoint in the terminal area which is:

a) Either considered to be of such significance by the ATS provider that it must be identified in such a way that it can be easily remembered and stand out on any display; or

b) Used as an activation point to generate a message between computer systems when an aircraft passes it.

Note: These points are usually part of the SID / STAR route structure.

9.4.0.11.5.1.2 Tactical Waypoints

A tactical waypoint is a waypoint that is defined solely for use in the specific terminal area and has not been designated as a strategic waypoint.

These waypoints may be part of the SID / STAR route structure or they may be detached waypoints within the terminal area, either off-set from the procedures themselves or providing leg extensions.

Tactical waypoints are generally used to assist the controllers to sequence approaches and maintain appropriate separation by discrete vectoring.

9.4.0.11.5.2 Waypoint Naming

9.4.0.11.5.2.1 Significant and Strategic Waypoints

ICAO requires significant and strategic waypoints to be named as follows:

a) All 'Significant' waypoints are identified by a 5 letter pronounceable name;

b) Where waypoints are marked by the site of a radio navigation aid they should have the same name and coded designator as the navigation aid.

Examples are 'REDFO', 'PIMAL' and similar.

9.4.0.11.5.2.2 Tactical Waypoints

Tactical waypoints have no international naming standard, but the following naming convention is the solution adopted in the European region:

'AAXNN'

Where:

a) 'AA' contains the last two characters of the aerodrome location indicator;

b) 'X' is a numeric code from 0 to 9 (although the letters 'N', 'E', 'W' and 'S' may be used instead if a State has a requirement for quadrantal information);

c) 'NN' is a numeric code from 00 to 99.

The exceptions are:

a) If a waypoint is collocated with a radio navigation aid, the navigation aid three-letter identifier is used; or

b) If the waypoint is collocated with a runway threshold, an identifier in the format RWNNA is used, where 'NN' is a numeric code from 01 to 36 and 'A' is an optional alphabetic code of 'L', 'C', 'R'; or

c) If a waypoint is designated by the ATS provider as a Strategic TMA Waypoint, then the 5-letter name code is used.

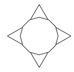
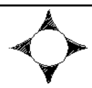
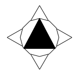
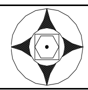
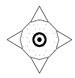
9.4.0.11.5.3 'Fly-By' and 'Fly-Over' Waypoints and Their Depiction

When an FMS database is constructed, the waypoints are coded as either:

FLY-BY: Where the navigation system anticipates the turn onto the next route leg; or

FLY-OVER: Where the aircraft overflies the waypoint before starting the turn onto the next route leg.

9.4.0.11.5.3.1 Waypoint Depiction

TYPE OF WAYPOINT	DEPICTION
Fly-by Waypoint	
Fly-over Waypoint	
Fly-by Waypoint coincident with Significant Point (Mandatory Reporting Point)	
Fly-over Waypoint coincident with VOR/DME	
Fly-by Waypoint coincident with NDB	

When checking FMS waypoints against published procedures, the depiction on the Navigation Display should be verified against the procedure chart.

CAUTION: Flight crew are not permitted to add, delete or modify any waypoint(s) in any procedure loaded from the FMS database. Such way points will only be constructed as FLY-BY waypoints which may be entirely inappropriate for the requirements of the procedure.

Selection of the 'DIRECT TO' function is not considered to be a modification. It is also permitted to insert waypoints in any en-route flight plan as en-route waypoints are all considered to be FLY-BY waypoints.

9.4.0.11.5.4 RNAV Leg Types (Path Terminators)

It is desirable to define how an aircraft will fly between waypoints, especially for consistent and predictable flight behaviour. The path between two waypoints is normally called a 'leg'. With ATS routes, the aircraft will fly the 'leg' to the next waypoint in sequence, performing a fly-by turn where capable. For consistent ground tracks in the turn, a Fixed Radius Turn (see 1.8.2) can be used.

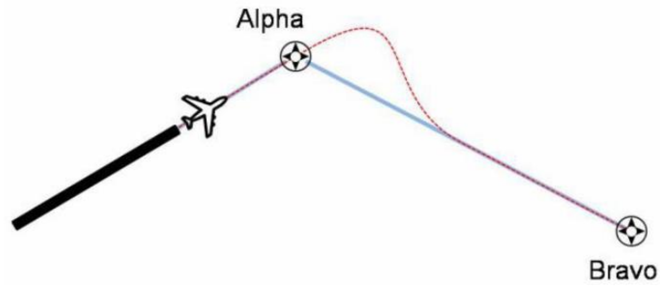
With SIDs and STARs each 'leg' is associated with a 'Path Terminator', which defines how the path will be flown and how the 'leg' will be terminated. These 'Path Terminators' have been defined by industry in a standard called ARINC 424. RF (Radius to Fix – see paragraph 3.2.8), used for SIDs and STARs, is an example of a 'leg' whose path is a fixed radius turn terminating at the next fix (which is a waypoint).

9.4.0.11.5.5 Leg Types for SIDs and STARs

RNAV leg types are used to describe the path before, after or between waypoints. During the design phase of an RNAV SID or STAR, the leg type for the each leg is defined by the procedure designers. The leg type may be any one of number of leg types ('Path Terminators') in accordance with the ARINC 424 Navigation Database Specification. The "leg type" is part of the information that is used to define each RNAV procedure and is contained in the data package that is used to 'build' the navigation database.

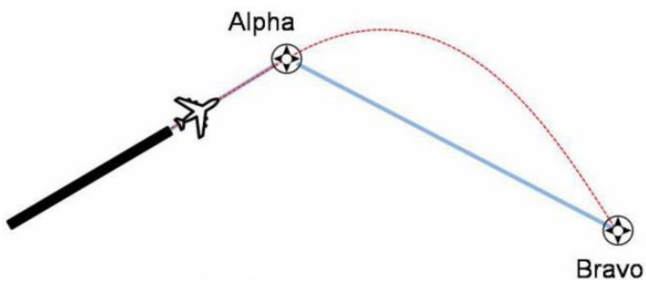
Generally only a few of the available leg types are used in the design of RNAV procedures. A two-letter code is used to describe the leg type (e.g., heading = 'V', course = 'C', track = 'T', etc.) and the leg end point (e.g., an altitude = 'A', distance = 'D', fix = 'F' etc.). Although not explicitly depicted on charts, controllers and pilots can determine leg types (and thus the expected aircraft behaviour) by reading the relevant RNAV procedure chart narrative and viewing the graphic depiction. The most common leg types used are:

TRACK: A 'track' is a magnetic course between waypoints that must be intercepted and flown. This is the most common leg type and is coded as 'TF'. In the diagram below, the aircraft will 'track' from ALPHA to BRAVO by intercepting the magnetic course between the two waypoints after correcting the track error resulting from the flying over ALPHA (ALPHA being a fly-over waypoint).



COURSE: A 'Course' is a magnetic course to a waypoint that must be intercepted and flown. A 'CF' leg differs from a 'TF' leg only in that it does not have a beginning waypoint.

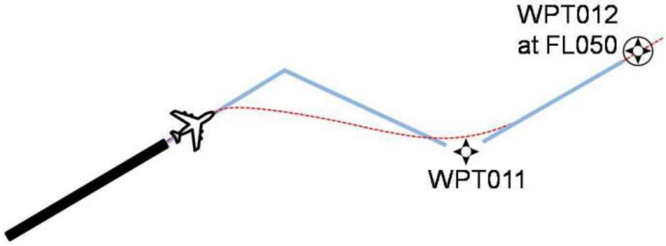
DIRECT: 'Direct' describes a direct course from an aircraft's position to a waypoint. A 'DF' leg allows an immediate turn to a waypoint without requiring intercept of a particular course. In the diagram below, the aircraft will proceed 'direct' to BRAVO after crossing the fly-over waypoint ALPHA.



HEADING: A 'heading' is a magnetic heading to be flown. Heading legs are subject to wind drift. A 'VA' leg is a heading to an altitude and a 'VM' is a heading to a 'manual termination'. The 'VA' leg is often used as the first leg of a RNAV departure. The 'VM' leg is most often used to end a RNAV STAR on, for example, a downwind leg heading.

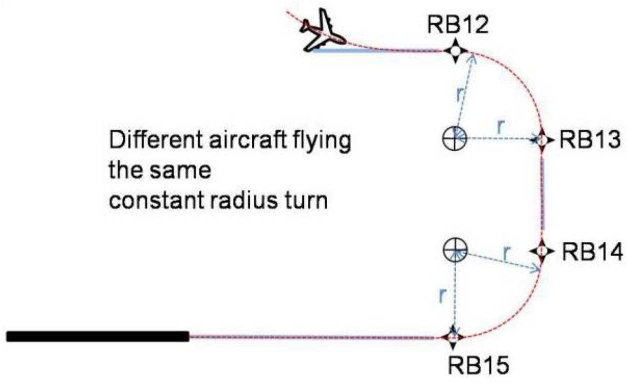
In the diagram below, we see a combination of VA, CF, and TF legs that have been used to create the initial portion of a RNAV SID where the procedure is:

"After take-off fly heading 060°, climb to FL 050. On passing 400 ft agl, turn right direct to WPT011. After WPT011 track to WPT012. Cross WPT012 at FL 050."



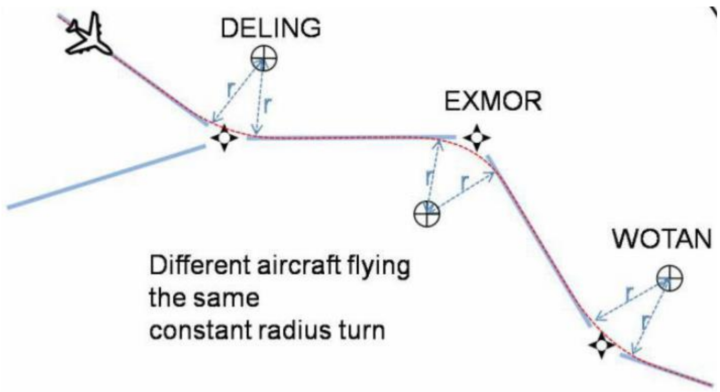
9.4.0.11.5.6 Fixed Radius Paths

Radius to Fix (RF): This functionality is only used for Standard Instrument Departures (SIDs) and Standard Arrival Routes (STARs) and Arrival Transitions.



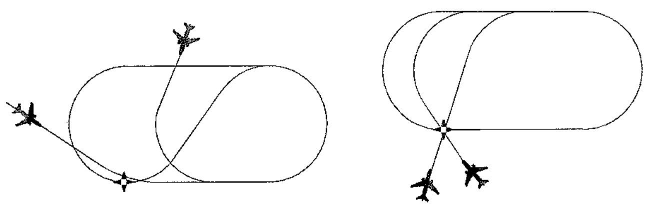
Fixed Radius Transitions (FRT): These transitions are used for other Air Traffic Services (ATS) routes, usually at higher altitudes. The FRTs used in the en-route phase of flight have two turn radii:

a) 15 nm below FL 190;
b) 22.5 nm above FL 200.



9.4.0.11.5.7 Holding Patterns

The RNAV system facilitates the holding pattern specification by allowing the definition of the inbound course to the holding waypoint, turn direction and leg time or distance on the straight segments, as well as the ability to plan the exit from the hold. For RNP systems, further improvement in holding is available. These RNP improvements include fly-by entry into the hold, minimising the necessary protected airspace on the non-holding side of the holding pattern, consistent with the RNP limits provided. Where RNP holding is applied, a maximum of RNP 1 applies since less stringent values adversely affect airspace usage and design.



9.4.0.11.5.8 Offset Flight Paths

RNAV systems may provide the capability for the flight crew to specify a lateral offset from a defined route. Generally, lateral offsets can be specified in increments of 1 nm up to 20 nm. When a lateral offset is activated in the RNAV system, the RNAV aircraft will depart the defined route and typically intercept the offset at an angle of 45° or less. When the offset is cancelled, the aircraft returns to the defined route in a similar manner. Such offsets can be used both strategically (i.e. fixed offset for the length of the route), or tactically (i.e. temporarily). Most RNAV systems discontinue offsets in the terminal area or at the beginning of an approach procedure, at an RNAV hold, or during course changes of 90° or more.

9.4.0.12 RNAV R/T PHRASEOLOGY

RTF phraseologies for RNAV are as follows:

When checking if an aircraft is able to accept a SID / STAR, ATC will use:

"ADVISE IF ABLE (designator) DEPARTURE [or ARRIVAL]"

e.g. "Jetair 23, advise if able SNAKE ONE ALPHA arrival".

If the aircraft is unable to accept an ATC issued clearance for a RNAV SID / STAR, the flight crew will use:

"UNABLE (designator) DEPARTURE [or ARRIVAL] DUE RNAV TYPE"

e.g. "Jetair 921, unable BILBO ONE ALPHA arrival due RNAV type"

Note: In this case, ATC will normally seek to provide an alternative routeing.

If the aircraft is unable to continue with RNAV operations due to some failure or degradation of the RNAV system, the flight crew will use:

"UNABLE RNAV DUE EQUIPMENT"

Note: Aircraft in flight which announce to ATC the loss of RNAV capability should normally expect to be provided with radar vectors, routed via conventional routes or routed direct to conventional NAVAIDs.

If ATC is unable to assign a RNAV SID / STAR requested by the flight crew for reasons associated with the type of on-board RNAV equipment indicated on the ATC flight plan, ATC will inform the pilot using:

"UNABLE TO ISSUE (designator) DEPARTURE [or ARRIVAL] DUE RNAV TYPE"

e.g. "Jetair 921, unable to issue TRENT ONE CHARLIE departure due RNAV type".

9.4.1 PBN Operations

Operations in PBN airspace must not be conducted without the appropriate operational approval issued by the IOMAR.

9.4.1.1 RNAV 10 (RNP 10) Operational Procedures

RNAV 10, Designated and Authorised as RNP 10 is an Oceanic / Remote area specification requiring the aircraft to maintain a track-keeping accuracy of +/- 10 nm without regular updates from ground-based navigation aids. RNAV 10 (RNP 10) approval can be based on IRS performance alone (with a time limit of up to 6.2 hours), and there is no requirement for an RNP alerting function in the FMS.

RNAV 10 (RNP 10) airspace supports 50 nm lateral and longitudinal distance-based separation minima.

9.4.1.1.1 RNAV 10 Flight Planning

In the flight planning phase, flight crew should:

- Identify which portions of the flight are to be conducted in RNAV 10 airspace and verify the entry and exit points;
- Ensure that the ATC Flight Plan includes: -
  - 'R' for PBN in item 10a;
  - the appropriate Surveillance (SUR) Capability in Item 10b; and
  - PBN/A1 to identify RNAV 10 in item 18.
- For IRS-only operations, ensure that the RNAV 10 time limit has been accounted for (normally 6.2 hours).

9.4.1.1.2 RNAV 10 Pre-Flight Requirements

At the aircraft, flight crew should:

- Review the aircraft (technical) Log to ensure that there is no defect in navigational equipment (and if applicable communications equipment) that would preclude RNAV 10 operations (the MEL should identify the alleviations that are not suitable for RNAV 10 operations);
- Confirm the navigation database is current for the duration of the flight; and
- Review and brief the contingency procedures for the area in which RNAV 10 operations are to be conducted (this may be deferred to any time before entering RNAV 10 airspace if there is a lengthy non-RNAV 10 sector before entering RNAV 10 airspace).

9.4.1.1.3 RNAV 10 En-Route Procedures

During en-route operations, and before entering RNAV 10 airspace, flight crew should:

- Verify that the aircraft technical status allows RNAV 10 operations (at least 2 Long Range Navigation Systems (LRNS) capable of navigating to the RNP are required);
- Find an alternative non-RNAV 10 route or divert if the equipment requirements cannot be met.
- After entering RNAV 10 airspace, flight crew should:
- Cross-check to identify navigation errors in sufficient time to prevent the aircraft from an inadvertent deviation from ATC cleared routes;
- Advise ATC of any deterioration or failure of the navigation equipment below the navigation performance requirements, or of any deviations required for a contingency procedure.

9.4.1.1.3.1 Strategic Lateral Offset Procedure (SLOP) on RNAV 10 Routes

Certain ATS Authorities have authorised the use of the Strategic Lateral Offset Procedure that may be employed at the discretion of the flight crew as standard operating practice in the course of RNAV 10 operations. This procedure may be used for both wake vortex encounters and to mitigate the heightened risk of collision when non-normal events such as operational altitude deviation errors and turbulence-induced altitude deviations occur.

Where authorised, SLOP should be applied as follows:

a) All offsets are to be made to the right of a route or track;

b) In relation to a route or track, there are three positions that an aircraft may fly:

   i) Centreline; or

   ii) 1 nm right*; or

   iii) 2 nm right*

   Offsets are not to exceed 2 nm right of centreline; and offsets **left** of centreline **must not be made**.

*Aircraft able to perform offsets in tenths of nautical mile should do so as it contributes to risk reduction.

CAUTION: Aircraft without automatic offset programming capability must fly the centreline.

Note: There is no ATC clearance required for this procedure and it is not necessary that ATC be advised. However, crews must ensure that SLOP is authorised in the particular airspace. Voice position reports are to be based on the current ATC route / course clearance and not the exact co-ordinates of the offset position. When an offset has been applied, the aircraft must be returned to the centreline before the RNAV 10 airspace exit point.

9.4.1.1.4 RNAV 10 Contingency Procedures

In Oceanic / Remote areas, continuous direct controller-pilot communication may not always be possible, so a range of contingencies have been considered which allow independent action by flight crews. These procedures provide for the more frequent cases such as:

a) Inability to maintain assigned flight level due to meteorological conditions, aircraft performance or pressurization failure;

b) En-route diversion across the prevailing traffic flow;

c) Loss of, or significant reduction in, the required navigation capability when operating in airspace where the navigation performance accuracy is a prerequisite to the safe conduct of flight operations.

In general, they permit crews, in exceptional circumstances, to deviate from assigned clearances by selecting flight levels and/or tracks where other aircraft are least likely to be encountered. During such deviations, crews are required to make maximum use of the aircraft lighting and to transmit relevant information on all appropriate frequencies, including the distress and emergency frequency.

Once contact with ATC has been re-established, the crew will be assisted and issued with new clearances as required. Offset track procedures are permitted if an encounter with turbulence is considered to be due to a wake vortex encounter.

Navigation Database discrepancies that invalidate a route must be reported to the operator.

9.4.1.1.4.1 General Concept for Offsets

Whenever possible, offset the route first and then stabilise the flight at the existing level +/- 500 feet. Seek a re-clearance at an achievable flight level from ATC.

The sequence of actions is:

- Turn at least 30° left or right of the cleared track;
- Maintain flight level, or minimum vertical speed if this is not possible, until clear of the core of the existing track;
- Establish an appropriate track offset (normally 5nm, but area and route requirements may differ);

  Note: Where a 5 nm track offset applies, flight crew, should, where practicable, avoid overshooting the track to be acquired.
- Once established on the offset track, climb or descend to select a flight level which differs from those normally used by 500 feet (150 m);
- Establish communications with and alert nearby aircraft by broadcasting, at suitable intervals: aircraft identification, flight level, position (including the ATS route designator or the track code, as appropriate) and intentions on the frequency in use and on 121.5 MHz (or, as a back-up, on the inter-pilot air-to-air frequency 123.45 MHz);
- Maintain a watch for conflicting traffic both visually and by reference to ACAS;
- Turn on all aircraft exterior lights (commensurate with appropriate operating limitations);
- Keep the SSR transponder on at all times; and
- Take any other action as necessary to ensure the safety of the aircraft.

  Note: Details of specific contingency procedures for each area or route can be found in the Route Guide (e.g. Jeppesen Manual).

9.4.1.1.4.2 In-Flight Contingencies – Weather Deviations

If the aircraft is required to deviate from track to avoid weather and prior clearance cannot be obtained, an air traffic control clearance shall be obtained at the earliest possible time. In the meantime, the aircraft should follow the following procedures:

- ATC should be advised when the weather deviation is no longer required, or when a weather deviation has been completed and the aircraft has returned to the centreline of its cleared route.

  Note: A more rapid response may be obtained from ATC by stating "WEATHER DEVIATION REQUIRED" in the initial call to indicate that priority is desired on the frequency and for ATC response.
- If the deviation is urgent, initiate communications with ATC using the urgency call "PAN-PAN-PAN" (preferably spoken three times) to alert all listening parties to a special handling condition which will receive ATC priority for issue of a clearance or assistance.
- Once communications have been established, advise ATC, when possible, of the extent of the deviation expected. ATC will authorise a weather deviation providing there is no conflicting traffic or, if there is conflicting traffic, advise the details of the traffic and refuse the deviation.

9.4.1.1.4.2.1 Weather Deviations

For a deviation from the assigned track due to anything weather-related, the following procedure must be followed:

- In the first instance, up the urgency with the phrase "WEATHER DEVIATION REQUIRED." ATC will attempt to provide separation, and if they can't they will ask you to advise your intentions.
- If you intend to deviate, let them know, for example "I am deviating under PIC emergency authority. At 5 NM from course I will employ the Weather Deviation contingency."

Then apply the following:

- Declare a PAN.
- Deviate away from other airways if practical.
- Talk to other aircraft on 121.5 and 123.45.
- Keep an eye on your TCAS and outside.
- Turn on all your exterior lights.
- For deviations of **less than 5 NM**, remain at the flight level assigned by ATC.
- For deviations of **5 NM or more**, at the 5 NM point, initiate a change as follows:

If flying	**EAST**	**descend** left by 300ft	or	**climb** right by 300ft
If flying	**WEST**	**climb** left by 300ft	or	**descend** right by 300ft
South of track = **A**scend; **N**orth of track = **D**escend; Up/Down by 300ft				

- Once established back on track, resume the cleared level. If already deviating and cannot obtain a clearance to deviate further, change level immediately in accordance with the table above.

9.4.1.1.4.3 Actions to Be Taken if a Revised Air Traffic Control Clearance Cannot be Obtained

The commander may take the actions listed below under the provision that the pilot may deviate from Rules of the Air (e.g. the requirement to operate on route or track centreline unless otherwise directed by ATC), when it is absolutely necessary in the interests of safety to do so.

If a revised air traffic control clearance cannot be obtained and deviation from track is required to avoid weather, the pilot shall take the following actions:

The commander may take the actions listed below under the provision that the pilot may deviate from Rules of the Air (e.g. the requirement to operate on route or track centreline unless otherwise directed by ATC), when it is absolutely necessary in the interests of safety to do so.

If a revised air traffic control clearance cannot be obtained and deviation from track is required to avoid weather, the pilot shall take the following actions:

- If possible, deviate away from any organised track or route system;
- Establish communication with and alert nearby aircraft by broadcasting, at suitable intervals:
- Flight identification;
- Flight level;
- Aircraft position (including the ATS route designator or the track code); and
- Intentions (including the magnitude of the deviation expected) on the frequency in use, as well as on frequency 121.5 MHz (or, as a back-up, the VHF inter-pilot air-to-air frequency 123.45 MHz)
- **Note:** If it has been determined that there is another aircraft at or near the same FL with which the aircraft might conflict, then the commander is expected to adjust the path of the aircraft, as necessary, to avoid conflict.

- Watch for conflicting traffic both visually and by reference to ACAS;
- Turn on all aircraft exterior lights;
- For deviations of less than 10 nm, remain at the level assigned by ATC;
- For deviations of greater than 10 nm, when the aircraft is approximately 10 nm from track, initiate a level change based on the criteria in the table below;

Track	Deviations > 10 Nm	Level Change
East (000-179 magnetic)	Left Right	Descend 300 Ft Climb 300 Ft
West (180-359 magnetic)	Left Right	Climb 300 Ft Descend 300 Ft

Note: If contact was not established prior to deviating, continue to attempt to contact ATC to obtain a clearance. If contact was established, continue to keep ATC advised of intentions and obtain essential traffic information. When returning to track, be at the assigned flight level when the aircraft is within approximately 10 nm of centreline.

9.4.1.2 RNP 4 Operational Procedures

RNP 4 is an Oceanic / Remote area specification requiring the aircraft to maintain a track-keeping accuracy of ± 4 nm for at least 95% of the total flight time. The along-track error must also be within ± 4 nm for at least 95% of the total flight time. GNSS is the primary navigation sensor to support RNP 4, either as a stand-alone navigation system or as part of a multi-sensor system. Within RNP 4 airspace, all routes are based upon WGS-84 co-ordinates.

9.4.1.2.1 RNP 4 Flight Planning

In the flight planning phase, flight crew should:

- Identify which portions of the flight are to be conducted in RNP 4 airspace and verify the entry and exit points;
- Ensure that the ATC Flight Plan includes: -
  - 'R' for PBN in item 10a;
  - the appropriate Surveillance (SUR) Capability in Item 10b; and
  - PBN/L1 to identify RNP 4 in item 18.
- Ensure that adequate navigation capability is available en-route to enable the aircraft to navigate to RNP 4, to include the availability of FDE if appropriate for the operation.

9.4.1.2.2 RNP 4 Pre-Flight Requirements

At the aircraft, flight crew should:

- Review the aircraft (technical) Log to ensure that there is no defect in navigational and communications equipment that would preclude RNP 4 operations (the MEL should identify the alleviations that are not suitable for RNP 4 operations);
- Confirm the navigation database is current for the duration of the flight; and
- Review and brief the contingency procedures for the area in which RNP 4 operations are to be conducted (this may be deferred to any time before entering RNP 4 airspace if there is a lengthy non-RNP 4 sector before entering RNP 4 airspace).

9.4.1.2.3 RNP 4 En-Route Procedures

During en-route operations, and before entering RNP 4 airspace, flight crew should:

- Verify that the aircraft technical status allows RNP 4 operations (at least 2 LRNS capable of navigating to the RNP, 2 LRCS and FANS 1/A (or FANS 1/A+) are required);
- Conduct a FANS 1/A logon to the appropriate authority;
- Find an alternative non-RNP 4 route or divert if the equipment requirements cannot be met.

After entering RNP 4 airspace, flight crew should:

- Use a lateral deviation indicator, flight director, or autopilot in lateral navigation mode;
- Maintain route centrelines, as depicted by on-board lateral deviation indicators and/or flight guidance unless authorised to deviate by ATC or under emergency conditions. For normal operations, cross-track error / deviation (the difference between the RNAV system computed path and the aircraft position relative to the path) should be limited to ±½ the navigation accuracy associated with the route (i.e. 2 nm). Brief deviations from this standard (e.g. overshoots or undershoots) during and immediately after route turns, up to a maximum of 100% of the required navigation accuracy (i.e. 4 nm), are allowable.
- Cross-check to identify navigation errors in sufficient time to prevent the aircraft from an inadvertent deviation from ATC cleared routes;

- Advise ATC of any deterioration or failure of the navigation equipment below the navigation performance requirements or of any deviations required for a contingency procedure.

9.4.1.2.3.1 Strategic Lateral Offset Procedure (SLOP) on RNP 4 Routes

Certain ATS Authorities have authorised the use of the Strategic Lateral Offset Procedure that may be employed at the discretion of the flight crew as standard operating practice in the course of RNP 4 operations. This procedure may be used for both wake vortex encounters and to mitigate the heightened risk of collision when non-normal events such as operational altitude deviation errors and turbulence induced altitude deviations occur.

Where authorised, SLOP should be applied as follows:

a) All offsets are to be made to the right of a route or track;

b) In relation to a route or track, there are three positions that an aircraft may fly:

    i) Centreline; or

    ii) one nm right*; or

    iii) two nm right*

c) Offsets must not exceed 2 NM right of centreline; and offsets **left** of centreline **must not be made**.

*Aircraft able to perform offsets in tenths of nautical mile should do so as it contributes to risk reduction.

CAUTION: Aircraft without automatic offset programming capability must fly the centreline.

Note: There is no ATC clearance required for this procedure and it is not necessary that ATC be advised. However, crews must ensure that SLOP is authorised in the particular airspace. Voice position reports are to be based on the current ATC route / course clearance and not the exact co-ordinates of the offset position. When an offset has been applied, the aircraft must be returned to the centreline before the RNP 4 airspace exit point.

9.4.1.2.4 RNP 4 Contingency Procedures

In Oceanic / Remote areas, continuous direct controller-pilot communication may not always be possible, so a range of contingencies have been considered which allow independent action by flight crews. These procedures provide for the more frequent cases such as:

a) Inability to maintain assigned flight level due to meteorological conditions, aircraft performance or pressurization failure;

b) En-route diversion across the prevailing traffic flow;

c) Loss of, or significant reduction in, the required navigation capability when operating in airspace where the navigation performance accuracy is a prerequisite to the safe conduct of flight operations.

In general, they permit crews, in exceptional circumstances, to deviate from assigned clearances by selecting flight levels and/or tracks where other aircraft are least likely to be encountered. During such deviations, crews are required to make maximum use of the aircraft lighting and to transmit relevant information on all appropriate frequencies, including the distress and emergency frequency.

Once contact with ATC has been re-established, the crew will be assisted and issued with new clearances as required. Offset track procedures are permitted if an encounter with turbulence is considered to be due to a wake vortex encounter.

Navigation Database discrepancies that invalidate a route must be reported to the operator.

9.4.1.2.4.1 General Concept for Offsets

Whenever possible, offset the route first and then stabilise the flight at the existing level +/- 500 feet. Seek a re-clearance at an achievable flight level from ATC.

The sequence of actions is:

- Turn 90° left or right of the cleared track;
- Maintain flight level, or minimum vertical speed if this is not possible, until clear of the core of the existing track;
- Establish an appropriate track offset (normally 5 nm, but area and route requirements may differ);

  Note: Where a 5 nm track offset applies, flight crew, should, where practicable, avoid overshooting the track to be acquired.
- Once established on the offset track, climb or descend to select a flight level which differs from those normally used by 500 feet (150 m);
- Establish communications with and alert nearby aircraft by broadcasting, at suitable intervals: aircraft identification, flight level, position (including the ATS route designator or the track code, as appropriate) and intentions on the frequency in use and on 121.5 MHz (or, as a back-up, on the inter-pilot air-to-air frequency 123.45 MHz);
- Maintain a watch for conflicting traffic both visually and by reference to ACAS;
- Turn on all aircraft exterior lights (commensurate with appropriate operating limitations);
- Keep the SSR transponder on at all times; and
- Take any other action as necessary to ensure the safety of the aircraft.

  Note: Details of specific contingency procedures for each area or route can be found in the Route Guide (e.g. Jeppesen Manual).

9.4.1.2.4.2 In-Flight Contingencies – Weather Deviations

If the aircraft is required to deviate from track to avoid weather and prior clearance cannot be obtained, an air traffic control clearance shall be obtained at the earliest possible time. In the meantime, the aircraft should follow the following procedures:

- Advise ATC when the weather deviation is no longer required, or when a weather deviation has been completed and the aircraft has returned to the centreline of its cleared route.

  Note: A more rapid response may be obtained from ATC by stating "WEATHER DEVIATION REQUIRED" in the initial call to indicate that priority is desired on the frequency and for ATC response.
- If the deviation is urgent, initiate communications with ATC using the urgency call "PAN-PAN-PAN" (preferably spoken three times) to alert all listening parties to a special handling condition which will receive ATC priority for issue of a clearance or assistance.
    - Once communications have been established, advise ATC, when possible, the extent of the deviation expected. ATC will authorise a weather deviation providing there is no conflicting traffic or, if there is conflicting traffic, advise the details of the traffic and refuse the deviation.

9.4.1.2.4.3 Actions to Be Taken if a Revised Air Traffic Control Clearance Cannot be Obtained

The commander may take the actions listed below under the provision that the pilot may deviate from Rules of the Air (e.g., the requirement to operate on route or track centreline unless otherwise directed by ATC), when it is absolutely necessary in the interests of safety to do so.

If a revised air traffic control clearance cannot be obtained and deviation from track is required to avoid weather, the pilot shall take the following actions:

- If possible, deviate away from any organised track or route system;
- Establish communication with and alert nearby aircraft by broadcasting, at suitable intervals:
  - Flight identification;
  - Flight level;
  - Aircraft position (including the ATS route designator or the track code); and
  - Intentions (including the magnitude of the deviation expected) on the frequency in use, as well as on frequency 121.5 MHz (or, as a back-up, the VHF inter-pilot air-to-air frequency 123.45 MHz)

  Note: If it has been determined that there is another aircraft at or near the same FL with which the aircraft might conflict, then the commander is expected to adjust the path of the aircraft, as necessary, to avoid conflict.
- Watch for conflicting traffic both visually and by reference to ACAS;
- Turn on all aircraft exterior lights;
- For deviations of less than 5 nm, remain at the level assigned by ATC;
- For deviations of greater than 5 nm, when the aircraft is approximately 5 nm from track, initiate a level change based on the criteria in the Table below;

Track	Deviations > 10nm	Level Change
East (000-179 magnetic)	Left Right	Descend 300 Ft Climb 300 Ft
West (180-359 magnetic)	Left Right	Climb 300 Ft Descend 300 Ft

Note: If contact was not established prior to deviating, continue to attempt to contact ATC to obtain a clearance. If contact was established, continue to keep ATC advised of intentions and obtain essential traffic information. When returning to track, be at the assigned flight level when the aircraft is within approximately 10 nm of centreline.

9.4.1.3 RNP 2 Operational Procedures

RNP 2 is primarily intended for a diverse set of en-route applications, particularly in geographic areas with little or no ground NAVAID infrastructure, limited or no ATS surveillance, and low to medium density traffic. Use of RNP 2 in continental applications requires a lower continuity requirement than used in oceanic/remote applications.

9.4.1.3.1 RNP 2 Flight Planning

In the flight planning phase, flight crew should:

- Ensure that the ATC Flight Plan includes: -
  - 'R' for PBN in item 10a;
  - the appropriate Surveillance (SUR) Capability in Item 10b; and
  - PBN/C1 together with NAV/RNP2 (unrestricted) or NAV RNP2 CONTINENTAL, to identify RNP 2 in item 18.

Prior to flight, consider conditions that may affect RNP 2 operations, including:

- Verify that the aircraft and operating crew are approved for RNP 2;
- Confirm that the aircraft can be operated in accordance with the RNP 2 requirements for the planned route(s) including the route/s to any alternate aerodrome(s) and minimum equipment requirements;
- Check availability of the NAVAID infrastructure required for the intended routes, including any non-RNAV contingencies, for the period of the intended operation;
- Confirm that the navigational database is current and appropriate for the region of intended operation and includes the NAVAIDs and waypoints required for the route; and
- Consider any operating restrictions, including time limits if applicable.

9.4.1.3.2 RNP 2 Pre-Flight Requirements

At the aircraft, flight crew should:

- Review the aircraft (technical) Log to ensure that there is no defect in navigational and communications equipment that would preclude RNP 2 operations (the MEL should identify the alleviations that are not suitable for RNP 2 operations);
- Confirm the navigation database is current for the duration of the flight; and
- Review and brief the contingency procedures for the area in which RNP 2 operations are to be conducted (this may be deferred to any time before entering RNP 2 airspace if there is a lengthy non-RNP 2 sector before entering RNP 2 airspace).

9.4.1.3.3 En-Route

All pilots must maintain a centre line, as depicted by on-board lateral deviation indicators and/or flight guidance during all RNP 2 operations described in this manual, unless authorized to deviate by ATC or under emergency conditions. For normal operations, cross-track error/deviation (the difference between the system computed path and the aircraft position relative to the path, i.e. FTE) should be limited to ±½ the navigation accuracy associated with the route (i.e. 1 NM for RNP 2). Brief deviations from this standard (e.g. overshoots or undershoots) during and immediately after turns, up to a maximum of one times the navigation accuracy (i.e. 2 NM for RNP 2) are allowable.

Some aircraft do not display or compute a path during turns, therefore, pilots of these aircraft may not be able to confirm adherence to the ±½ lateral navigation accuracy during turns, but must satisfy the standard during intercepts following turns and on straight segments.

If ATC issues a heading assignment that takes an aircraft off a route, the pilot should not modify the flight plan in the RNP system until they receive a clearance to rejoin the route or the controller confirms a new route clearance. When the aircraft is not on the RNP 2 route, the RNP 2 performance requirements do not apply.

Pilots of aircraft with RNP input selection capability should select a navigation accuracy value of 2 NM, or lower. The selection of the navigation accuracy value should ensure the RNP system offers appropriate lateral deviation scaling permitting the pilot to monitor lateral deviation and meet the requirements of the RNP 2 operation.

9.4.1.3.4 Contingency Procedures

Notify ATC when the RNP performance ceases to meet the requirements for RNP 2.

Navigation Database discrepancies that invalidate a route must be reported to the operator.

General Aircraft DOC 4444 contains Contingency Procedures - worldwide.

9.4.1.4 RNAV 5 (European B-RNAV) Operational Procedures

For operations in RNAV 5 airspace, aircraft require a track-keeping accuracy of +/-5 nm for 95% of the flight time. RNAV 5 does not require a navigation database, it only requires the flight management system to store four waypoints, and it does not require waypoint fly-by functionality

9.4.1.4.1 RNAV 5 Flight Planning

In the flight planning phase, flight crew should:

- Ensure that the ATC Flight Plan includes: -
  - 'R' for PBN in item 10a;
  - the appropriate Surveillance (SUR) Capability in Item 10b; and
  - PBN/B1 – B6 (as appropriate) to identify RNAV 5 in item 18.
- If stand-alone GNSS equipment is used to satisfy the RNAV requirement, the availability of RAIM should be checked against the latest GPS NOTAMs.

Note: *Dispatch should not take place in the event of predicted continuous loss of RAIM of more than 5 minutes for any part of the intended flight*.

9.4.1.4.2 RNAV 5 Pre-Flight Requirements

At the aircraft, flight crew should:

- Check the Technical Log to ensure that there is no defect to navigational equipment that would preclude RNAV 5 operations;

  Note: The MEL identifies those alleviations that are not suitable for RNAV 5 operations.
- Confirm that the navigation database is current;
- Crosscheck the cleared flight plan by comparing charts or other applicable resources with the FMS and the aircraft map display. If required, the exclusion of specific navigation aids should be confirmed.

9.4.1.4.3 RNAV 5 En-Route

During en-route RNAV 5 operations, flight crew should:

- Monitor flight progress for navigational reasonableness by cross-checks with conventional navigation aids using the primary displays in conjunction with the FMS;
- While operating on RNAV segments, flight crew should use the flight director and/or autopilot in lateral navigation mode (LNAV).

If ATC issues a heading assignment taking the aircraft off a route / procedure, flight crew should not modify the flight plan in the RNAV system until a clearance is received to rejoin the procedure or the controller confirms a new route clearance. When the aircraft is not on the published procedure, the specified accuracy requirement does not apply.

9.4.1.4.4 RNAV 5 Contingency Procedures

ATC must be advised if the RNAV performance ceases to meet the requirements for RNAV 5 together with the proposed course of action (e.g. reversion to non-RNAV procedures or a request for radar headings). The communication to ATC should be in accordance with phraseology described in Part 1 Chapter 9.4.0.12.

In the event of communications failure, the flight crew should continue with the flight plan in accordance with the published communications failure procedure.

Where stand-alone GNSS equipment is used, in the event of a loss of the RAIM detection function, the GNSS position may continue to be used for navigation. The flight crew should attempt to cross-check the aircraft's position using other sources of position information (e.g. VOR, DME and NDB).

Navigation Database discrepancies that invalidate a route must be reported to the operator.

9.4.1.5 RNAV 1 (P-RNAV) and RNAV 2 Operational Procedures

An RNAV 1 or RNAV 2 SID or STAR must not be flown unless it is retrievable by route name from the on-board navigation database and conforms to the charted route. However, the route may subsequently be modified through the insertion or deletion of specific waypoints in response to ATC clearances. The manual entry or creation of new waypoints by latitude and longitude is not permitted. Additionally, pilots must not change any RNAV SID or STAR database waypoint type from a fly-by to a fly-over or vice versa.

9.4.1.5.1 RNAV 1 and 2 Flight Planning

In the flight planning phase, flight crew should:

- Identify which portions of the flight are to be conducted in RNAV 1 / RNAV 2 airspace and verify the entry and exit points;
- Ensure that the ATC Flight Plan includes: -
  - 'R' for PBN in item 10a;
  - the appropriate Surveillance (SUR) Capability in Item 10b; and
  - in item 18: -
    - for RNAV 2, PBN/C1 – C4 as appropriate; and/or
    - for RNAV 1, PBN/D1 – D4 as appropriate.
- Ensure that adequate navigation capability is available en-route to enable the aircraft to navigate to RNAV 1 / RNAV 2 requirements.
- Note: RAIM levels required for RNAV 1 and RNAV 2 can be verified either through NOTAMs (where available) or through prediction services (see paragraph 2.1.1.3).
- In the event of a predicted, continuous loss of appropriate level of fault detection of more than five minutes for any part of the RNAV 1 or RNAV 2 operation, the flight plan should be revised (e.g. delaying the departure or planning a different departure procedure).

9.4.1.5.2 RNAV 1 and 2 Pre-Flight Requirements

At the aircraft, flight crew should:

- Check the Technical Log to ensure that there is no defect in navigational equipment that would preclude RNAV 1 / RNAV 2 operations;

  Note: The MEL identifies those alleviations that are not suitable for RNAV 1/RNAV 2 operations.
- Confirm that the navigation database is current;

  CAUTION: Navigation databases are expected to be current for the duration of the flight. If the AIRAC cycle is due to change during flight, the electronic data must be verified against paper products that are current for the required time frame.
- Crosscheck the cleared flight plan by comparing charts or other applicable resources with the FMS and the aircraft map display. If required, the exclusion of specific navigation aids should be confirmed.

  Note: Pilots may notice a slight difference between the navigation information portrayed on the chart and their primary navigation display. Differences of 3° or less may result from the equipment manufacturer's application of magnetic variation and are operationally acceptable.
- Check and brief the contingency procedures for the area in which RNAV 1 / RNAV 2 operations are to be conducted.

Note: This may be deferred to any time before entering RNAV 1 / RNAV 2 airspace if there is a lengthy non-RNAV 1 / RNAV 2 sector before entering RNAV 1 / RNAV 2 airspace.

9.4.1.5.3 Flying RNAV 1 / RNAV Procedures

9.4.1.5.3.0 General

For RNAV 2 routes, pilots should use a lateral deviation indicator, flight director or autopilot in lateral navigation mode. Pilots may use a navigation map display with functionality equivalent to that of a lateral deviation indicator, without a flight director or autopilot.

For RNAV 1 routes, pilots must use a lateral deviation indicator, flight director, or autopilot in lateral navigation mode.

Maintain route centrelines, unless authorised to deviate by ATC or under emergency conditions. For normal operations, cross-track error/deviation (the difference between the RNAV system computed path and the aircraft position relative to the path, i.e. FTE) should be limited to ±½ the navigation accuracy associated with the procedure or route (i.e. 0.5 nm for RNAV 1, 1.0 nm for RNAV 2). Brief deviations from this standard (e.g. overshoots or undershoots) during and immediately after procedure/route turns, up to a maximum of 100% of the navigation accuracy (i.e. 1.0 nm for RNAV 1, 2.0 nm for RNAV), are allowable.

CAUTION: Manually selecting aircraft bank limiting functions may reduce the aircraft's ability to maintain its desired track and is not recommended.

If ATC issues a heading assignment taking the aircraft off a route, the pilot should not modify the flight plan in the FMS until a clearance is received to rejoin the route or the controller confirms a new route clearance.

Note: When the aircraft is not on the published route in these circumstances, the specified accuracy requirement does not apply.

9.4.1.5.3.1 RNAV SID Specific Requirements

Before commencing the take-off, the flight crew should verify that the aircraft's RNAV system is available, operating correctly, and that the correct aerodrome, runway and RNAV procedure data are loaded. This is particularly important where a change of runway or procedure occurs and flight crew must verify that the appropriate changes are entered and available for navigation prior to take-off. A final check of proper runway entry and correct route depiction, shortly before take-off, is recommended.

The flight crew must use RNAV equipment to follow flight guidance for lateral RNAV no later than 500 ft above the aerodrome elevation. The altitude at which RNAV guidance begins on a given route may be higher (e.g. "Climb to 1,000 ft, then direct to …").

9.4.1.5.3.2 RNAV STAR Specific Requirements

Before the arrival phase, the flight crew should verify that the correct terminal route has been loaded. The active flight plan should be checked by comparing the charts with the map display (if applicable) and the CDU. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. If required by a route, a check will need to be made to confirm that updating will exclude a particular navigation aid. A route must not be used if doubt exists as to the validity of the route in the navigation database.

CAUTION: The creation of new waypoints by manual entry into the RNAV system by the flight crew would invalidate the route and is not permitted. All published altitude and speed constraints must be observed.

Route modifications in the terminal area may take the form of radar headings or 'Direct To' clearances and the flight crew must be capable of reacting in a timely fashion. This may include the insertion of tactical waypoints loaded from the database.

CAUTION: Manual entry or modification by the flight crew of the loaded route, using temporary waypoints or fixes not provided in the database, is not permitted.

9.4.1.5.4 RNAV 1 / RNAV 2 Contingency Procedures

Where the contingency procedure requires reversion to a conventional arrival route, necessary preparations must be completed before commencing the RNAV route.

The flight crew must notify ATC of any loss of the RNAV capability, together with the proposed course of action. If unable to comply with the requirements of an RNAV route, the flight crew must advise ATS as soon as possible. The loss of RNAV capability includes any failure or event causing the aircraft to no longer satisfy the RNAV requirements of the route.

In the event of communications failure, continue with the RNAV route in accordance with established lost communications procedures.

Navigation Database discrepancies that invalidate a route must be reported to the operator.

9.4.1.6 RNP 1 Operational Procedures

The RNP 1 specification provides a means to develop routes for connectivity between the en-route structure and terminal airspace with no or limited ATS surveillance, with low to medium density traffic.

RNP 1 specification is based upon GNSS. While DME/DME-based RNAV systems are capable of RNP 1 accuracy, this navigation specification is primarily intended for environments where the DME infrastructure cannot support DME/DME area navigation to the required performance. The increased complexity in the DME infrastructure requirements and assessment means it is not practical or cost-effective for widespread application.

9.4.1.6.1 Flight Planning

In the flight planning phase, flight crew should:

- Ensure that the ATC Flight Plan includes: -
  - 'R' for PBN in item 10a;
  - the appropriate Surveillance (SUR) Capability in Item 10b; and
  - PBN/O1 – O4 (as appropriate) to identify RNP 1 in item 18.
- Ensure the on-board navigation data must be current and include appropriate procedures; and
- Check the availability of the NAVAID infrastructure required for the intended routes, including any non-RNAV contingencies, must be confirmed for the period of intended operations using all available information. (RAIM levels required for RNP 1 can be verified either through NOTAMs (where available) or through prediction services.)

In the event of a predicted, continuous loss of appropriate level of fault detection of more than five minutes for any part of the RNP 1 operation, the flight planning should be revised (e.g. delaying the departure or planning a different departure procedure).

9.4.1.6.2 Flying RNP 1 Procedures

9.4.1.6.2.0 General

On RNP 1 routes, pilots must use a lateral deviation indicator, flight director, or autopilot in lateral navigation mode. Pilots of aircraft with a lateral deviation display must ensure that lateral deviation scaling is suitable for the navigation accuracy associated with the route/procedure (e.g. full-scale deflection: ±1 NM for RNP 1).

All pilots are expected to maintain centre lines, as depicted by on-board lateral deviation indicators and/or flight guidance during all RNP 1 operations described in this manual, unless authorized to deviate by ATC or under emergency conditions. For normal operations, cross-track error/deviation (the difference between the system computed path and the aircraft position relative to the path, i.e. FTE) should be limited to ±½ the navigation accuracy associated with the procedure (i.e. 0.5 NM for RNP 1). Brief deviations from this standard (e.g. overshoots or undershoots) during and immediately after turns, up to a maximum of one times the navigation accuracy (i.e. 1.0 NM for RNP 1) are allowable.

Note: Some aircraft do not display or compute a path during turns, but are still expected to satisfy the above standard during intercepts following turns and on straight segments.

If ATC issues a heading assignment that takes an aircraft off of a route, the pilot should not modify the flight plan in the RNP system until a clearance is received to rejoin the route or the controller confirms a new route clearance. When the aircraft is not on the published RNP 1 route, the specified accuracy requirement does not apply.

9.4.1.6.2.1 RNP 1 SIDs

Prior to commencing take-off, the pilot must verify that the aircraft's RNP 1 system is available, operating correctly, and that the correct airport and runway data are loaded. Prior to flight, pilots must verify their aircraft navigation system is operating correctly and the correct runway and departure procedure (including any applicable en-route transition) are entered and properly depicted. Pilots who are assigned an RNP 1 departure procedure and subsequently receive a change of runway, procedure or transition must verify that the appropriate changes are entered and available for navigation prior to take-off. A final check of proper runway entry and correct route depiction, shortly before take-off, is recommended.

GNSS Aircraft: When using GNSS, the signal must be acquired before the take-off roll commences. For aircraft using TSO-C129a avionics, the departure airport must be loaded into the flight plan in order to achieve the appropriate navigation system monitoring and sensitivity. For aircraft using TSO-C145()/C146() avionics, if the departure begins at a runway waypoint, then the departure airport does not need to be in the flight plan to obtain appropriate monitoring and sensitivity. If the RNP 1 SID extends beyond 30 NM from the ARP and a lateral deviation indicator is used, its full-scale sensitivity must be selected to not greater than 1 NM between 30 NM from the ARP and the termination of the RNP 1 SID.

For aircraft using a lateral deviation display (i.e. navigation map display), the scale must be set for the RNP 1 SID, and the flight director or autopilot should be used.

9.4.1.6.2.2 RNP 1 STARs

Prior to the arrival phase, the pilot should verify that the correct terminal route has been loaded. The active flight plan should be checked by comparing the charts with the map display (if applicable) and the MCDU. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. If required by a route, a check will need to be made to confirm that updating will exclude a particular NAVAID. A route must not be used if doubt exists as to the validity of the route in the navigation database.

The creation of new waypoints by manual entry into the RNP 1 system by the pilot would invalidate the route and is not permitted.

Where the contingency procedure requires reversion to a conventional arrival route, necessary preparations must be completed before commencing the RNP 1 procedure.

Procedure modifications in the terminal area may take the form of radar headings or "direct to" clearances and the pilot must be capable of reacting in a timely fashion. This may include the insertion of tactical waypoints loaded from the database. Manual entry or modification by the pilot of the loaded route using temporary waypoints or fixes not provided in the database is not permitted.

Pilots must verify their aircraft navigation system is operating correctly, and the correct arrival procedure and runway (including any applicable transition) are entered and properly depicted.

All published altitude and speed constraints must be observed.

Aircraft with TSO-C129a GNSS RNP systems: If the RNP 1 STAR begins beyond 30 NM from the ARP and a lateral deviation indicator is used, then full scale sensitivity should be manually selected to not greater than 1 NM prior to commencing the STAR. For aircraft using a lateral deviation display (i.e. navigation map display), the scale must be set for the RNP 1 STAR, and the flight director or autopilot should be used.

9.4.1.6.3 Contingency Procedures

The pilot must notify ATC of any loss of the RNP capability (integrity alerts or loss of navigation), together with the proposed course of action. If unable to comply with the requirements of an RNP

1 SID or STAR for any reason, pilots must advise ATS as soon as possible. The loss of RNP capability includes any failure or event causing the aircraft to no longer satisfy the RNP 1 requirements of the route.

In the event of communications failure, the pilot should continue with the published lost communications procedure.

Navigation Database discrepancies that invalidate a RNP1 SID/STAR must be reported to the operator.

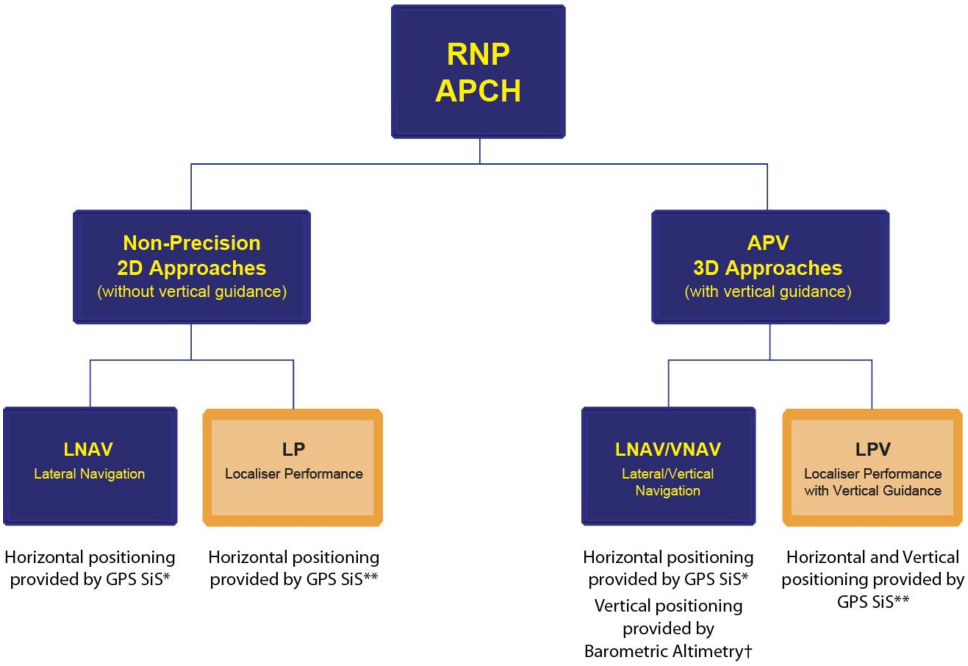
9.4.1.7 RNP APCH Operational Procedures

RNP approach (RNP APCH) procedures include existing RNAV (GNSS) approach procedures designed with a straight segment.

The FAA issued airworthiness criteria, AC20-138( ), for GNSS equipment and systems that are eligible for such operations. EASA also developed certification material (AMC 20-27A) and AMC-20-28) for airworthiness approval and operational criteria for RNP APCH operations. While similar in functional requirements, there are slight differences between these two sets of airworthiness criteria. In order to achieve a global standard, the two sets of criteria were harmonized into a single navigation standard.

The resulting harmonised ICAO standard is RNP APCH procedures down to LNAV, LNAV/VNAV, LPV or LP minima. The IOMAR can authorise appropriately certified aircraft to conduct RNP APCH down to the applicable minima and this will be identified on the Operations Specification.

The RNP APCH Model



Notes:

a) Augmentation of GPS Signal-in-Space for LNAV or LNAV/VNAV is provided by an Aircraft-Based Augmentation System (ABAS). A common ABAS implementation is the Receiver Autonomous Integrity Monitoring (RAIM) algorithm.

b) Augmentation of GPS Signal-in-Space for LP or LPV is provided by a Satellite-Based Augmentation System (SBAS). In Europe this is provided by the European Geostationary Navigation Overlay Service (EGNOS).

c) An RNAV (GNSS) named chart reflects the dependence on lateral positioning on GNSS Signal-In-Space (SiS). With the inherent on-board performance monitoring and alerting provided by GNSS, the navigation specification qualifies as RNP and yet, like many navigation applications, GPS-based approaches pre-date PBN, so the chart name has remained. RNP APCH procedures may be designed as stand-alone "T" or "Y" with the four segments as indicated above, or may be linked to a Runway Transition provided by either RNAV 1 or RNP 1 up to the Final Approach segment, and followed by the Missed Approach. The Final Approach segment may be flown either as a 2 Dimensional Approach (Non-Precision Approach), or as a 3 Dimensional Approach (Approach Procedure with Vertical guidance). For the latter, the vertical path positioning is provided by either on-board barometric systems or Space-Based Augmentation of Basic GNSS. From this the terms APV Baro-VNAV and APV SBAS are coined.

9.4.1.7.1 Flight Planning

In the flight planning phase, flight crew should:

- Ensure that the ATC Flight Plan includes: -
  - 'R' for PBN in item 10a;
  - the appropriate Surveillance (SUR) Capability in Item 10b; and
  - and PBN/S1 to identify RNP APCH in item 18.
- Verify that the Operations Specification includes approval for RNP APCH to the planned minima (i.e. LNAV, LNAV/VNAV, LPV, LP) and both pilots have completed training down to the applicable minima; and
- Confirm that the navigational database is current and include appropriate procedures.
- For LNAV, LNAV/VNAV operations check GNSS availability (RAIM levels should be verified either through NOTAMs) (where available) or through prediction services.
- For LPV, LP operations check augmented GNSS availability (service levels required can be verified either through NOTAMs (where available) or through prediction services).

9.4.2.7.2 Navigation Charting

The approach charts should clearly indicate that the navigation application is RNP APCH.

9.4.2.7.2.1 LNAV, LNAV/VNAV Minima

The procedure design should rely on normal descent profiles and the chart should identify minimum segment altitude requirements, including an lateral navigation OCA(H). If the missed approach segment is based on conventional means, NAVAID facilities that are necessary to conduct the approach must be identified in the relevant publications. The navigation data published in the State AIP for the procedures and supporting NAVAIDs must meet the requirements of Annex 4 — Aeronautical Charts, and Annex 15 — Aeronautical Information Services (as appropriate). All procedures must be based upon WGS-84 coordinates.

9.4.2.7.2.2 LPV, LP Minima

The charting designation should remain consistent with current conventions and will be promulgated as an LP or LPV OCA(H).

Note: LP, LPV, LNAV and LNAV/VNAV minima can be indicated on the same chart entitled RNAV (GNSS).

If the missed approach segment is based on conventional means, NAVAID facilities that are necessary to conduct the approach will be identified in the relevant publications.

The FAS of RNP APCH operations down to LP or LPV minima is uniquely characterized by a geometrically defined FAS. The FAS is the approach path which is defined laterally by the Flight Path Alignment Point (FPAP) and Landing Threshold Point/Fictitious Threshold Point (LTP/FTP), and defined vertically by the Threshold Crossing Height (TCH) and Glide Path Angle (GPA). The FAS will be promulgated using the FAS Data Block process. This FAS Data Block contains the lateral and vertical parameters, which define the approach to be flown. Each FAS Data Block ends with a Cyclic Redundancy Check (CRC), which wraps around the approach data.

The FAS may be intercepted by an approach transition (e.g. RNAV1), or initial and intermediate segments of an RNP APCH approach or through vectoring (e.g. interception of the extended FAS).

9.4.2.7.3 Temperature Compensation

For aircraft with temperature compensation, flight crews may disregard the temperature limits on RNP procedures if the operator provides pilot training on the use of the temperature compensation function. Temperature compensation by the system is applicable to the VNAV guidance and is not a substitute for the flight crew compensating for the cold temperature effects on minimum altitudes or the decision altitude. Flight crews should be familiar with the effects of the temperature compensation on intercepting the compensated path described in EUROCAE ED-75B/ RTCA DO-236B Appendix H.

9.4.2.7.3.1 Temperature Limits (when using Barometric VNAV)

Barometric VNAV (Baro-VNAV) operations can be subject to temperature limitation.

When the aerodrome temperature is 0°C or colder, the temperature error correction shall be added to:

- DH/DA or MDH/MDA and step-down fixes inside the final approach fix (FAF).
- All low altitude approach procedure altitudes in mountainous regions (terrain of 3000 ft AMSL or higher)

Operators using Baro-VNAV in an aircraft with an airworthiness approval for automatic temperature compensation, or in an aircraft using an alternate means for vertical guidance e.g. Satellite-Based Augmentation Systems (SBAS), can disregard the temperature limits (high temperature limit still applies if the system only compensates for low temperature).

9.4.2.7.4 Contingency Procedures

The pilot must notify ATC of any loss of the RNP APCH capability, together with the proposed course of action. If unable to comply with the requirements of an RNP APCH procedure, pilots must advise ATS as soon as possible. The loss of RNP APCH capability includes any failure or event causing the aircraft to no longer satisfy the RNP APCH requirements of the procedure.

The operator should develop contingency procedures in order to react safely following the loss of the RNP APCH capability during the approach.

In the event of communications failure, the pilot must continue with the RNP APCH in accordance with the published lost communications procedure.

9.4.1.8 RNP AR APCH

RNP AR APCH specification (sometimes referred to as SAAAR - Special Aircraft and Aircrew Authorization Required) represents the ICAO global standard for developing IAPs to airports where limiting obstacles exist and/or where significant operational efficiencies can be gained.

All RNP AR procedures have reduced lateral obstacle evaluation areas and vertical obstacle clearance surfaces predicated on the aircraft and aircrew performance requirements of this section.

An approval to conduct RNP AR APCH operations from the IOMAR is required, please refer to Part 2 Chapter 3.8.

9.4.2 RNAV Substitution

9.4.2.0 General

RNAV Substitution is the ability to use the FMS/RNAV system instead of conventional radio navigation aids, without monitoring the raw data of conventional navigation aids.

RNAV Substitution can have significant operational benefits, derived from the following:

- Failure of the conventional radio navigation aid does not automatically impose an operational limitation;
- Flight crew workload is reduced in part due to not having to interpret both conventional radio navigation aids and FMS navigational displays;
- Flight crew are able to employ common operating procedures across a range of routes and instrument flight procedures; and
- The ability to use the full functionality of modern navigation displays is maintained thereby improving situational awareness.

9.4.2.1 Limitations

RNAV Substitution cannot be used on any route or procedure where RNAV substitution has been indicated as "not authorised" in the States Aeronautical Information Publication or on the applicable commercial flight guides.

Unless prohibited by the State, RNAV Substitution may be used in all phases of flight airspace, except to provide lateral guidance in the final approach segment of an Instrument Approach Procedure (IAP).

Applications of RNAV substitution can be used to:

- determine of aircraft position relative to or distance from:
    - ➢ a Very High Frequency Omnidirectional Radio range (VOR);
    - ➢ a Marker;
    - ➢ a DME fix; or
    - ➢ a named fix defined by a VOR radial or Non-Directional Beacon (NDB) bearing and DME distance.
- navigation to or from a VOR, or NDB, except as lateral guidance in the final approach segment of an Instrument Approach Procedure (IAP);
- hold over a VOR, NDB, or DME fix;
- fly an arc based upon DME;

- fly an overlay of a conventional departure, arrival or route except as lateral guidance in the final approach segment Instrument Approach Procedure (IAP);
- fly a procedure where the chart contains a note requiring a particular type of conventional navaid, e.g. "ADF required".

Notes:

- Operators/pilots may apply RNAV Substitution as an Alternative Means of Compliance where Charts indicate that a published route or instrument approach procedure segment is not available without a particular conventional radio navigation aid e.g., NDB(L).
- RNAV substitution for ADF, VOR or DME may be used where the aircraft equipment is not installed or is inoperative and/or the ground-based radio navigation aid is either inoperative or unreliable.
- For the Initial, Intermediate and Missed Approach segments of an Instrument Approach Procedure (IAP), the entire procedure must be coded as an overlay procedure, from which it may be selected from the navigation data base and executed.
- For VOR and DME, RNAV Substitution should not encourage operators/pilots to remove VOR or DME, which remain as standard equipment.
- Additional information regarding the validation of procedures and the use of radio navigation aids is provided in the Quality Assurance Manual for Flight Procedure Design (Doc 9906), Volume 5 – Validation of Instrument Flight Procedures; and the Performance-based Navigation (PBN) Manual (Doc 9613).

9.4.2.2 Operational Criteria

Operational Approval for RNP 1 must be granted by the IOMAR. This will be published on the Aircraft Operations Specification (Ops Spec) Certificate.

The operator/pilot shall establish and document:

- a policy for the use of RNAV Substitution. Depending on its operational constraint(s), the operator/pilot may decide to limit the use of RNAV Substitution to particular cases, mainly to cope with inoperative or unreliable conventional radio navigation aids;
- standard operating procedures to be used by the flight crew when utilising the FMS/Area navigation system for substitution, complying with any procedures and/or limitations developed by the aircraft manufacturer in its documentation (Aircraft Flight Manual (AFM), Quick Reference Handbook (QRH), etc.); and
- training for the use of RNAV substitution. The training programme shall, as a minimum, include the limitations, operational criteria and operating procedures as extended to support staff, as applicable.

The operator/pilot shall ensure that the Minimum Equipment List (MEL), as applicable, is updated to include operating limitations associated with the FMS/Area navigation system and any other related system e.g., the GNSS system, that supports that equipment.

The operator/pilot shall verify that conventional radio navigation aids intended to be substituted are coded in the FMS/Area navigation system database, so that they can be used as a waypoint.

The operator/pilot shall verify that the conventional procedure intended to be flown is coded in the FMS/Area navigation system database. Depending on the complexity of the conventional procedure e.g., several conventional radio navigation aids involved in the path definition with several turning points, a flyability check may be considered necessary.

9.4.2.3 Operating Procedures

The pilot-in-command is responsible for:

- applying pre-flight procedures associated with GNSS use e.g., Receiver Autonomous Integrity Monitoring (RAIM) check, if applicable;
- checking that the navigation database is current;
- ensuring that any procedures and waypoints used are retrieved from the navigation database;
- verifying waypoint sequence, reasonableness of track angles, and distances of any coded overlay procedure used and in particular, where the use of RNAV Substitution is used to replace offset DME with a zero-range indication, associated with an ILS;
- ensuring that FMS/Area navigation system and the GNSS systems are operational; and
- complying with any limitation on RNAV Substitution in the AFM and manufacturer's documentation.

9.4.2.4 Pilot Knowledge and Training

Operators must ensure that training is provided so that the pilot aware of the limitations of and familiar with the policies and operating procedures (refer to Part 1 Chapter 9.4.2.2).

9.5 Operation Of Airborne Collision Avoidance System (ACAS) Equipment

9.5.0 General

Airborne collision avoidance system (ACAS) is an aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.

The information provided by an ACAS is intended to assist pilots in the safe operation of aircraft by providing advice on appropriate action to reduce the risk of collision. This is achieved through resolution advisories (RAs), which propose manoeuvres, and through traffic advisories (TAs), which are intended to prompt visual acquisition and to act as a warning that an RA may follow. TAs indicate the approximate positions of intruding aircraft that may later cause resolution advisories. RAs propose vertical manoeuvres that are predicted to increase or maintain separation from threatening aircraft. ACAS I equipment is only capable of providing TAs, while ACAS II is capable of providing both TAs and RAs. In this chapter, reference to ACAS means ACAS II.

ACAS indications shall be used by pilots in the avoidance of potential collisions, the enhancement of situational awareness, and the active search for, and visual acquisition of, conflicting traffic.

Nothing in the procedures specified hereunder shall prevent pilots-in-command from exercising their best judgement and full authority in the choice of the best course of action to resolve a traffic conflict or avert a potential collision.

Note: Unless otherwise specified in an air traffic control instruction, to avoid unnecessary airborne collision avoidance system (ACAS II) resolution advisories in aircraft at or approaching adjacent altitudes or flight levels, pilots should consider using appropriate procedures to ensure that a rate of climb or descent of less than 1500 ft/min (depending on the instrumentation available) is achieved throughout the last 1 000 ft of climb or descent to the assigned altitude or flight level, when made aware of another aircraft at or approaching an adjacent altitude or flight level.

9.5.1 Use Of ACAS Indications

The indications generated by ACAS shall be used by pilots in conformity with the following safety considerations:

a) pilots shall not manoeuvre their aircraft in response to traffic advisories (TAs) only;

b) on receipt of a TA, pilots shall use all available information to prepare for appropriate action if an RA occurs; and

c) in the event of an RA, pilots shall:

    1) respond immediately by following the RA as indicated, unless doing so would jeopardize the safety of the aeroplane;

    2) follow the RA even if there is a conflict between the RA and an air traffic control (ATC) instruction to manoeuvre;

    3) not manoeuvre in the opposite sense to an RA;

    4) as soon as possible, as permitted by flight crew workload, notify the appropriate ATC unit of any RA which requires a deviation from the current ATC instruction or clearance;

    5) promptly comply with any modified RAs;

    6) limit the alterations of the flight path to the minimum extent necessary to comply with the RAs;

7) promptly return to the terms of the ATC instruction or clearance when the conflict is resolved; and

8) notify ATC when returning to the current clearance using the phrase ".

The phraseology to be used by flight crew for the notification to ATC of manoeuvres in response to a resolution advisory and other ACAS events shall be as follows:

Event	Phraseology
... after a flight crew starts to deviate from any ATC clearance or instruction to comply with an ACAS resolution advisory (RA)	"TCAS RA"
... after the response to an ACAS RA is completed and a return to the ATC clearance or instruction is initiated	"CLEAR OF CONFLICT, RETURNING TO (assigned clearance)"
… after the response to an ACAS RA is completed and the assigned ATC clearance or instruction has been resumed	"CLEAR OF CONFLICT (assigned clearance) RESUMED"
… after an ATC clearance or instruction contradictory to the ACAS RA is received, the flight crew will follow the RA and inform ATC directly	"UNABLE, TCAS RA"

9.6 Operation with an Out-of-Currency Navigation Database

A Navigation Database (NavDB) which is operative but out of currency is not considered by the IOMAR to be inoperative, therefore does not need to be deferred in accordance with an MEL approved by the IOMAR.

In order to operate and aircraft with an out of currency NavDB, Operators shall establish a procedure for comparing the database with the current applicable aeronautical charts to verify navigation information prior to dispatch for the departure, destination, alternates and planned route.

If changes to the current applicable charts (including alternate information) have been published, the aircraft database should not be used to conduct flight operations.

It is the operator's responsibility to ensure that the highest level of safety is maintained when utilizing out of currency navigation databases for flight operations.

Chapter 10: Safety Management System

10.1 What is a Safety Management System?

A Safety Management System (SMS) is a systematic approach to managing safety including the necessary organisational structures, accountabilities, policies and procedures. It should be a common sense but organised means of managing safety. A SMS attempts to put the proven safety management processes together in a sound framework so that the processes work as a system to enhance the safety, efficiency and effectiveness of the operator.

10.2 Need for a SMS

A SMS is mandated for all operators of Large and Turbojet Aircraft (refer to Part 1 Chapter 13.1.3).

SMS is just as relevant for a small operation as for the operator of multiple aircraft; however, what is appropriate for a single aircraft owner/operator is unlikely to be appropriate for the operator of multiple aircraft. Due to the safety benefits which an effective SMS can bring, the IOMAR ***strongly recommends all operators (regardless of aircraft type/class) to implement a SMS commensurate with the size and complexity of their operation.***

Consequently, the IOMAR expects aircraft operators to tailor their SMS to their particular operation. Implementing a SMS can be simpler than initially expected and many small organizations already have many of the elements of a SMS in place. Fundamentally, a SMS does not have to be complicated to be effective and to generate safety and consequent financial benefits to the operator.

10.3 Benefits of an SMS

A SMS allows an aircraft operator to take a proactive approach to managing safety by identifying causal factors that contribute to errors being made. The SMS helps you to have a greater understanding of safety by eliminating the hazards or reducing the related risks and therefore the likelihood of accidents and incidents occurring. A SMS also helps to prevent or minimise minor occurrences that can lead to a minor injury, aircraft down time, or even legal costs. The existence of a SMS can also be beneficial in giving confidence to customers, financial institutions and insurers that safety risk is being understood and managed. Additional SMS benefits can include in improved intercompany communication, building a safety culture and providing regulator confidence.

With an SMS it should be possible to systematically and proactively anticipate hazards and reduce 'surprises' by making effective risk management decisions.

10.4 SMS Framework

The SMS shall meet the ICAO SMS Framework below, which has been reworded slightly for international general aviation. This framework is the minimum requirement for an SMS implementation regardless of the size and complexity of the operation.

Component 1 – Safety Policy and Objectives

There are 5 elements within this component:

Component 1.1 Management Commitment

Management commitment is essential and shall be reflected in the operators Safety Policy and Objectives.

The safety policy shall:

- reflect the organisational commitment regarding safety, including the promotion of a positive safety culture;
- include a clear statement about the provision of the necessary resources for the implementation of the safety policy;
- include safety reporting procedures;
- clearly indicates which types of behaviours are unacceptable related to the operator's aviation activities and include the circumstances under which disciplinary action would not apply;
- be signed by the accountable executive of the organisation;
- be communicated, with visible endorsement, throughout the organization; and
- be periodically reviewed to ensure it remains relevant and appropriate to the operator.

The Safety Objectives shall:

- form the basis for safety performance monitoring and measurement;
- reflect the operator's commitment to maintain or continuously improve the overall effectiveness of the SMS;
- be communicated throughout the organization; and
- be periodically reviewed to ensure they remain relevant and appropriate to the service provider.

Component 1.2Safety Accountability and Responsibilities

Accountability and Responsibilities shall be clearly defined and: -

- identify the accountable executive who, irrespective of other functions, is accountable on behalf of the organisation for the implementation and maintenance of an effective SMS;
- clearly defined lines of safety accountability throughout the organisation, including a direct accountability for safety on the part of senior management;
- identification of the responsibilities of all members of management, irrespective of other functions, as well as of employees, with respect to the safety performance of the organisation;
- document and communicate safety accountability, responsibilities and authorities throughout the organisation; and
- include definitions of the levels of management with authority to make decisions regarding safety risk tolerability.

Component 1.3Appointment of Key Safety Personnel

A safety manager shall be nominated to be responsible for the implementation and maintenance of the SMS.

Note: Depending on the size and complexity of the operator, the responsibilities for the implementation and maintenance of the SMS can be assigned to one or more persons, fulfilling the role of safety manager, either combined with other duties or as their sole function or, provided these do not result in any conflicts of interest.

Component 1.4Coordination of Emergency Response Planning

The SMS shall include an emergency response plan for accidents, incidents and aviation emergencies.

Component 1.5 SMS Documentation

The SMS shall be properly documented to describe its: -

- safety policy and objectives;
- SMS requirements;
- SMS processes and procedures; and
- accountabilities, responsibilities and authorities for the SMS processes and procedures.

Note: Depending on the size of the service provider and the complexity of its aviation products or services, the SMS manual and SMS operational records can be in the form of stand-alone documents or can be integrated with other organisational documents (or documentation) maintained by the operator.

Component 2 – Safety Risk Management

There are 2 elements within this component:

Component 2.1 Hazard Identification

The SMS shall include a process to identify hazards associated with the operation of aircraft. Hazard identification shall be based on a combination of reactive and proactive methods.

Component 2.2 Safety Risk Assessment and Mitigation

Once the hazards have been identified, there shall be a process to analyse, assess and implement controls of the safety risks associated with identified hazards.

Component 3 – Safety Assurance

There are 3 elements within this component:

Component 3.1 Safety Performance Monitoring and Measurement

The SMS shall include a means verifying safety performance and validating the effectiveness of safety risk controls.

Component 3.2 The Management of Change

The SMS shall include a process to identify changes that can affect the level of safety risk associated with the aircraft operation and to identify and manage the safety risks that can arise from those changes.

Component 3.3 Continuous Improvement of the SMS

The SMS shall include a process to monitor and assess the SMS processes to maintain or improve the overall effectiveness.

Component 4 – Safety Promotion

There are two elements within this component:

Component 4.1 Training and Education

A safety training programme that ensures that personnel are trained and competent to perform their SMS duties shall be provided to all relevant staff.

Component 4.2 Safety Communication

A formal means for safety communication shall be developed and maintained that:

- ensures personnel are aware of the SMS to a degree commensurate with their positions;
- conveys safety-critical information;
- explains why particular actions are taken to improve safety; and
- explains why safety procedures are introduced or changed.

10.5 Further Guidance

For guidance on implementing the SMS Framework, please refer to the dedicated SMS page on the IOMAR Website.

CHAPTER 11: AERODROME OPERATING MINIMUM

11.0 General

Aerodrome operating minima are usually expressed as a minimum altitude or height and a minimum visibility or RVR.

For take-off, they are an indication of the minimum visibility or RVR conditions in which the pilot of an aeroplane may be expected to have available the external visual reference required for the control of the aeroplane along the surface of the runway until it is airborne or until the end of a rejected take-off. For approach and landing, they are an expression of the minimum altitude or height by which the specified visual reference should be available and at which the decision to continue for landing or to execute a missed approach should be made. They are also an indication of the minimum visibility in which the pilot may have the visual information necessary for continued control of the flight path of the aeroplane during the visual phase of the approach, landing and roll-out.

Minimum visibility values are primarily used in association with regulations that address the commencement and continuation of an approach.

The minimum visibility specified by State of the Aerodrome is to be used to prohibit commencement or continuation of an instrument approach.

11.1 Take-off Minima

Take-off minima are usually stated as visibility or RVR limits. Where there is a specific need to see and avoid obstacles on departure, take-off minima may include cloud base limits. Where avoidance of such obstacles may be accomplished by alternate procedural means, such as use of climb gradients or specified departure paths, cloud base restrictions need not be applied. Take-off minima typically account for factors such as terrain and obstacle avoidance, aircraft controllability and performance, visual aids available, runway characteristics, navigation and guidance available, non-normal conditions such as engine failure, and adverse weather including runway contamination or winds.

For multi-engined aeroplanes whose performance is such that in the event of a critical power unit failure at any point during take-off, the aeroplane can either stop or continue to a height of 1,500ft above the aerodrome while clearing all obstacles by the required margins, the take-off minima may not be less than those given in the Table below:

Facilities	**RVR/Visibility** (see note 1)
Adequate Visual Reference Nil (see note 2) – Day Only	500 m / 1,600 ft
Runway Edge Lighting or Runway Centreline Markings (See note 3)	400 m / 1,200 ft

Notes:

1) The TDZ RVR/VIS may be assessed by the pilot.
2) Adequate visual reference means that a pilot is able to continuously identify the take-off surface and maintain directional control.
3) For night operations, at least Runway Edge Lights or Centreline Lights and Runway End Lights must be are available.

For take-off with an RVR below 400 m / 1,200 ft, an AWOPS approval from the IOMAR is required, refer to RP39 – AWOPS Approvals and Renewals.

11.2 Approach/Landing Minima

Approach and Landing Minima is published by the Aerodrome authority and replicated in commercial flight guides.

Unless approved for Operational Credit or to conduct Category II, Category IIIA or Category IIIB Approaches, the pilot in command of an aircraft when causing the aircraft to descend at an aerodrome to a runway for which there is a notified instrument approach, must not cause the aircraft to descend from a height of 1,000 feet or more above the aerodrome to a height of less than 1,000 feet above the aerodrome if the relevant runway visual range for that runway is at the time less than the specified minimum for landing.

CHAPTER 12: AEROPLANE PERFORMANCE & PRE-FLIGHT ROUTE ASSESSMENT

12.0 Aeroplane Performance Standards

Aeroplane performance can be divided into three general categories: -

1) Airworthiness Standards, for which compliance demonstration is under the responsibility of the aeroplane manufacturer or type certificate (TC) holder.
2) Operating Standards, which must be complied with by the aeroplane operator.
3) Supplemental Performance Standards (which may be of an advisory nature), may be provided by the manufacturer in order to assist operators.

Airworthiness and operating Standards may not cover all the information necessary to operate the aeroplane with regard to take-off and landing performance. Therefore, this chapter identifies specific aeroplane performance issues that operators should consider to ensure a safe operation.

The operation of aeroplanes on runways that are not dry, i.e. wet or contaminated, crosses multiple boundaries in the regulatory framework such as: -

- airworthiness standards;
- aircraft operating standards;
- aerodrome runway construction and maintenance standards; and
- the determination and dissemination of the description of the runway surface condition.

The runway condition report (RCR) creates a common language on runway surface conditions for all stakeholders. It allows aerodrome personnel to report the relevant elements that characterize a contaminated runway surface in terms of their effect on performance.

12.1 Runway Surface Condition Assessment and Reporting

12.1.0 General

The ICAO Global Reporting Format (GRF) is a methodology and terminology for assessing and reporting the runway surface conditions which should come into effect on 4th November 2021, although implementation and preparedness may vary in each State.

Runway accidents and incidents are aviation's number one safety-related risk category. A primary factor contributing to this risk includes runway excursions during take-off or landing in adverse weather conditions; the runway surface may be contaminated by snow, ice, slush or water, with a potentially negative impact on an aircraft's braking, acceleration or controllability. ICAO therefore introduced a methodology to harmonize the assessment and reporting of runway surface conditions. This methodology will improve the flight crew's assessment of the take-off and landing performance of aeroplanes. The report is intended to cover conditions found in all climates and provides a means for aerodrome operators to rapidly and correctly assess the conditions, whether they be a wet runway, snow, slush, ice or frost, including rapidly changing conditions such as those experienced during winter or in tropical climates. The information can be provided to the flight crew via various channels, such as the revised SNOWTAM or air traffic control. This is a conceptual change for the airport as it no longer just reports a series of observations and measurements, but it also turns this information into an overall assessment of the effect that the surface condition has on the aeroplane performance.

The reporting process begins with the evaluation of a runway by human observation, normally performed by airport operations staff. A description of the surface contaminant based on its type, depth and coverage for each third of the runway, is then used to obtain a runway condition code (RWYCC) specific to the conditions observed. The evaluation and associated RWYCC are used to complete a standard report called the runway condition report (RCR) which is then forwarded to air traffic control (ATC) and the aeronautical information service (AIS) for onward dissemination to pilots.

Therefore flight crew should use the RCR provided, to determine the expected performance of their aircraft by correlating the RWYCC or the reported runway condition description with performance data provided by the aircraft manufacturer. This helps pilots to correctly carry out their landing and take-off performance calculations for wet or contaminated runways. Pilots should also report their own observations of runway conditions once a landing has been completed, thereby confirming the RWYCC or providing an alert to changing conditions. This relatively simple and globally applicable reporting methodology is an important means by which the risk of runway excursion can be mitigated and the safety of runway operations improved.

12.1.1 Runway Descent Below 1000 ft Onto A Contaminated Runway

An approach to land should not be continued below 300 m (1000 ft) above aerodrome elevation unless the pilot-in-command is satisfied that, with the runway surface condition information available, the aeroplane performance information indicates that a safe landing can be made.

12.1.2 Runway Condition Report (RCR)

The RCR is the basis for all runway surface condition reporting. It is a comprehensive, standardized report relating to the runway surface condition and its effect on the landing and take-off performance of an aeroplane.

The philosophy of the RCR is that the aerodrome operator assesses the runway surface conditions whenever water, snow, slush, ice or frost are present on an operational runway. From this assessment, a Runway Condition Code (RWYCC) and a description of the runway surface are reported which can be used by the flight crew for aeroplane performance calculations. This format, based on the type, depth and coverage of contaminants, is the best assessment of the runway surface condition by the aerodrome operator. All other pertinent information will be taken into consideration and be kept up to date so that changes in conditions can be reported without delay.

The RWYCC reflects the runway braking capability as a function of the surface conditions. With this information, the flight crew can derive, from the performance information provided by the aeroplane manufacturer, the necessary stopping distance of an aircraft on the approach under the prevailing conditions.

When the runway is wholly or partly contaminated by standing water, snow, slush, ice or frost, or is wet associated with the clearing or treatment of snow, slush, ice or frost, the RCR should be disseminated through the AIS and ATS services. When the runway is wet, not associated with the presence of standing water, snow, slush, ice or frost, the assessed information should be disseminated using the runway condition report through the ATS only.

The RCR information shall be included in an information string in the following order using only AIS compatible characters:

Aeroplane Performance Calculation Section	**Situational Awareness Section**
Aerodrome location indicator;	Reduced runway length;
Date and time of assessment;	Drifting snow on the runway;
Lower runway designation number;	Loose sand on the runway;
RWYCC for each runway third;	Chemical treatment on the runway;
Percent coverage contaminant for each runway third;	Snowbanks on the runway;
Depth of loose contaminant for each runway third;	Snowbanks on the taxiway;
Condition description for each runway third; and	Snowbanks adjacent to the runway;
Width of runway to which the RWYCCs apply if less than published width.	Taxiway conditions;
	Apron conditions;
	State-approved, and published use of, measured friction coefficient; and
	Plain language remarks.

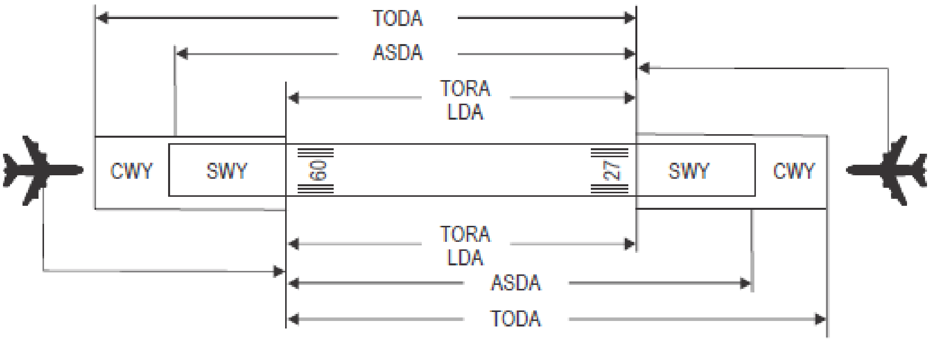
12.1.2.1 Runway Condition Codes (RWYCC)

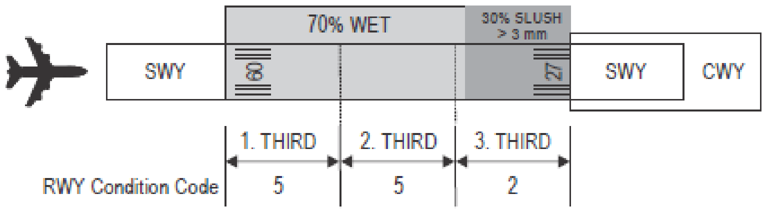
The RWYCC is a single-digit number describing the deceleration and lateral control capability for the runway surface condition. They are assigned to each runway third whenever the coverage of any water-based contaminant on that runway third exceeds 25 per cent. It is the total assessment of the slipperiness of the surface, as judged by the trained and competent aerodrome personnel and based on given procedures and all information available, and enables flight crew to determine the effect of the runway surface condition on aeroplane deceleration performance and control.

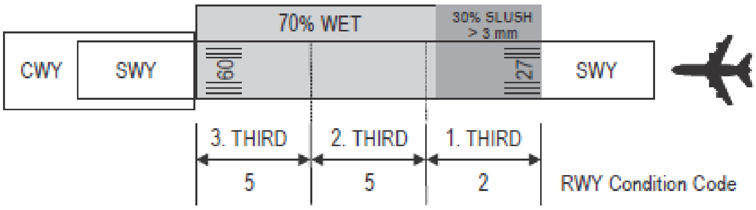
There are seven surface condition levels associated with RWYCC numbers zero to six and they represent conditions that range from too slippery to operate on (zero), to completely dry conditions (six). Each RWYCC (except zero) is matched with a corresponding aeroplane deceleration performance level. Airport operations staff assign the RWYCC based on the conditions observed in their physical evaluations of runway conditions, which are then included in the RCR.

The reference runway length will typically be the full length of asphalt or concrete available for take-off or landing. However, it should be noted that when a stopway exists at the airport, it is excluded from the scope of the runway surface for which RWYCC are assigned. This is shown below, which illustrates the runway thirds and RWYCCs for runways with and without, a displaced threshold. It is important for the flight crew to be aware that the stopways will see less traffic than the rest of the runway surface and may therefore be subject to more accumulation of contamination. If the condition of the stopway is significantly different from the rest of the runway, this should be reported in the free text comments of the RCR.

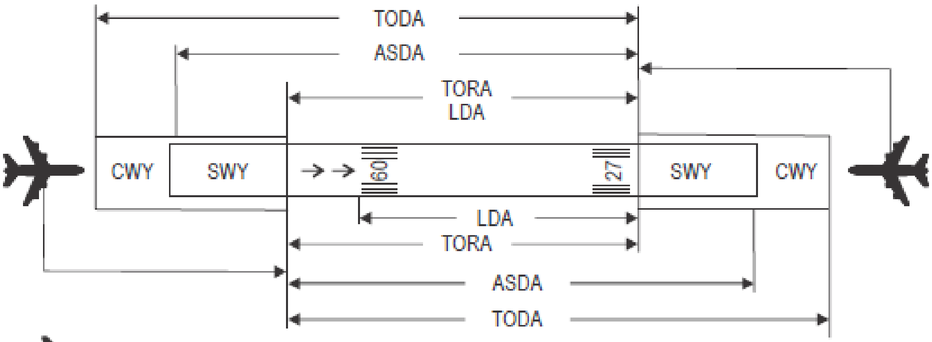
Normal Threshold

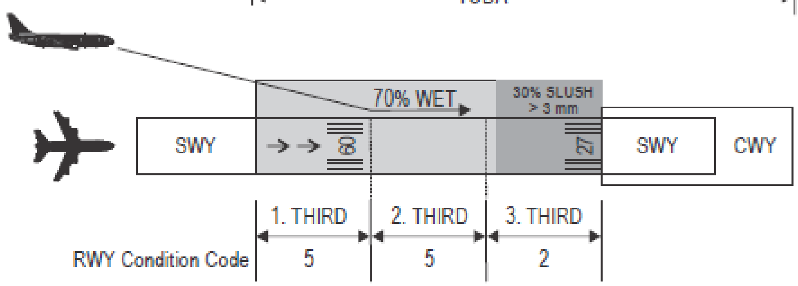


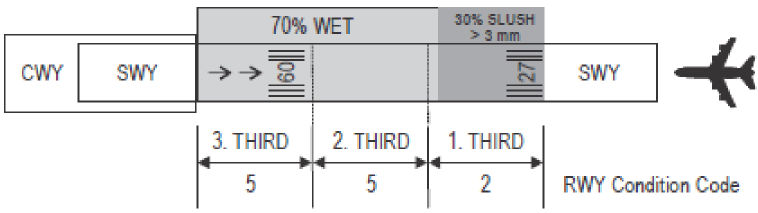




Displaced Threshold







Runway Condition Codes are assigned in the RCR according to the descriptions as shown in the following table:

Runway Condition Description	**RWYCC**
• Dry	6
• FROST • WET (runway surface is covered by any visible dampness or water up to and including 3 mm deep) ***Up to and including 3 mm depth:*** • SLUSH • DRY SNOW • WET SNOW	5
-15ºC and Lower outside air temperature: • COMPACTED SNOW	4
• **WET** ("Slippery wet" runway) • **DRY SNOW** or **WET SNOW** (any depth) on top of Compacted Snow ***More than 3 mm depth:*** • DRY SNOW • WET SNOW ***Higher than -15ºC outside air temperature[1]:*** • COMPACTED SNOW	3
More than 3 mm depth of water or slush • STANDING WATER • SLUSH	2
• ICE[2]	1
• WET ICE[2] • WATER ON TOP OF COMPACTED SNOW[2] • DRY SNOW OR WET SNOW ON TOP OF ICE[2]	0

Notes:
1. Runway surface temperature should preferably be used where available.
2. The airport operator may assign a higher runway condition code (but no higher than code 3) for each third of the runway.

12.1.2.2 RCR Example

In the example below, Runway 08 at EGNS (Isle of Man) has been assessed as follows at 0950 on 25 December:

Description	1st Third	2nd Third	3rd Third
Runway condition code RWYCC	2	3	3
Percent coverage contaminant	75	100	100
Depth of loose contaminant	6mm	12mm	12mm
Condition description	Slush	Wet Snow	Wet Snow
Width of runway to which the RWYCC applies (if less than published width)	30m	30m	30m

This would be transmitted by the aerodrome operator via AIS as:

(Headers)
GG EGGNYNYX
12250958 EGNSZTZX
(SWEG0100 EGNS 12250950

(Aeroplane performance calculation section)
EGNS 12250950 08 2/3/3 75/100/100 06/12/12 SLUSH/WET SNOW/WET SNOW 30

(Situational awareness section)
RWY 08 SNOWBANK R30 FM CL. TAXIWAY A POOR.)

ATIS or **RTF** reports are given in the direction of take-off/landing, so for the example given:

"Runway 08 surface condition code 2, 3, 3. Slush depth 6 mm, wet snow depth 12 mm, wet snow depth 12 mm. Cleared width 30m. Caution Runway 08 snowbank 30m right of centreline. Taxiway ALPHA poor."

12.1.3 Runway Braking Action Reporting

Whilst it is the aerodrome operators responsibility to generate the RCR, it is imperative that flight crew provide accurate braking action reports to provide feedback to the aerodrome operator regarding the accuracy of the RCR resulting from the observed runway surface conditions.

ATC passes these braking action reports to the aerodrome operator, which in turn uses them to determine if it is necessary to downgrade or upgrade the RWYCC.

During busy times, runway inspections and maintenance may be less frequent and need to be sequenced with arrivals. Therefore, aerodrome operators may depend on braking action reports to confirm that the runway surface condition is not deteriorating below the assigned RCR.

Since both ATC and the aerodrome operator rely on accurate braking action reports, flight crew should use standardised terminology in accordance with ICAO Doc 4444 'PANS ATM'. The following table shows the correlation between the terminology to be used in the AIREP to report the braking action and the RWYCC.

Pilot report of runway braking action	Description	Runway Condition (RWYCC)
N/A		6
GOOD	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	5
GOOD TO MEDIUM	Braking deceleration OR directional control is between good and medium.	4
MEDIUM	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	3
MEDIUM TO POOR	Braking deceleration OR directional control is between medium and poor.	2
POOR	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	1
LESS THAN POOR	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	0

12.1.4 Aircraft Reports (AIREP)

An AIREP should be transmitted to ATC, in accordance with one of the following specifications, as applicable:

a) Good braking action is reported as 'BRAKING ACTION GOOD'.

b) Good to medium braking action is reported as 'BRAKING ACTION GOOD TO MEDIUM'.

c) Medium braking action is reported as 'BRAKING ACTION MEDIUM'.

d) Medium to poor braking action is reported as "BRAKING ACTION MEDIUM TO POOR"

e) Poor braking action is reported as 'BRAKING ACTION POOR'.

f) Less than poor braking action is reported as 'BRAKING ACTION LESS THAN POOR'.

The pilot-in-command should report runway braking action when the runway braking action encountered is not as good as reported.

When the experienced braking action is better than that reported by the aerodrome operator, it is important to report this information, which may trigger further actions for the aerodrome operator in order to upgrade the RCR.

If an aircraft-generated braking action report is available, it should be transmitted, identifying its origin accordingly. If the flight crew have a reason to modify the aircraft-generated braking action report based on their judgement, the commander should be able to amend such report.

A Mandatory Occurrence Report must be submitted whenever low braking action may have represented a significant risk to aviation safety.

12.1.5 Training

Operators must ensure that their flight crew are appropriately trained on runway surface condition assessment and reporting, and on the impact on the aeroplane performance data. While the methodology establishes a clear link between the observation, reporting and accounting for runway surface conditions in performance, it also creates new paths for errors that should be highlighted during the proactive training of crew. As the assessment of the runway condition, friction measurement, and estimation of braking action are not an exact science, it is important that training emphasizes that the methodology provides a toolset permitting an approximate assessment of the aeroplane performance rather than establishing exact aeroplane behaviour in terms of numbers.

12.1.5.1 Recommended Training Syllabus

A training syllabus should include the following, as a minimum:

a) The history of runway surface condition reporting:
   1) accident history; and
   2) reasoning and description of the reporting method.
b) The purpose of new runway surface condition reporting.
c) Matrix fundamentals:
   1) RCAM layout:
      i) differences between those published for aerodromes and flight crew;
      ii) format in use;
      iii) the use of runway friction measurements;
      iv) the use of temperature;
      v) the concept of "performance buckets" and ICAO runway surface condition codes;
   2) runway contaminant definitions;
   3) depth measurements;
   4) runway coverage: errors in the reporting percentage coverage and how reporting in thirds can produce highly deceptive information to the flight crews;
   5) use of the term "slippery wet": conditions must be effectively observed and reported; and
   6) downgrading or upgrading criteria.
d) Flight crew related actions:
   1) the difference between a calculation and an assessment;
   2) effects of aircrew task loading on receiving condition reporting; and
   3) pilot braking AIREPs: pilots must understand the physics the reports represent as well as the techniques necessary to produce an accurate observation.
e) Types of runway contamination and its effects:
   1) general types of contaminant;
      i) solid;
      ii) loose; and
      iii) deformable.

f) Aircraft performance:
   1) effects of contamination during take-off;
   2) effects of contamination during landing;
   3) airport items used for landing;
      i) visual cues; and
      ii) Category III cues;
   4) the components of a pilot braking report;
      i) how to give an accurate report; and
      ii) when reports are not valid;

g) Operational observations with friction devices: the friction measuring devices must be properly calibrated and operated and should meet the standard and correlation criteria set by the State.

h) Critical areas of the runway;

i) Safety considerations;
   1) types of errors possible;
   2) mindfulness principals necessary for high reliability; and
   3) safety reporting.

j) Documentation and records.

12.2 Pre-Flight Route Assessment

The operator shall ensure that a flight will not be commenced unless it has been ascertained by every reasonable means available that the ground and/or water facilities including communication facilities and navigation aids available and directly required on such flight, for the safe operation of the aeroplane, are adequate for the type of operation under which the flight is to be conducted.

12.2.1 RFFS Facilities

The pilot-in-command, in making a decision on the adequacy of facilities and services available at an aerodrome of intended operation, should assess the level of safety risk associated with the aircraft type and nature of the operation, in relation to the availability of rescue and fire-fighting services (RFFS).

CHAPTER 13: REQUIREMENTS FOR LARGE & TURBOJET AIRCRAFT

13.0 General

A large and turbojet aircraft is an aircraft which meets **any** of the following criteria: -

- A maximum total mass authorised exceeding 5,700 kg;
- One of more turbojet engines; or
- A seating configuration of more than 9 passenger seats.

Large and Turbojet aircraft have the additional requirements included in this section.

13.1 Company Operations Manual (COM)

13.1.0 General

The Company Operations Manual shall be written for the use and guidance of operational personnel.

It shall contain all the instructions and information necessary for operational personnel to perform their duties.

The operations manual shall be amended or revised as is necessary to ensure that the information contained therein is kept up to date.

All such amendments or revisions shall be issued to all personnel that are required to use this manual.

13.1.1 Requirements for a COM

An operator of a large and turbojet aircraft must prepare and ensure that a Company Operations Manual (COM) is in force. The COM shall contain the information and instructions as may be necessary to enable the operating staff to perform their duties.

The form and scope of COM can vary considerably with the nature and complexity of the operator's organisation and types of aircraft in use. A COM template is available to operators from the IOMAR upon request. The template provides a framework which will assist operators to produce a COM.

The IOMAR do not approve the operator's COM however the manual can be requested as part of its safety and compliance oversight activities.

13.1.2 Mandatory Contents of the COM

The COM must include a table of contents, and an amendment control page.

The COM must include details of: -

a) the duties, responsibilities and succession of the management and operating personnel of the operator;
b) the operator's safety management system, refer to Part 1 Chapter 13.1.3;
c) the aircraft's operational control system;
d) details of the aircraft's minimum equipment list procedures, refer to Part 2 Chapter 5.2;

e) the flight preparation procedures in respect of the aircraft including procedures for briefing passengers;

f) how cabin baggage must be stowed and secured when the aircraft is taking off or landing;

g) how operational flight planning in respect of the aircraft must be carried out;

h) normal flight operations, including fuel procedures and requirements, refer to Part 1 Chapter 8;

i) the standard operating procedures in respect of the aircraft together with its performance information as shown in its operating manual;

j) any weather limitations in respect of the aircraft, the use of alternate aerodromes and aerodrome operating minima;

k) a fatigue risk management programme, refer to Part 1 Chapter 13.1.4;

l) any noise abatement procedures to be adopted in respect of the aircraft;

m) the emergency operations applicable to the aircraft;

n) how any accident or other incident in respect of the aircraft is to be dealt with and recorded, refer to Part 1 Chapter 4;

o) the qualifications, including proficiency in the use of the English language, and training that each member of the crew of the aircraft must have or must have undertaken;

p) the records that must be kept in respect of the aircraft and who must keep them;

q) the aircraft's maintenance control system;

r) any applicable security procedures in respect of the aircraft;

s) the performance operating limitations of the aircraft;

t) how the electronic navigation data management systems of the aircraft are to be used and monitored;

u) how dangerous goods on the aircraft are to be handled, refer to Part 1 Chapter 7;and

v) if applicable,

    i) the use and protection of the flight data recorder records and cockpit voice recorder records of the aircraft; and

    ii) the use of automatic landing system, a HUD or equivalent display and EVS, SVS or CVS equipment as applicable.

13.1.3 Safety Management System

All operators of Large and Turbojet Aircraft registered in the Isle of Man must prepare and ensure that a company operations manual is in force in respect of the aircraft which includes, amongst other items, a Safety Management System (SMS).

Refer to Part 1 Chapter 10 for more details.

13.1.4 Fatigue Risk Management Programme

The operator of an aircraft must establish and implement a Fatigue Risk Management Programme (FRMP) that ensures that personnel involved in the operation and maintenance of aircraft (see note) do not carry out their duties when fatigued. The FRMP must be included in the COM.

Note:

'Personnel involved in the operation and maintenance of aircraft' includes:

- Flight Crew & Cabin Crew; and

- Aircraft Maintenance Engineers who are directly employed by the operator.

But does not include:

- Personnel directly employed by the operator to conduct other functions; and,
- Individuals contracted by the operator to perform ground based operational and maintenance functions.

Operators are responsible for managing risks to their operations, operators shall manage the fatigue of employees and personnel not included in the direct scope of a FRMP through their SMS.

For guidance on implementing a FRMP, please refer to the dedicated FRMP page on the IOMAR Website.

13.1.5 Aerodrome Operating Minima (AOM)

13.1.5.1 Take-off Minima Permitted

Refer to Part 1 Chapter 11.1 Take-off Minima.

13.1.5.2 Take-off and Landing Minima – Aeroplanes

The COM must identify where the PIC can obtain the AOM for take-off, landing and visual manoeuvring.

13.1.5.3 Requirements for Two Destination Alternates

Two destination alternates shall be nominated when:

a) the appropriate weather reports or forecasts for the destination indicate that, during a period commencing one hour before and ending one hour after the estimated time of arrival, the weather conditions will be below minima; or

b) no weather reports or forecasts are available for the destination.

13.1.5.4 COM Requirements Relating to Operational Flight Plan (OFP)

Operators must provide an Operational Flight Plan (OFP) for the safe conduct of the flight based on considerations of aeroplane performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes concerned.

13.1.5.5 Take-off Alternate Aerodrome

A take-off alternate aerodrome shall be selected and specified in the flight plan if either the meteorological conditions at the aerodrome of departure are below the applicable aerodrome landing minima for that operation or if it would not be possible to return to the aerodrome of departure for other reasons.

The take-off alternate aerodrome shall be located within the following flight time from the aerodrome of departure:

a) for aeroplanes with two engines, one hour of flight time at a one-engine-inoperative cruising speed, determined from the aircraft operating manual, calculated in ISA and still-air conditions using the actual take-off mass; or

b) for aeroplanes with three or more engines two hours of flight time at an all engines operating cruising speed, determined from the aircraft operating manual, calculated in ISA and still-air conditions using the actual take-off mass.

For an aerodrome to be selected as a take-off alternate the available information shall indicate that, at the estimated time of use, the conditions will be at or above the applicable aerodrome operating minima for that operation.

13.2 Checklists to be used

The operator must ensure that checklists are used by the flight crew of an aircraft prior to, during and after all phases of its operations, and in emergencies, as detailed in the aircraft's operating manual. The PIC must ensure that the checklists are fully complied with.

The operator must ensure that the design and utilisation of checklists takes into account human factors.

13.3 Minimum Flight Altitude

The operator must specify, for flights that are to be conducted in IFR, the method of establishing terrain clearance altitudes.

13.4 Maintenance Personnel Training

The operator must ensure that maintenance personnel in respect of the aircraft receive initial and continuation training appropriate to their assigned tasks and responsibilities.

13.5 Maintenance Control Manual

The operator of an aircraft must ensure that a reference to an operator's maintenance control manual developed in accordance with industry codes of practice is included in the company operations manual.

The manual must contain information about: -

- the operator's maintenance responsibilities;
- the means of recording names and positions of maintenance personnel;
- the maintenance programme;
- the methods used for the completion and retention of maintenance records;
- the procedures for ensuring that appropriate information, including any amendment to the maintenance programme, is disseminated to others;
- the procedures for implementing action required following the receipt of mandatory continuing airworthiness information;
- a system of analysis and continued monitoring of the performance and efficiency of the maintenance programme in order to correct identified deficiencies;
- the aircraft types and models to which the manual applies;
- procedures for ensuring that any unserviceability affecting an aircraft's airworthiness is recorded and rectified; and
- the procedures for advising the IOMAR of significant in-service occurrences.

The manual can be issued in parts.

The design of the manual must take account of human factors. Please refer to RP56b Maintenance Control Manual Guidance for further guidance.

13.6 Safeguarding Flight & Voice Recorder Records

When an aircraft has been involved in an accident or incident, the owner of the aircraft, or lessee, must as far as is possible to do so: -

a) preserve the related flight data recorder records and cockpit voice recorder records of the aircraft and, if necessary the associated flight recorders and voice recorders; and
b) retain them in safe custody pending their disposal as determined in accordance with ICAO Annex 13.

13.7 Requirements for Cabin Crew

The operator of an aircraft must determine the number of cabin crew required to effect a safe and expeditious evacuation of the aircraft. The operator must consider the aircraft's seating capacity; or the number of passengers carried on it.

Where cabin crew are carried the operator must determine and assign the functions to be performed by each member of the cabin crew in an emergency or a situation requiring an emergency evacuation of the aircraft.

The operator of an aircraft must ensure that a training programme is established and is completed by each person before being assigned as a member of the cabin crew on the aircraft.

The training syllabus must be referenced in the company operations manual and include training in human factors.

The IOMAR recommends that Crew Resource Management (CRM) training is completed by all cabin crew members.

13.8 Use of Boom Microphones

The operator must ensure that flight crew members, who are required to be on flight deck duty, communicate through boom microphones when the aircraft is below the transition level or transition altitude.

13.9 Minimum Equipment List

The operator of an aircraft of a type that has a master minimum equipment list established must—

- prepare and ensure that a minimum equipment list for the aircraft is approved by the Department; and
- include the details of the minimum equipment list procedures in the company operations manual.

Please refer to Part 2 Chapter 5.2 for further details.

CHAPTER 14 ON-BOARD MEDICAL EMERGENCIES

14.0 General

The term In-flight Medical Emergency is not universally recognised by ATC. Therefore if a medical emergency occurs in-flight, flight crew must declare a 'PAN, PAN, PAN' or a 'MAYDAY' depending on the severity of the situation.

14.1 Suspected Communicable Diseases, Or Other Public Health Risk

The flight crew of an en-route aircraft shall, upon identifying a suspected case(s) of communicable disease, or other public health risk, on board the aircraft, promptly notify the ATS unit with which the pilot is communicating, the information listed below:

a) aircraft identification;

b) departure aerodrome;

c) destination aerodrome;

d) estimated time of arrival;

e) number of persons on board;

f) number of suspected case(s) on board; and

g) nature of the public health risk, if known.

The pilot-in-command should follow pertinent operator protocols and procedures and the health-related legal requirements of the countries of departure and/or destination normally found in the Aeronautical Information Publications of the States concerned.

A communicable disease could be suspected and require further evaluation if a person has a fever (temperature 38°C/100°F or greater) that is associated with certain signs or symptoms, e.g.:

- appearing obviously unwell;
- persistent coughing;
- impaired breathing;
- persistent diarrhoea;
- persistent vomiting;
- skin rash;
- bruising or bleeding without previous injury; or,
- confusion of recent onset.

"Public health risk" means: a likelihood of an event that may affect adversely the health of human populations, with an emphasis on one which may spread internationally or may present a serious and direct danger.

CHAPTER 15 DEMONSTRATION & DELIVERY FLIGHTS

15.0 General

The IOMAR recognises that there are occasions where aircraft owners/operators have a valid need to conduct demonstration, pre-purchase inspection or delivery flights for the potential sale or lease of an aircraft. It is also recognised that it is generally the corporate aviation industry norm for the actual costs of such flights to be borne by the potential aircraft buyer/lessee.

Consequently remuneration or valuable consideration may be given or promised by a person that is limited to the direct costs of either or both: -

a) a demonstration or pre-purchase inspection flight;

b) a necessary positioning flight to enable the demonstration or pre-purchase inspection flight to take place and a subsequent repositioning flight;

c) a delivery flight necessary to facilitate an aircraft sale or lease.

The aircraft operator must keep a record of the remuneration or valuable consideration received, including the relevant direct costs of the flight, for one year or such longer period as the IOMAR may in a particular case specify.

15.1 Conditions

The only remuneration or valuable consideration given or promised by a person for the flight is limited to the direct costs of either:

- a demonstration or pre-purchase inspection flight;
- a necessary positioning flight to enable the demonstration or pre-purchase inspection flight to take place and a subsequent repositioning flight; or,
- a delivery flight necessary to facilitate an aircraft sale or lease.

The aircraft operator must keep a record of the remuneration or valuable consideration received, including the relevant direct costs of the flight, for one year or such longer period as the IOMAR may specify. When requested, the aircraft operator must produce these documents to the IOMAR within 14 days, or such longer period as may be agreed.

For the purposes of the Exemption, the following interpretations apply:

- "demonstration flight" means a flight performed with the purpose of demonstrating an aircraft's handling, performance, capabilities and functionalities to prospective buyers or lessees;
- "direct costs" means the costs directly in relation to a flight.

PART 2 – OPERATIONAL APPROVALS

This part contains details of the operational approvals available to operators of M-Registered aircraft.

CHAPTER 1: OPERATIONAL APPROVALS

1.0 General

An operational approval from the IOMAR is required for those specified in RP4 Part 2.

Only Operator Contact(s) or the FOR as recorded in the ARDIS Aircraft Record, are authorised to sign the declarations on Operational Approval application forms.

1.1 Initial/Additional Operational Approval Applications

Form 4 – Initial/Additional Operational Approvals lists all operational approvals which the IOMAR currently issues.

Operator can apply for Designated Airspace, PBN (with the exception of RNP AR APCH), and ATS Comms and Surveillance approvals via the Form 4.

Operators wishing to apply for certain other operational approvals should complete the applicable application form identified in the appropriate sub-chapter of Part 2. To assist operators, Form 4 includes a link to the relevant application form.

1.2 Operational Approval Renewals

Form 4a – Operational Approval Renewals shall be used to request **renewals** of all operational approvals for M- Registered aircraft.

Renewal applications should be submitted to the IOMAR prior to the expiry of the current Operations Specification (Ops Spec) Certificate. The service delivery times for renewal applications are published on the IOMAR Website, taking into account additional time required for special approvals such as RNP AR APCH, DG, Aerial Work and AWOPS.

1.3 Documentary Evidence

Each application form identifies the documentary evidence required to be submitted to support the application. Further details can also be found in each chapter of RP4 Part 2.

Failure to include the correct documentary evidence with the application, could lead to a delay in the operational approval being issued.

The IOMAR will work with each applicant to ensure that all the required documentary evidence is supplied before the operational approval can be issued.

1.4 Appropriate Maintenance Procedures

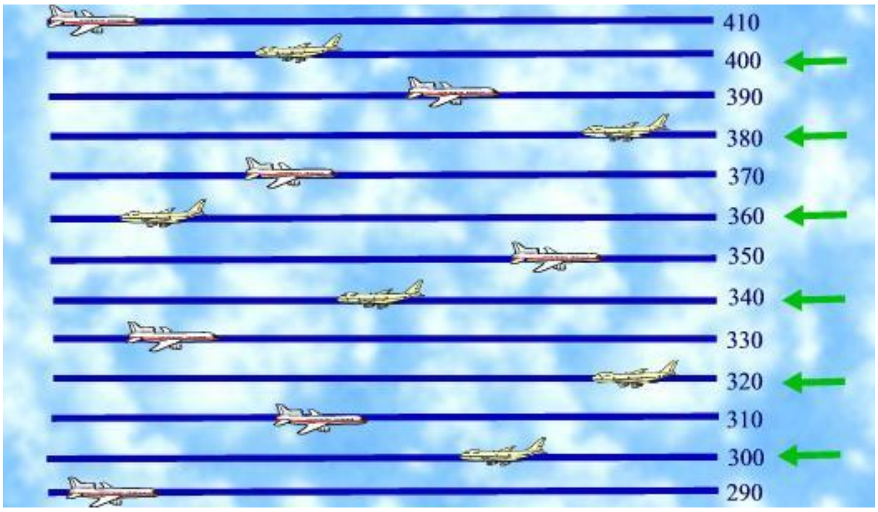
For all operational approvals, the operator, in liaison with the NATR, must ensure that appropriate practices and programmes are instituted with respect to continuing airworthiness (maintenance and repair) practices and programmes in accordance with the applicable specifications.

CHAPTER 2: DESIGNATED AIRSPACE APPROVALS

2.1 RVSM (Reduced Vertical Separation Minima)

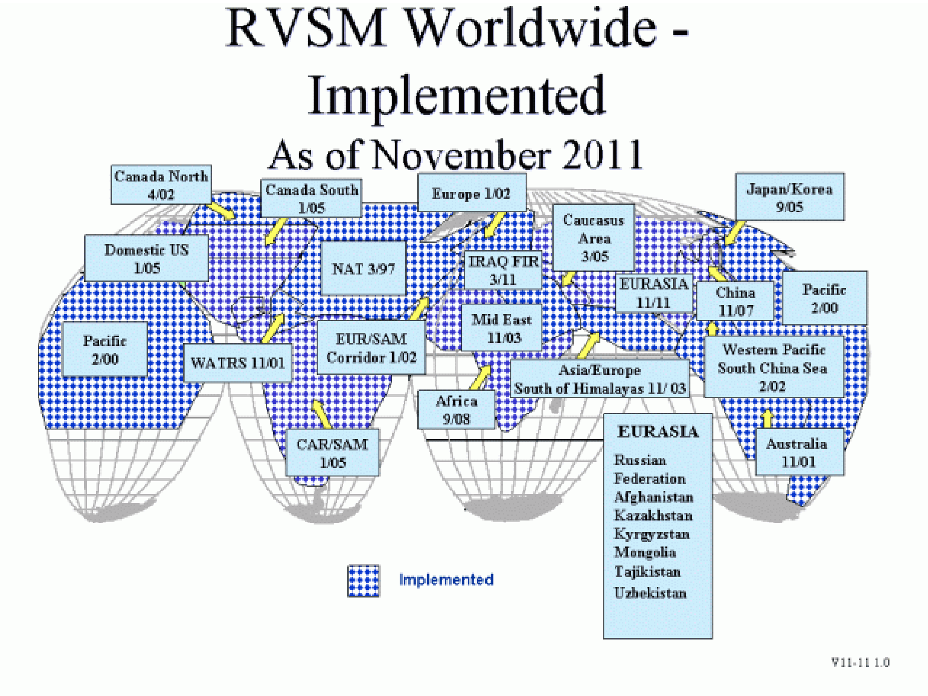
A M- Registered aircraft must not fly in RVSM airspace without an approval issued by the IOMAR unless otherwise authorised by the appropriate air traffic control unit.

Reduced Vertical Separation Minimum in RVSM Airspace permits the application of a 1000 ft (300 m) vertical separation minimum between suitably equipped aeroplanes in the level band from FL290 to FL410 (inclusive). FL 290 and FL 410 are themselves RVSM levels. Aeroplane wishing to avoid RVSM airspace must fly either below FL290 or above FL 410.



The arrows indicate those RVSM levels that are not available under normal semi-circular rules where 2,000 ft vertical separation applies.

Note: The direction of levels under RVSM rules may be different to those under semi-circular rules.



The purpose of RVSM is to increase airspace capacity and provide airspace users with more flight levels and thus optimised flight profiles. RVSM approval can be a prerequisite for other approvals, for example NAT HLA.

2.1.1 RVSM Approval Requirements

Operators wishing to apply for RVSM airspace approval shall demonstrate the aircraft is certified and equipped.

An RVSM Approval granted by the IOMAR is not regionally specific, but is valid for world-wide operations.

Training evidence is not required as part of the initial or renewal application process although it is the responsibility of the operator to ensure all flight crew are suitably trained and competent to operate within this specific airspace.

2.1.2 RVSM MEL Requirements

For operation in RVSM Airspace, the IOMAR approved MEL for each type and variant must show those items that are RVSM-critical, and the comments column will indicate when an item must be serviceable for RVSM operations, even though dispatch when inoperative under other circumstances may be permitted.

Minimum equipment for flight in RVSM airspace includes:

a) At least 1 serviceable autopilot with a height-keeping facility;

b) At least 1 serviceable ATC transponder;

c) At least 2 serviceable air data systems;

d) A serviceable altitude alert system.

2.1.3 RVSM Height Monitoring Requirements

Following approval to operate in RVSM airspace, the operator must ensure that height-keeping performance is monitored, refer to Part 1 Chapter 9.2.5 for further details.

2.2 NAT HLA

An M- Registered aircraft must not fly in NAT HLA airspace without an approval issued by the IOMAR.

2.2.1 NAT HLA Approval Requirements

Operators wishing to apply for NAT HLA airspace approval shall demonstrate the aircraft is certified and equipped. Training evidence is not required as part of the initial or renewal application process although it is the responsibility of the operator to ensure all flight crew are suitably trained and competent to operate within this specific airspace.

There are 2 types of NAT HLA approval which operators can apply for, 'unrestricted' and 'restricted'.

2.2.1.1 Unrestricted NAT HLA

To operate unrestricted in NAT HLA airspace the aircraft must be equipped with:

a) 2 Long Range Navigation Systems (LRNS); and

b) 2 Long Range Communication Systems (LRCS), one of which shall be a HF radio.

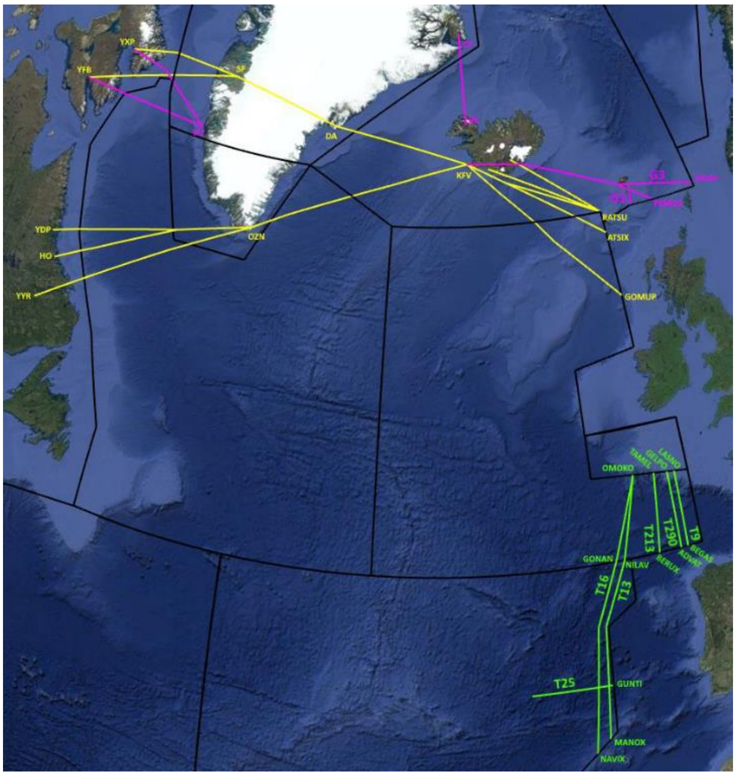
Note: Aeronautical Mobile Satellite (Route) Service (AMS(R)S) also known as SATCOM Voice, can be used to supplement HF communications throughout the NAT Region. SATCOM cannot be used as an alternative to HF prior to entering NAT HLA.

In addition, RVSM and RNAV 10 (RNP 10) or RNP 4 approvals are required.

To use the PBCS Tracks the aircraft shall have an approval for RNP 4 and FANS 1/A+ (PBCS).

2.2.1.2 Restricted NAT HLA

Aircraft not equipped with 2 Long Range Navigation Systems (LRNS) and/or 2 Long Range Communication Systems (LRCS) can apply for Restricted NAT HLA approval and will be limited to certain routes.



The routes will depend on the number of LNRS and LRCS equipped as per the table below.

Following approval for Restricted NAT HLA, the Operations Specification (Ops Spec) certificate will be issued to evidence NAT HLA approval, with a remarks which identifies the type of routes as per the table below.

Number of LRNS	Number of LRCS	Limitation
2	1	Restricted to routes with a dispatch requirement for 1 Long Range Navigation System
2	0	Restricted to routes which do not require HF Radio
1	2	Restricted to routes with a dispatch requirement for 1 Long Range Navigation System
1	1	Restricted to routes with a dispatch requirement for 1 Long Range Navigation System
1	0	Restricted to routes which do not require HF Radio

Note: Routes with a dispatch requirement of 1 LRNS include those known as the 'Blue Spruce Routes'. For further details please refer to the latest version of the ICAO NAT Doc 007 North Atlantic Airspace and Operations Manual.

2.2.2 Acceptable Means of Compliance for NAT HLA Approval

Documentary evidence to demonstrate that the aircraft is suitably equipped for NAT HLA shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documents listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for NAT HLA operations: -

a) MNPS;

b) RNAV 10; or

c) RNP 10.

2.2.3 NAT HLA Checklist

A checklist which can be used for NAT HLA Operations is available on the IOMAR website.

CHAPTER 3: PBN AIRSPACE APPROVALS

3.0 General

Aircraft operating within PBN airspace are required to meet the prescribed minimum standards of navigational performance capability through the mandatory carriage and proper use of a specified level of area navigation equipment that, in the case of a M- Registered aircraft, has been approved by the IOMAR.

Aircraft used to conduct PBN operations shall be equipped with an RNAV system able to support the desired navigation application. The RNAV system and aircraft operations shall be compliant with regulatory material that reflects the navigation specification developed for a particular navigation application approved by the appropriate regulatory authority for the operation.

The navigation specification details the flight crew and aircraft requirements needed to support the navigation application. This specification includes the level of navigation performance, functional capabilities, and operational considerations required for the RNAV system. The RNAV system installation shall be certified in accordance with applicable regulations and operational procedures shall respect the applicable Aircraft Flight Manual (AFM) limitations, if any.

The RNAV system shall be operated in accordance with recommended practices described in the subsequent sections. Flight crew shall adhere to any operational limitations required for the navigation application.

3.0.1 PBN Approvals

The IOMAR can issue a number of PBN approvals, including operations in oceanic, continental, en-route, approach arrival and departure. More details on each PBN Approval can be found in the following chapters. Operators wishing to apply for PBN airspace approval(s) shall demonstrate the aircraft is certified and equipped.

3.0.1.1 PBN Operational Approval Requirements

The airworthiness approval process assures that each item of PBN equipment installed is of a type and design appropriate to its intended function, and that the installation functions properly under foreseeable operating conditions.

3.0.1.2 Acceptable Documentation for Demonstration of Compliance

However, some PBN equipment and installations could have been certified prior to the publication of the latest ICAO PBN Manual and the adoption of its terminology for the navigation specifications; it is not always possible to find a clear statement of aircraft PBN capability in the AFM.

Each PBN which the IOMAR can approve is contained in the following subchapters. Within each subchapter is a paragraph headed "Acceptable Means of Compliance for Approval of XXX". This paragraph includes alternative means of compliance which demonstrates the aircraft's eligibility for a specific PBN specification if the specific term is not used.

Acceptable Documentation for Demonstration of Compliance:-

a) AFM;
b) AFM Supplement; or
c) Service Bulletin or Service Letter issued by the TC holder or STC holder;

Any other formal document issued by the TC or STC holders stating compliance with RVSM, NAT HLA or PBN specifications, including AMC, Advisory Circulars (AC) or similar documents issued by the State of Design.

3.0.1.3 Approval of RNAV Systems for RNAV-X Operations

The RNAV system installed shall be compliant with a set of basic performance requirements as described in the navigation specification, which defines accuracy, integrity and continuity criteria. It shall also be compliant with a set of specific functional requirements, have a navigation database, and support each specific path terminator as required by the navigation specification.

For a multi-sensor RNAV system, an assessment shall be conducted to establish which sensors are compliant with the performance requirement described in the navigation specification. The navigation specification generally indicates if a single or a dual installation is necessary to fulfil availability and/or continuity requirements. The airspace concept and NAVAID infrastructure are key elements in deciding if a single or a dual installation is necessary.

3.0.1.4 Approval of RNP Systems for RNP-X Operations

The RNP system installed shall be compliant with a set of basic RNP performance requirements, as described in the navigation specification, which shall include an on-board performance monitoring and alerting function. It shall also be compliant with a set of specific functional requirements, have a navigation database, and shall support each specific path terminator as required by the navigation specification.

For a multi-sensor RNP system, an assessment shall be conducted to establish sensors which are compliant with the RNP performance requirement described in the RNP specification.

3.0.1.5 Training

Training requirements for each PBN airspace are listed against each PBN specification in the following sub-chapters.

3.1 RNAV 10 (RNP 10)

RNAV 10, Designated and Authorised as RNP 10 is an Oceanic / Remote area specification requiring the aircraft to maintain a track-keeping accuracy of +/- 10 nm without regular updates from ground-based navigation aids. RNAV 10 (RNP 10) approval can be based on IRS performance alone (with a time limit of up to 6.2 hours), and there is no requirement for an RNP alerting function in the FMS.

RNAV 10 (RNP 10) airspace supports 50 nm lateral and longitudinal distance-based separation minima.

The existing RNP 10 designation is, therefore, inconsistent with PBN RNP and RNAV specifications. Since RNP 10 does not include requirements for on-board performance monitoring and alerting, technically, RNP 10 is an RNAV navigation specification (see paragraph 1.2. However, renaming current RNP 10 routes, operational approvals, etc. to an RNAV 10 designation would be an extensive and expensive task, which is not cost-effective. Consequently, any existing or new operational approvals will continue to be designated RNP 10, and any charting annotations will be depicted as RNP 10.

Approvals issued by the IOMAR to operate in RNP 10 airspace will be issued as RNAV 10 (RNP 10).

3.1.1 RNAV 10 Category & Area of Operation

RNAV 10 is for operations in oceanic and remote areas and does not require any ground-based NAVAID infrastructure or assessment.

Examples of RNAV 10 (RNP 10) airspace exist over the Indian Ocean and in the AFI, SAM and PAC regions.

3.1.2 RNAV 10 Minimum Navigation Equipment

For an aircraft to operate in RNAV 10 (RNP 10) airspace it needs to be equipped with a minimum of two independent long range navigation systems (LRNSs).

Each LRNS shall, in principle, have a flight management system (FMS) that utilises positional information from either an approved global navigation satellite system (GNSS) or an approved inertial reference system (IRS) or mixed combination.

The mix of sensors (pure GNSS, pure IRS or mixed IRS/GNSS) determines pre-flight and in-flight operation and contingencies in the event of system failure.

3.1.3 RNAV 10 Minimum Communication & ATS Surveillance

Minimum communication and ATS surveillance is not established globally by ICAO. The operating crew shall ensure the minimum communication requirements are met by reviewing the appropriate Aeronautical Information Publication.

3.1.4 RNAV 10 Minimum Equipment List Requirements

The MEL shall specify the required dispatch conditions for RNAV 10 operations.

3.1.5 RNAV 10 Training Requirements

The Operator, shall ensure, and continue to ensure that pilots are knowledgeable of the RNAV 10 operational procedures, see below.

3.1.6 RNAV 10 Operational Procedures

Refer to Part 1 Chapter 9.4.1.1.

3.1.7 RNAV 10 Navigation Database Requirements

The navigation database shall be current and appropriate for the operations and shall include the NAVAIDs and waypoints required for the route.

3.1.8 Acceptable Means of Compliance for RNAV 10 Approval

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNAV 10 shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documents listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNAV 10 operations: -

d) RNP 10;

e) FAA AC 20-138 for the appropriate navigation specification;

f) AMC 20-12;

g) FAA Order 8400.12 (or later revision); or

h) FAA AC 90-105.

3.2 RNP 4

RNP 4 is an Oceanic / Remote area specification requiring the aircraft to maintain a track-keeping accuracy of ± 4 nm for at least 95% of the total flight time. The along-track error must also be within ± 4 nm for at least 95% of the total flight time. GNSS is the primary navigation sensor to support RNP 4, either as a stand-alone navigation system or as part of a multi-sensor system. Within RNP 4 airspace, all routes are based upon WGS-84 co-ordinates.

RNP 4 airspace supports 30 nm lateral and longitudinal distance-based separation minima.

3.2.1 RNP 4 Category & Area of Operation

RNP 4 is for operations in oceanic and remote areas and does not require any ground-based NAVAID infrastructure or assessment.

Examples of RNP 4 airspace exist in the PAC region and in the NAT HLA.

3.2.2 RNP 4 Minimum Navigation Equipment

To meet the accuracy of RNP 4, two independent LRNSs are required for which GNSS sensors are mandatory. If GNSS is used as a stand-alone LRNS, an integrity check is foreseen (fault detection and exclusion). RNP 4 shall not be used in areas of known GNSS signal interference. If an item of equipment required for RNP 4 operations is unserviceable, then the pilot shall consider an alternate route or diversion for repairs.

3.2.3 RNP 4 Minimum Communication & ATS Surveillance

Additional aircraft requirements include two long range communication systems (LRCSs) in order to operate in RNP 4 designated airspace. The appropriate Aeronautical Information Publication (AIP) shall be consulted to assess coverage of HF and SATCOM.

In RNP 4 airspace, controller-pilot data link communications (CPDLC) and automatic dependent surveillance (contract) (ADS-C) systems are also required when the separation standard is 30 nm lateral and/or longitudinal.

The IOMAR requires evidence that the aircraft is fitted with FANS 1/A as a minimum before a request for RNP 4 approval can be considered.

3.2.4 RNP 4 Minimum Equipment List Requirements

The MEL shall specify the required dispatch conditions for RNP 4 operations.

3.2.5 RNP 4 Training Requirements

The operator must ensure that pilots are trained and have appropriate knowledge of the RNP 4 Operational Procedures (see below), the limits of the aircrafts RNP 4 navigation capabilities (including the effects of updating), and RNP 4 contingency procedures.

3.2.6 RNP 4 Operational Procedures

Refer to Part 1 Chapter 9.4.1.2.

3.2.7 RNP 4 Navigation Database Requirements

The navigation database shall be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. An LOA issued by the appropriate regulatory authority demonstrates compliance with this requirement.

The operator shall report any discrepancies invalidating an ATS route to the navigation database supplier and take actions to prohibit their pilots from flying the affected ATS route.

Aircraft operators should conduct periodic checks of the operational navigation databases in order to meet existing quality system requirements.

Note: To minimize PDE, the database shall comply with DO-200A/ED-76, or an equivalent operational means shall be in place to ensure database integrity for RNP 4.

3.2.8 Acceptable Means of Compliance for RNP 4 Approval

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNP 4 shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documents listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNP 4 operations: -

a) FAA AC 20-138B or later, for the appropriate navigation specification;

b) FAA Order 8400.33; or

c) FAA AC 90-105 for the appropriate navigation specification.

3.3 RNP 2

RNP 2 is primarily intended for a diverse set of en-route applications, particularly in geographic areas with little or no ground NAVAID infrastructure, limited or no ATS surveillance, and low to medium density traffic. Use of RNP 2 in continental applications requires a lower continuity requirement than used in oceanic/remote applications.

RNP 2 area specification requires the aircraft to maintain a track-keeping accuracy of ± 2 nm for at least 95% of the total flight time. The along-track error must also be within ± 1 nm for at least 95% of the total flight time. GNSS is the primary navigation sensor to support RNP 2, either as a stand-alone navigation system or as part of a multi-sensor system. Within RNP 2 airspace, all routes are based upon WGS-84 co-ordinates.

RNP 2 requires Global Navigation Satellite System (GNSS) as the primary navigation sensor, either as a stand-alone navigation system or as part of a multi-sensor system. Where multi-sensor systems incorporating GNSS are used, positioning data from non-GNSS navigation sensors may be integrated with the GNSS data provided the non-GNSS data do not cause position errors exceeding the total system error budget. Otherwise a means should be provided to deselect the non-GNSS navigation sensor types.

Unlike RNP 4 there is no standard track spacing for RNP 2.

3.3.1 RNP 2 Category & Area of Operation

There are 2 types of RNP 2 approval which operators can apply for, Continental and Oceanic/Remote.

Examples of RNP 2 airspace exist in the India, Australia and the PAC region.

3.3.1.1 RNP 2 Continental

To operate RNP 2 Continental airspace the aircraft must be certified for operations in RNP 2 airspace and equipped with at least:

- 1 Long Range Navigation Systems (LRNS)

3.3.1.2 RNP 2 Oceanic/Remote

To operate RNP 2 Oceanic/Remote airspace the aircraft must be certified for operations in RNP 2 airspace and equipped with at least:

- 2 Long Range Navigation Systems (LRNS)

Note: Operators of aircraft with a single LRNS can only apply for RNP 2 Continental, whereas operators of aircraft with 2 LRNSs can apply for RNP 2 Oceanic/Remote and Continental approval.

3.3.2 RNP 2 Minimum Navigation Equipment

The RNP 2 specification is based upon GNSS.

Operators relying on GNSS are required to have the means to predict the availability of GNSS fault detection (e.g. ABAS RAIM) to support operations along the RNP 2 ATS route. The on-board RNP system, GNSS avionics, the ANSP or other entities can provide a prediction capability. The AIP shall clearly indicate when prediction capability is required and an acceptable means to satisfy that requirement.

RNP 2 shall not be used in areas of known GNSS signal interference.

3.3.3 RNP 2 Minimum Communication & ATS Surveillance

Communication performance on RNP 2 routes will be commensurate with operational considerations such as route spacing, traffic density, complexity and contingency procedures. The operating crew shall ensure the minimum communication requirements are met by reviewing the appropriate Aeronautical Information Publication.

3.3.4 RNP 2 Minimum Equipment List Requirements

The MEL shall specify the required dispatch conditions for RNP 2 operations.

3.3.5 RNP 2 Training Requirements

The training requirements shall be in accordance with the ICAO PBN Manual (Doc 9613) for RNP 2 and in accordance with the requirements of the pilot's licence.

3.3.6 RNP 2 Operational Procedures

Refer to Part 1 Chapter 9.4.1.3.

3.3.7 RNP 2 Navigation Database Requirements

The navigation database shall be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. An LOA issued by the appropriate regulatory authority demonstrates compliance with this requirement.

The operator shall report any discrepancies invalidating an ATS route to the navigation database supplier and take actions to prohibit their pilots from flying the affected ATS route.

Aircraft operators should conduct periodic checks of the operational navigation databases in order to meet existing quality system requirements.

3.3.8 Acceptable Means of Compliance for RNP 2 Approval

3.3.81 RNP 2 Continental

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNP 2 Continental shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documents listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNP 2 Continental operations: -

a) FAA AC 20-138 for the appropriate navigation specification; or

b) FAA AC 90-105.

c) If the aircraft has been assessed eligible for RNP 4, the aircraft is eligible for RNP 2 Continental.

3.3.8.2 RNP 2 Oceanic/Remote & Continental

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNP 2 Oceanic/Remote & Continental shall be provided to support the application.

Alternatively: -

a) If a statement of compliance with FAA AC 90-105 for the appropriate navigation specification is found in any of the document listed in Part 2 Chapter 3.0.1.2 the aircraft is eligible for RNP 2 Oceanic/Remote & Continental, or

b) If the aircraft has been assessed eligible for RNP 4, the aircraft is eligible for RNP 2 Oceanic/Remote & Continental.

3.4 RNAV 5 (B-RNAV/RNP 5)

RNAV 5, also known as B-RNAV in Europe is a basic en-route area navigation specification.

For operations in RNAV 5 airspace, aircraft require a track-keeping accuracy of +/-5 nm for 95% of the flight time. RNAV 5 does not require a navigation database, it only requires the flight management system to store four waypoints, and it does not require waypoint fly-by functionality.

RNAV 5 track keeping is based on the air navigation service provider's assessment of the available navigation aids against the minimum equipment standard and area navigation equipment updating from ground-based navigation aids is assumed. There is no requirement for an RNP alerting function, and crew navigation accuracy crosschecks over and above normal SOPs are not required.

3.4.1 RNAV 5 Category & Area of Operation

RNAV 5 systems permit aircraft navigation along any desired flight path within the coverage of station referenced NAVAIDs (space or terrestrial) or within the limits of the capability of self-contained aids, or a combination of both methods.

B-RNAV is mandated above FL95 throughout European States and also applied in the Middle East (where it can be called RNP 5).

In the UK B-RNAV is applicable on all UK ATS routes at all levels/altitudes in controlled airspace.

3.4.2 RNAV 5 Minimum Navigation Equipment

RNAV 5 operations are based on the use of RNAV equipment which automatically determines the aircraft position using input from one or a combination of the following types of position sensors, together with the means to establish and follow a desired path:

a) VOR/DME;

b) DME/DME;

c) INS or IRS; and

d) GNSS.

Navigation data must be available for display either on a display forming part of the RNAV equipment or on a lateral deviation display (e.g. CDI, (E)HSI, or a navigation map display).

These must be used as primary flight instruments for the navigation of the aircraft, for manoeuvre anticipation and for failure / status / integrity indication. They should meet the following requirements:

a) The displays must be visible to the pilot when looking forward along the flight path;

b) The lateral deviation display scaling should be compatible with any alerting and annunciation limits, where implemented;

c) The lateral deviation display must have a scaling and full-scale deflection suitable for the RNAV 5 operation.

d) The navigation database must be current and appropriate for the region of intended operation and must include the navigation aids and waypoints required for the route.

   Note: Navigation databases are expected to be current for the duration of the flight. If the AIRAC cycle is due to change during flight, the electronic data must be verified against paper products that are current for the required time frame.

3.4.3 RNAV 5 Minimum Communication & ATS Surveillance

Direct pilot to ATC (voice) communications is required.

Radar monitoring by ATS can be used to mitigate the risk of gross navigation errors, provided the route lies within the ATS surveillance and communications service volumes and the ATS resources are sufficient for the task.

3.4.4 RNAV 5 Minimum Equipment List Requirements

The MEL shall specify the required dispatch conditions for RNAV 5 operations.

3.4.5 RNAV 5 Training Requirements

The pilot training programme should address the following items: - should address the following items:

a) the capabilities and limitations of the RNAV system installed;

b) the operations and airspace for which the RNAV system is approved to operate;

c) the NAVAID limitations with respect to the RNAV system to be used for the RNAV 5 operation;

d) contingency procedures for RNAV failures;

e) the radio/telephony phraseology for the airspace, in accordance with Doc 4444 and Doc 7030, as appropriate;

f) the flight planning requirements for the RNAV operation;

g) RNAV requirements as determined from chart depiction and textual description;

h) RNAV system-specific information, including:

  i) levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation;

  ii) functional integration with other aircraft systems;

  iii) monitoring procedures for each phase of the flight (e.g. monitor PROG or LEGS page);

  iv) types of navigation sensors (e.g. DME, IRU, GNSS) utilized by the RNAV system and associated system prioritization/weighting/logic;

  v) turn anticipation with consideration to speed and altitude effects; and

  vi) interpretation of electronic displays and symbols;

i) RNAV equipment operating procedures, as applicable, including how to perform the following actions:

  i) verify that the aircraft navigation data is current;

  ii) verify the successful completion of RNAV system self-tests;

  iii) initialize RNAV system position;

  iv) fly direct to a waypoint;

  v) intercept a course/track;

  vi) be vectored off and rejoin a procedure;

  vii) determine cross-track error/deviation;

viii) remove and reselect navigation sensor input;

ix) when required, confirm exclusion of a specific NAVAID or NAVAID type; and

x) perform gross navigation error checks using conventional NAVAIDs.

3.4.6 RNAV 5 Operational Procedures

Refer to Part 1 Chapter 9.4.1.4.

3.4.7 RNAV 5 Navigation Database Requirements

Where a navigation database is carried and used, it shall be current and appropriate for the intended operations and include the NAVAIDs and waypoints required for the route.

3.4.8 Acceptable Means of Compliance for RNAV 5 Approval

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNAV 5 shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documents listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNAV 5 operations: -

a) B-RNAV;

b) RNAV 1;

c) RNP APCH;

d) RNP 4;

e) AMC 20-4;

f) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 2 (TGL 2);

g) JAA AMJ 20X2;

h) FAA AC 20-130A for en route operations;

i) FAA AC 20-138 for en route operations; or

j) FAA AC 90-96.

3.5 RNAV 1 (P-RNAV) RNAV 2

The Joint Aviation Authorities (JAA) published airworthiness and operational approval for Precision Area Navigation (P-RNAV) on 1 November 2000 in Temporary Guidance Leaflet TGL-10. The Federal Aviation Administration (FAA) published AC 90-100 for U.S. terminal and en-route area navigation (RNAV) operations on 7 January 2005. While similar in functional requirements, differences exist between these two documents, though currently European and US authorities recognise the other's approvals.

The paragraphs that follow reflect the harmonised ICAO RNAV 1 and RNAV 2 specification as published in the ICAO PBN Manual (Doc 9613). For existing systems, compliance with both P-RNAV (TGL-10) and U.S. RNAV (FAA AC 90-100A) assures automatic compliance with this ICAO specification, and aircraft approved for RNAV 1 and RNAV 2 operations are automatically approved to operate within the United States or airspace of the Member States of the European Civil Aviation Conference (ECAC). In addition, an operational approval to this specification allows the conduct of RNAV 1 and/or RNAV 2 operations globally. The aircraft requirements for RNAV 1 and 2 are identical, while some operating procedures are different.

The RNAV 1 and 2 navigation specification is applicable to all ATS routes, including routes in the en-route domain, standard instrument departures (SIDs), and standard arrival routes (STARs). It also applies to instrument approach procedures up to the final approach fix. RNAV 1 and RNAV 2 routes are envisioned to be conducted in direct controller-pilot communication environments.

During operations in airspace or on routes designated as RNAV 1, the lateral total system error must be within ±1 nm for at least 95% of the total flight time. The along-track error must also be within ±1 nm for at least 95% of the total flight time.

During operations in airspace or on routes designated as RNAV 2, the lateral total system error must be within ±2 nm for at least 95% of the total flight time. The along-track error must also be within ±2 nm for at least 95% of the total flight time.

The RNAV 1 and 2 navigation specification is primarily developed for RNAV operations in a radar environment (for SIDs, radar coverage is expected prior to the first RNAV course change). However, RNAV 1 and RNAV 2 may be used in a non-radar environment or below minimum radar vectoring altitude (MRVA) if the implementing State ensures appropriate system safety and accounts for lack of performance monitoring and alerting.

3.5.1 RNAV 1 / RNAV 2 Category & Area of Operation

The RNAV 1 & RNAV 2 specification is applicable for area navigation operations globally. RNAV 1 and RNAV 2 are suitable for en-route continental operations and Departure and Arrival routes.

RNAV 1 (PRNAV) is also suitable for Initial, Intermediate and Missed Approach, refer to Part 2 Chapter 3.0.3.

P-RNAV is applicable for terminal airspace only within European Airspace. P-RNAV can be used for GNSS-based RNAV 1 procedures in the USA.

3.5.2 RNAV 1 / RNAV 2 Minimum Navigation Equipment

RNAV 1 and RNAV 2 operations are based upon the use of RNAV equipment that automatically determines the aircraft position in the horizontal plane using input from the following types of position sensors (no specific priority):

a) Global navigation satellite system (GNSS);

   Note: Position data from other types of navigation sensors may be integrated with the GNSS data provided other position data do not cause position errors exceeding the total system accuracy requirements.

b) DME/DME RNAV equipment;

c) DME/DME/IRS RNAV equipment.

3.5.3 RNAV 1 / RNAV 2 Minimum Communication & ATS Surveillance

Where reliance is placed on the use of radar to assist contingency procedures, its performance shall be adequate for that purpose, i.e. radar coverage, its accuracy, continuity and availability shall be adequate to ensure separation on the RNAV 1 and RNAV 2 ATS route structure and provide contingency in cases where several aircraft are unable to achieve the navigation performance prescribed in this navigation specification.

3.5.4 RNAV 1 / RNAV 2 Minimum Equipment List Requirements

The MEL shall specify the required dispatch conditions for RNAV 1(P-RNAV) and RNAV-2 operations.

3.5.5 RNAV 1 / RNAV 2 Training Requirements

The pilot training programme should address the following items: -

a) RNAV 1 / RNAV 2 operational procedures (see below);

b) the meaning and proper use of aircraft equipment/navigation suffixes;

c) procedure characteristics as determined from chart depiction and textual description;

d) depiction of waypoint types (fly-over and fly-by), AIRINC 424 path terminators and path terminators and any other types used by the operator, as well as associated aircraft flight paths;

e) required navigation equipment for operation on RNAV routes/SIDs/STARs, e.g. DME/DME, DME/DME/IRU, and GNSS;

f) RNAV system-specific information:

   i) levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation;

   ii) functional integration with other aircraft systems;

   iii) the meaning and appropriateness of route discontinuities as well as related flight crew procedures;

   iv) pilot procedures consistent with the operation;

   v) types of navigation sensors (e.g. DME, IRU, GNSS) utilized by the RNAV system and associated system prioritization/weighting/logic;

   vi) turn anticipation with consideration to speed and altitude effects;

   vii) interpretation of electronic displays and symbols;

   viii) understanding of the aircraft configuration and operational conditions required to support RNAV operations, i.e. appropriate selection of CDI scaling (lateral deviation display scaling);

g) RNAV equipment operating procedures, as applicable, including how to perform the following actions:

   i) verify currency and integrity of the aircraft navigation data;

   ii) verify the successful completion of RNAV system self-tests;

iii) initialize navigation system position;

iv) retrieve and fly a SID or a STAR with appropriate transition;

v) adhere to speed and/or altitude constraints associated with a SID or STAR;

vi) select the appropriate STAR or SID for the active runway in use and be familiar with procedures to deal with a runway change;

vii) perform a manual or automatic update (with take-off point shift, if applicable);

viii) verify waypoints and flight plan programming;

ix) fly direct to a waypoint;

x) fly a course/track to a waypoint;

xi) intercept a course/track;

xii) following vectors and rejoining an RNAV route from "heading" mode;

xiii) determine cross-track error/deviation. More specifically, the maximum deviations allowed to support RNAV must be understood and respected;

xiv) resolve route discontinuities;

xv) remove and reselect navigation sensor input;

xvi) when required, confirm exclusion of a specific NAVAID or NAVAID type;

xvii) when required by the State aviation authority, perform gross navigation error checks using conventional NAVAIDs;

xviii) change arrival airport and alternate airport;

xix) perform parallel offset functions if capability exists. Pilots should know how offsets are applied, the functionality of their particular RNAV system and the need to advise ATC if this functionality is not available;

xx) perform RNAV holding functions;

h) operator-recommended levels of automation for phase of flight and workload, including methods to minimize cross-track error to maintain route centre line;

i) R/T phraseology for RNAV applications; and

j) contingency procedures for RNAV applications.

3.5.6 RNAV 1 / RNAV 2 Operational Procedures

Refer to Part 1 Chapter 9.4.1.5.

3.5.7 RNAV 1 / RNAV 2 Navigation Database Requirements

The navigation database shall be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data and shall be compatible with the intended function of the equipment (Annex 6, Part 1, Chapter 7). An LOA, issued by the appropriate regulatory authority to each of the participants in the data chain, demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or EASA LOA issued in accordance with EASA Opinion Nr. 01/2005.

Discrepancies that invalidate a route shall be reported to the navigation database supplier and affected routes reported to the pilots.

3.5.8 Acceptable Means of Compliance for RNAV 1 / RNAV 2 Approval

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNAV 1 (P-RNAV) RNAV 2 shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documents listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNAV 1 (P-RNAV) RNAV 2 operations: -

a) RNAV 1;

b) US RNAV type A;

c) FAA AC 20-138 for the appropriate navigation specification;

d) FAA AC 90-100A;

e) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 Rev1 (TGL 10);

f) FAA AC 90-100; or,

g) P-RNAV (refer to Table II-B-3-1 from ICAO Doc 9613).

However, if position determination is exclusively computed based on VOR-DME, the aircraft is not eligible for RNAV 1/RNAV 2 operations.

Table II-B-3-1. Additional requirements for obtaining an RNAV 1 and RNAV 2 approval from a TGL-10 approval

Operator has TGL-10	*Needs to confirm these performance capabilities for ICAO RNAV 1 and RNAV 2*	*Note*
If approval includes use of DME/VOR (DME/VOR may be used as the only positioning input where this is explicitly allowed.)	RNAV 1 does not accommodate any routes based on DME/VOR RNAV	RNAV system performance must be based on GNSS, DME/DME, or DME/DME/IRU. However, DME/VOR input does not have to be inhibited or deselected
If approval includes use of DME/DME	No action required if RNAV system performance meets specific navigation service criteria in this Chapter 3, 3.3.3.2.2 (DME/DME only) or 3.3.3.2.3 (DME/DME/IRU)	Operator can ask manufacturer or check FAA website for list of compliant systems (see the Note below this table)
RNAV SID specific requirement with DME/DME aircraft	RNAV guidance available no later than 500 ft above field elevation	Operator should add these operational procedures
If approval includes use of GNSS	No action required	
Note.— rgl.faa.gov/		

3.6 RNP 1

The RNP 1 specification provides a means to develop routes for connectivity between the en-route structure and terminal airspace with no or limited ATS surveillance, with low to medium density traffic.

RNP 1 specification is based upon GNSS. While DME/DME-based RNAV systems are capable of RNP 1 accuracy, this navigation specification is primarily intended for environments where the DME infrastructure cannot support DME/DME area navigation to the required performance. The increased complexity in the DME infrastructure requirements and assessment means it is not practical or cost-effective for widespread application.

RNP 1 provides a track-keeping accuracy equal to or better than +/- 1 NM for 95% of the flight time for the following segments:

a) arrival*
b) initial approach
c) intermediate approach
d) missed approach#
e) departure*

*Beyond 30nm from the ARP, the accuracy value for alerting becomes +/-2 NM.

Area of application can only be used after the initial climb of a missed approach phase.

3.6.1 RNP 1 Category & Area of Operation

The RNP 1 specification provides a means to develop routes for connectivity between the en-route structure and terminal airspace with no or limited ATS surveillance, with low to medium density traffic.

3.6.2 RNP 1 Minimum Navigation Equipment

The following systems meet the accuracy, integrity and continuity requirements of these criteria:

a) aircraft with E/TSO-C129a sensor (Class B or C), E/TSO-C145() and the requirements of E/TSOC115b FMS, installed for IFR use in accordance with FAA AC 20-130A;
b) aircraft with E/TSO-C129a Class A1 or E/TSO-C146() equipment installed for IFR use in accordance with FAA AC 20-138 or AC 20-138A; and
c) aircraft with RNP capability certified or approved to equivalent standards.

Note: For RNP procedures, the RNP system can only use DME updating when authorized by the State.

RNP 1 shall not be used in areas of known navigation signal (GNSS) interference.

3.6.3 RNP 1 Minimum Communication & ATS Surveillance

This navigation specification is intended for environments where ATS surveillance is either not available or limited.

RNP 1 SIDs/STARs are primarily intended to be conducted in DCPC environments

3.6.4 RNP 1 Minimum Equipment List Requirements

The MEL shall specify the required dispatch conditions for RNP 1 operations.

3.6.5 RNP 1 Training Requirements

The training programme should provide sufficient training (e.g. simulator, training device, or aircraft) on the aircraft's RNP system to the extent that the pilots are familiar with the following: -

a) RNP 1 operational procedures (see below);

b) the meaning and proper use of aircraft equipment/navigation suffixes;

c) procedure characteristics as determined from chart depiction and textual description;

d) depiction of waypoint types (fly-over and fly-by) and path terminators, AIRINC 424 path terminators and any other types used by the operator), as well as associated aircraft flight paths;

e) required navigation equipment for operation on RNP 1 SIDs, and STARs;

f) RNP system-specific information:

    i) levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation;

    ii) functional integration with other aircraft systems;

    iii) the meaning and appropriateness of route discontinuities as well as related pilot procedures;

    iv) pilot procedures consistent with the operation;

    v) types of navigation sensors utilized by the RNP system and associated system prioritization/ weighting/logic;

    vi) turn anticipation with consideration to speed and altitude effects;

    vii) interpretation of electronic displays and symbols; and

    viii) understanding of the aircraft configuration and operational conditions required to support RNP 1 operations, i.e. appropriate selection of CDI scaling (lateral deviation display scaling);

g) RNP system operating procedures, as applicable, including how to perform the following actions:

    i) verify currency and integrity of the aircraft navigation data;

    ii) verify the successful completion of RNP system self-tests;

    iii) initialize navigation system position;

    iv) retrieve and fly an RNP 1 SID or a STAR with appropriate transition;

    v) adhere to speed and/or altitude constraints associated with an RNP 1 SID or STAR;

    vi) select the appropriate RNP 1 SID or STAR for the active runway in use and be familiar with procedures to deal with a runway change;

    vii) verify waypoints and flight plan programming;

    viii) fly direct to a waypoint;

    ix) fly a course/track to a waypoint;

    x) intercept a course/track;

xi) following vectors and rejoining an RNP 1 route from “heading” mode;

xii) determine cross-track error/deviation. More specifically, the maximum deviations allowed to support RNP 1 must be understood and respected;

xiii) resolve route discontinuities;

xiv) remove and reselect navigation sensor input;

xv) when required, confirm exclusion of a specific NAVAID or NAVAID type;

xvi) change arrival airport and alternate airport;

xvii) perform parallel offset function if capability exists. Pilots should know how offsets are applied, the functionality of their particular RNP system and the need to advise ATC if this functionality is not available; and

xviii) perform RNAV holding function;

h) h) operator-recommended levels of automation for phase of flight and workload, including methods to minimize cross-track error to maintain route centre line;

i) R/T phraseology for RNAV/RNP applications; and

j) contingency procedures for RNAV/RNP failures.

3.6.6 RNP 1 Operational Procedures

Refer to Part 1 Chapter 9.4.1.6.

3.6.7 RNP 1 Navigation Database Requirements

The navigation database shall be obtained from a supplier that complies with RTCA DO 200A/EUROCAE document ED 76, Standards for Processing Aeronautical Data. An LOA issued by the appropriate regulatory authority to each of the participants in the data chain demonstrates compliance with this requirement (e.g. FAA LOA issued in accordance with FAA AC 20-153 or EASA LOA issued in accordance with EASA Opinion Nr. 01/2005.

Discrepancies that invalidate a SID or STAR shall be reported to the navigation database supplier and the affected SID or STAR prohibited by an operator’s notice to its pilots.

Aircraft operators should conduct periodic checks of the operational navigation databases in order to meet existing quality system requirements.

Note: To minimize PDE, the database shall comply with DO 200A, or an equivalent operational means shall be in place to ensure database integrity for the RNP 1 SIDs or STARs.

3.6.8 Acceptable Means of Compliance for RNP 1 Approval

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNP 1 shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documents listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNP 1 operations: -

a) RNP 2 Continental

b) FAA AC 20-138 for the appropriate navigation specification; or

c) FAA AC 90-105.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above and position determination is primarily based on GNSS, the aircraft is eligible for RNP 1.

However, in the cases mentioned in:

a) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 (TGL 10) (any revision); or

b) FAA AC 90-100,

loss of GNSS implies loss of RNP 1 capability.

3.7 RNP APCH

RNP approach (RNP APCH) procedures include existing RNAV (GNSS) approach procedures designed with a straight segment.

The FAA issued airworthiness criteria, AC20-138( ), for GNSS equipment and systems that are eligible for such operations. EASA also developed certification material (AMC 20-27A) and AMC-20-28) for airworthiness approval and operational criteria for RNP APCH operations. While similar in functional requirements, there are slight differences between these two sets of airworthiness criteria. In order to achieve a global standard, the two sets of criteria were harmonized into a single navigation standard.

The resulting harmonised ICAO standard is RNP APCH procedures down to LNAV, LNAV/VNAV, LPV or LP minima. The IOMAR can authorise appropriately certified aircraft to conduct RNP APCH down to the applicable minima and this will be identified on the Operations Specification.

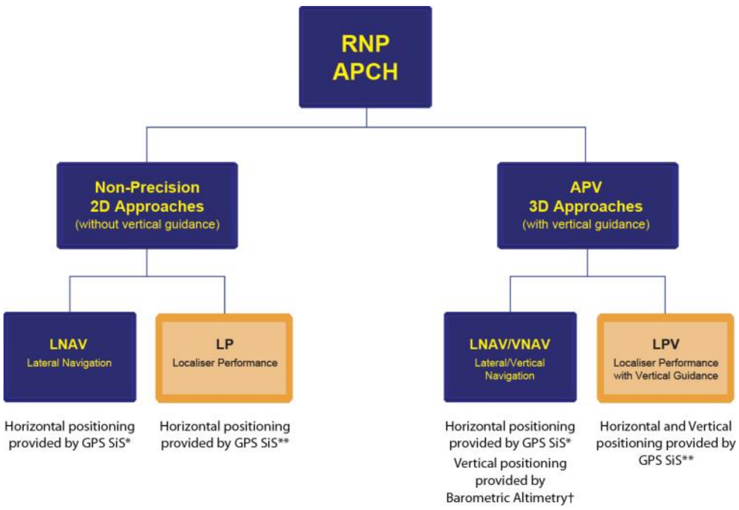
2D Approach Operations - LNAV and LP use lateral guidance only;

LP approaches are available at few aerodromes and many aircraft types are not equipped to carry them out. These are also known as RNP Approach in the United States of America.

3D Approach Operations - LNAV/VNAV and LPV use both lateral and vertical guidance.

LNAV/VNAV is also known as APV-Baro VNAV (when the vertical path positioning is provided by on-board barometric systems), or APV SBAS (when provided by Space-Based Augmentation of Basic GNSS).

The RNP APCH Model



Notes:

a) Augmentation of GPS Signal-in-Space for LNAV or LNAV/VNAV is provided by an Aircraft-Based Augmentation System (ABAS). A common ABAS implementation is the Receiver Autonomous Integrity Monitoring (RAIM) algorithm.

b) Augmentation of GPS Signal-in-Space for LP or LPV is provided by a Satellite-Based Augmentation System (SBAS). In Europe this is provided by the European Geostationary Navigation Overlay Service (EGNOS).

c) An RNAV (GNSS) named chart reflects the dependence on lateral positioning on GNSS Signal-In-Space (SiS). With the inherent on-board performance monitoring and alerting provided by GNSS, the navigation specification qualifies as RNP and yet, like many navigation applications, GPS-based approaches pre-date PBN, so the chart name has remained. RNP APCH procedures may be designed as stand-alone "T" or "Y" with the four segments as indicated above, or may be linked to a Runway Transition provided by either RNAV 1 or RNP 1 up to the Final Approach segment, and followed by the Missed Approach. The Final Approach segment may be flown either as a 2 Dimensional Approach (Non-Precision Approach), or as a 3 Dimensional Approach (Approach Procedure with Vertical guidance). For the latter, the vertical path positioning is provided by either on-board barometric systems or Space-Based Augmentation of Basic GNSS. From this the terms APV Baro-VNAV and APV SBAS are coined.

Refer to the PBN airspace category table, Part 2 Chapter 3.0.3 for further details.

3.7.1 RNP APCH Category & Area of Operation

RNP APCH is for use during approach and missed-approaches.

3.7.2 RNP APCH Minimum Navigation Equipment

The following systems meet the accuracy, integrity and continuity requirements of these criteria:

a) GNSS stand-alone systems, equipment shall be approved in accordance with TSO-C129a/ ETSO-C129a Class A, E/TSO-C146() Class Gamma and operational class 1, 2 or 3, or TSO C-196();

b) GNSS sensors used in multi-sensor system (e.g. FMS) equipment shall be approved in accordance with TSO C129 ( )/ ETSO-C129 ( ) Class B1, C1, B3, C3 or E/TSO C145() class 1, 2 or 3, or TSO C-196(). For GNSS receiver approved in accordance with E/TSO-C129(), capability for satellite FDE is recommended to improve continuity of function; and

c) multi-sensor systems using GNSS shall be approved in accordance with AC20-130A or TSO-C115b, as well as having been demonstrated for RNP APCH capability.

3.7.2.1 LNAV or LNAV/VNAV Minima

To support RNP APCH operations down to LNAV or LNAV/VNAV minima, the specification is based on GNSS.

The missed approach segment may be based upon the conventional NAVAID (e.g. VOR, DME, NDB).

3.7.2.2 LPV or LP Minima

To support operations down to LPV or LP minima, the specification is based on augmented GNSS.

The missed approach segment may be based upon GNSS or conventional NAVAID (e.g. VOR, DME, NDB).

3.7.3 RNP APCH Minimum Communication & ATS Surveillance

RNP APCH does not include specific requirements for communication or ATS surveillance.

Adequate obstacle clearance is achieved through aircraft performance, operating procedures and procedure design. Where reliance is placed on the use of radar to assist contingency procedures, its performance will be shown to be adequate for that purpose, and the requirement for a radar service will be identified in the AIP.

RT phraseology appropriate to RNP APCH operations will be promulgated.

3.7.4 RNP APCH Minimum Equipment List Requirements

The MEL shall specify the required dispatch conditions for RNP APCH operations to LNAV, LNAV/VNAV, LPV and/or LP minima as appropriate.

3.7.5 RNP APCH Training

3.7.5.1 LNAV or LNAV/VNAV Training Requirements

The training programme must provide sufficient training (e.g. simulator, training device, or aircraft) on the aircraft's RNP system to the extent that the pilots are not just task oriented, this includes:

a) the information in this chapter;

b) the meaning and proper use of RNP systems;

c) procedure characteristics as determined from chart depiction and textual description;

d) knowledge regarding depiction of waypoint types (fly-over and fly-by), required path terminators (IF,TF, DF) and any other types used by the operator as well as associated aircraft flight paths;

e) knowledge on the required navigation equipment in order to conduct RNP APCH operations (at least one RNP system based on GNSS);

f) knowledge of RNP system-specific information:

    i) levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation;

    ii) functional integration with other aircraft systems;

    iii) the meaning and appropriateness of route discontinuities as well as related pilot procedures;

    iv) monitoring procedures for each phase of flight;

    v) types of navigation sensors utilized by the RNP system and associated system prioritization/weighting/logic;

    vi) turn anticipation with consideration to speed and altitude effects; and

    vii) interpretation of electronic displays and symbols;

g) knowledge of RNAV equipment operating procedures, as applicable, including how to perform the following actions:

    i) verify currency of the aircraft navigation data;

    ii) verify the successful completion of RNP system self-tests;

    iii) initialize RNP system position;

    iv) retrieve and fly an RNP APCH;

    v) adhere to speed and/or altitude constraints associated with an approach procedure;

    vi) fly interception of an initial or intermediate segment of an approach following ATC notification;

    vii) verify waypoints and flight plan programming;

    viii) fly direct to a waypoint;

    ix) determine cross-track error/deviation;

    x) insert and delete route discontinuity;

xi) when required by the State aviation authority, perform gross navigation error check using conventional NAVAIDs; and

xii) change arrival airport and alternate airport;

h) knowledge of operator-recommended levels of automation for phase of flight and workload, including methods to minimize cross-track error to maintain procedure centre line;

i) knowledge of radio telephony phraseology for RNP applications; and

j) ability to conduct contingency procedures following RNP system failures.

3.7.5.2 LPV or LP Training Requirements

The pilot training programme should be structured to provide sufficient theoretical and practical training, using a simulator, training device, or line training in an aircraft, on the use of the aircraft's approach system to ensure that pilots are not just task-oriented. The following syllabus should be considered as a minimum amendment to the training programme to support these operations: -

a) RNP approach concept containing LP or LPV minima:

   1) theory of approach operations;

   2) approach charting;

   3) use of the approach system including:

      i) selection of the LP or LPV approach procedure; and

      ii) ILS look alike principle;

   4) use of lateral navigation mode(s) and associated lateral control techniques;

   5) use of VNAV mode(s) and associated vertical control techniques;

   6) R/T phraseology for LP or LPV approach operations; and

   7) the implication for LP or LPV approach operations of systems malfunctions which are not related to the approach system (e.g. hydraulic failure);

b) RNP approach operation containing LP or LPV minima:

   1) definition of LP or LPV approach operations and its direct relationship with RNAV(GNSS) procedures;

   2) regulatory requirements for LP or LPV approach operations;

   3) required navigation equipment for LP or LPV approach operations:

      i) GPS concepts and characteristics;

      ii) augmented GNSS characteristics; and

      iii) MEL;

   4) procedure characteristics:

      i) chart depiction;

      ii) aircraft display depiction; and

      iii) minima;

   5) retrieving an LP or LPV approach procedure from the database (e.g. using its name or the SBAS channel number);

   6) change arrival airport and alternate airport;

   7) flying the procedure:

i) use of autopilot, autothrottle and flight director;

ii) flight guidance mode behaviour;

iii) lateral and vertical path management;

iv) adherence to speed and/or altitude constraints;

v) fly interception of an initial or intermediate segment of an approach following ATC notification;

vi) fly interception of the extended FAS (e.g. using the VTF function);

vii) consideration of the GNSS approach mode indication (LP, LPV, LNAV/VNAV, lateral navigation); and

viii) the use of other aircraft equipment to support track monitoring, weather and obstacle avoidance;

8) ATC procedures;

9) abnormal procedures; and

10) contingency procedures.

3.7.6 RNP APCH Operational Procedures

Refer to Part 1 Chapter 9.4.1.7.

3.7.7 RNP APCH Navigation Database Requirements

The Operator shall implement procedures that ensure timely distribution and insertion of current and unaltered electronic navigation data to all aircraft that require it.

The Operator shall hold a valid copy of the Navigation Database Management Type 2 LoA, or equivalent, issued by EASA, FAA or Transport Canada.

Note:

i) EASA Type 2 LoA is issued by EASA in accordance with EASA OPINION Nr. 01/2005 on "The Acceptance of Navigation Database Suppliers" dated 14 Jan 05; or

ii) The FAA Type 2 LoA in accordance with AC 20-153A.

iii) Transport Canada (TCCA) issues an acknowledgement letter of an Aeronautical Data Process using the same basis

Discrepancies that invalidate a procedure shall be reported to the navigation database supplier and affected procedures prohibited by an operator's notice to its pilots.

The Operator should conduct ongoing checks of the operational navigation databases in order to meet existing quality system requirements.

3.7.8 Acceptable Means of Compliance for RNP APCH Approval

3.7.8.1 RNP APCH – LNAV Minima

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNP APCH – LNAV shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documents listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNP APCH – LNAV operations: -

a) AMC 20-27;
b) AMC 20-28;
c) FAA AC 20-138 for the appropriate navigation specification; or
d) FAA AC 90-105 for the appropriate navigation specification.

Or, if a statement of compliance with RNP 0.3 GNSS approaches in accordance with any of the following specifications or standards is found in the acceptable documentation as listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNP APCH — LNAV operations.

a) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 3 (TGL 3);
b) AMC 20-4;
c) FAA AC 20-130A; or
d) FAA AC 20-138.

Note: any limitation such as 'within the US National Airspace' can be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

3.7.8.2 RNP APCH – LNAV/VNAV minima

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNP APCH – LNAV/VNAV shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documentation listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNP APCH – LNAV/VNAV operations: -

a) AMC 20-27 with Baro-VNAV;
b) AMC 20-28;
c) FAA AC 20-138; or
d) FAA AC 90-105 for the appropriate navigation specification.

Or, if a statement of compliance with FAA AC 20-129 is found in the acceptable documentation listed in Part 2 Chapter 3.0.1.2the aircraft is eligible for RNP APCH — LNAV/VNAV operations.

Note: any limitation such as 'within the US National Airspace' can be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

3.7.8.3 RNP APCH – LPV Minima

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNP APCH – LPV shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documentation listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNP APCH – LPV operations: -

a) AMC 20-28;
b) FAA AC 20-138 for the appropriate navigation specification; or
c) FAA AC 90-107.

Note: any limitation such as 'within the US National Airspace' can be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

3.7.8.4 RNP APCH – LP Minima

Documentary evidence to demonstrate that the aircraft is suitably equipped for RNP APCH – LP shall be provided to support the application.

Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the documentation listed in Part 2 Chapter 3.0.1.2, the aircraft is eligible for RNP APCH – LP operations: -

a) FAA AC 20-138 for the appropriate navigation specification; or

b) FAA AC 90-107.

Note: any limitation such as 'within the US National Airspace' can be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

3.7.9 Operational Criteria

Before planning a flight to an aerodrome (destination or alternate) with the intent to use an RNP APCH procedure contained in the Navigation Database, the operator shall give consideration to an evaluation of any new or modified RNP APCH procedures.

Particular attention shall be paid to procedures:

- in mountainous environments,
- within the proximity of well-known obstacles,
- in the absence of radar coverage,
- have a missed approach trajectory involve turns, especially at low altitudes, or
- are subject to a declared exemption to the procedure design rules specified by the ICAO PANS OPS.

An operational evaluation of a RNP APCH procedure of the above mentioned operational characteristics can include, at operator discretion, an approach conducted with the aircraft in VMC or the use of a full flight simulator (FFS) in order to evaluate if the procedure is correctly executed by the navigation system and fly-able with the aircraft type.

Based on the results of the assessment, the appropriate information shall be given to the operating crew.

3.7.9.1 Temperature Limits (when using Barometric VNAV)

Barometric VNAV (Baro-VNAV) operations can be subject to temperature limitation.

When the aerodrome temperature is 0°C or colder, the temperature error correction shall be added to:

- DH/DA or MDH/MDA and step-down fixes inside the final approach fix (FAF).
- All low altitude approach procedure altitudes in mountainous regions (terrain of 3000 ft AMSL or higher)

Operators using Baro-VNAV in an aircraft with an airworthiness approval for automatic temperature compensation, or in an aircraft using an alternate means for vertical guidance e.g. Satellite-Based Augmentation Systems (SBAS), can disregard the temperature limits (high temperature limit still applies if the system only compensates for low temperature).

3.8 RNP AR APCH

RNP AR APCH specification (sometimes referred to as SAAAR - Special Aircraft and Aircrew Authorization Required) also known as RNAV (RNP), represents the ICAO global standard for developing IAPs to airports where limiting obstacles exist and/or where significant operational efficiencies can be gained.

These procedures require additional levels of scrutiny, control and authorization. The increased risks and complexities associated with these procedures are mitigated through more stringent RNP criteria, advanced aircraft capabilities and increased aircrew training.

All RNP AR procedures have reduced lateral obstacle evaluation areas and vertical obstacle clearance surfaces predicated on the aircraft and aircrew performance requirements of this section.

A critical component of RNP is the ability of the aircraft navigation system to monitor its achieved navigation performance, and to identify to the pilot whether the operational requirement is or is not being met during an operation.

The criteria (both procedure design and certification) can take account of the fact that aircraft with different flight guidance capabilities will be used to fly the procedures. However, the procedure design criteria do reflect specific levels of aircraft performance and capability for the Baro-VNAV aspects of the operation.

In addition to receiving approval by the IOMAR to conduct RNP AR (Authorization Required) APCH procedures, additional approval from the State within which the procedure is located can be required.

3.8.1 RNP AR APCH Characteristics

3.8.1.1 Accuracy

All aircraft operating on RNP AR APCH procedures shall have a cross-track navigation error no greater than the applicable accuracy value (0.1 nm to 0.3 nm) for 95% of the flight time. This includes positioning error, flight technical error (FTE), path definition error (PDE) and display error. Also, the aircraft along-track positioning error shall be no greater than the applicable accuracy value for 95% of the flight time. In addition, vertical accuracy criteria apply.

3.8.1.2 RNP Value

Each published line of minima has an associated RNP value. RNP AR procedures can have an RNP value of RNP 0.3 or less.

3.8.1.3 Procedures with radius to a Fix (RF) Legs

Some RNP AR procedures include RF legs. The instrument approach charts will indicate requirements for RF legs in the notes section or at the applicable initial approach fix (IAF).

3.8.1.4 Missed approaches requiring less than RNP 1.0

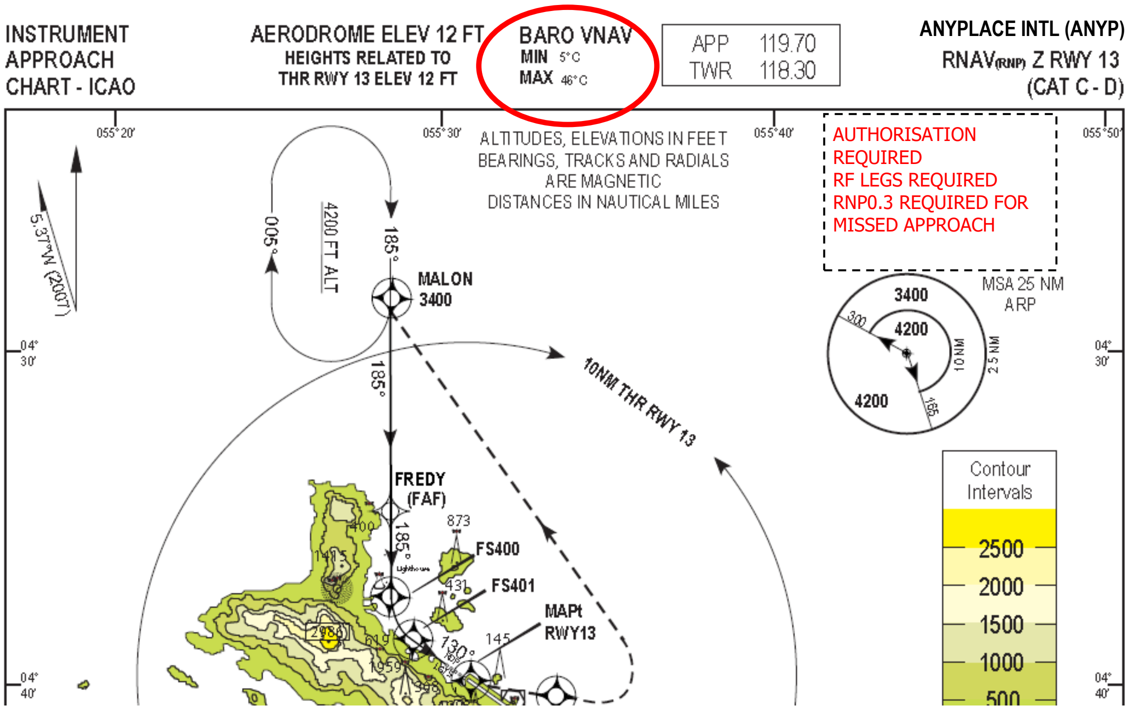
At certain locations, the airspace or obstacle environment can require RNP capability of less than 1.0 nm during a missed approach. Operation on these approaches typically requires redundant equipment. This requirement ensures that no single point of failure can cause loss of RNP capability.

3.8.1.5 Non-Standard Speeds or Climb Gradients

Normally, RNP AR procedure design relies on standard approach speeds and climb gradients including the Missed Approach Segment (MAS). The approach procedure will indicate any exceptions to these standards, and the operator shall ensure it can comply with any published restrictions before conducting these approach operations.

3.8.1.6 Temperature Limits (when using Barometric VNAV)

The RNP AR APCH chart (see example below) will identify outside air temperature limits applicable to operators using Barometric VNAV (Baro-VNAV). Cold temperatures reduce the effective glide path angle while high temperatures increase the effective glide path angle without cockpit indication of the variation.



Note: Temperature affects the aircraft's actual altitude AGL/AMSL. The effect is similar to high and low pressure changes, although not as significant. When temperature is higher than the International Standard Atmosphere (ISA), the aircraft will be higher than the indicated altitude. When temperature is lower than standard, the aircraft will be lower than indicated on the altimeter. When the aerodrome temperature is 0°C or colder, the temperature error correction shall be added to:

- DH/DA or MDH/MDA and step-down fixes inside the final approach fix (FAF).
- All low altitude approach procedure altitudes in mountainous regions (terrain of 3000 ft AMSL or higher)
- Operators using Baro-VNAV in an aircraft with an airworthiness approval for automatic temperature compensation, or in an aircraft using an alternate means for vertical guidance e.g. Satellite-Based Augmentation Systems (SBAS), can disregard the temperature limits (high temperature limit still applies if the system only compensates for low temperature).

3.8.1.7 Aircraft Size

Aircraft size can determine the minima for an RNP AR APCH procedure. Large aircraft can require higher minima due to gear height and/or wingspan. Approach charts will annotate any applicable aircraft size restrictions when appropriate.

3.8.2 RNP AR APCH Minimum Communication & ATS Surveillance

RNP AR APCH does not include specific requirements for communication or ATS surveillance.

3.8.3 RNP AR APCH Minimum Equipment List Requirements

The MEL shall identify any unserviceability that affects the conduct of an RNP AR operation, including, but not limited to, TAWS Class A, Autopilot ,Flight Director, etc.

Redundancy is required for essential systems prior to dispatch ensuring that capability is maintained following a loss of any individual system. Where redundant equipment is unserviceable the MEL requirements are determined by consideration of the effect on the RNP operation caused by a loss of system availability taking into account any mitigating provisions incorporated in the procedure design or operating procedures.

3.8.4 RNP AR APCH Training & Knowledge Requirements

The operator shall provide training for key personnel e.g. flight crew members and dispatchers in the use and application of RNP AR procedures. A thorough understanding of the operational procedures and best practices is critical to the safe operation of aircraft during RNP AR operations. The training programme shall provide sufficient detail on the aircraft's navigation and flight control systems to enable the pilots to identify failures affecting the aircraft's RNP capability and the appropriate abnormal/emergency procedures. Required training shall include both knowledge and skill assessments of the flight crew member (and dispatcher duties if applicable).

3.8.4.1 Flight Crew Training

The operator is responsible for the training of flight crews for the specific RNP AR operations approved for the operator. The operator shall include training on the different types of RNP AR procedures and required equipment. Training shall include discussion of RNP AR regulatory requirements. The operator shall include these requirements and procedures in their operations manual and training manuals (as applicable). This material shall cover all aspects of the operator's approved RNP AR operations. An individual shall have completed the appropriate ground and flight training segment before engaging in RNP AR operations.

Flight training segments shall include training and checking modules representative of the type of RNP AR operations the operator conducts during line flying activities. The operator can conduct required flight training modules in Flight Training Devices, Aircraft Simulators, and other enhanced training devices as long as these training mediums accurately replicate the operator's equipment and RNP AR operations.

The training requirements shall be in accordance with the ICAO PBN Manual (Doc 9613) for RNP AR APCH, and in accordance with the requirements of the pilot's licence.

Refer to Part 2 Chapter 3.8.9 for details on the Flight Crew Training Syllabus for RNP AR APCH.

3.8.4.2 Flight Dispatcher Training (if applicable)

Where flight dispatchers are utilised, training shall include recognition of the different types of RNP AR procedures, the importance of specific navigation equipment and other equipment during RNP AR operations and discuss RNP AR regulatory requirements and procedures. Dispatcher procedure and training manuals shall include these requirements (as applicable). This material shall cover all aspects of the operator's RNP AR operations including the applicable authorisation(s). An individual shall have completed the appropriate training course before engaging in RNP AR operations. Additionally, the dispatchers' training shall address how to determine: RNP AR availability (considering aircraft equipment capabilities), MEL requirements, aircraft performance, and navigation signal availability e.g. GPS RAIM/predictive RNP capability tool for destination and alternate airports.

3.8.5 RNP AR APCH Navigation Database (NavDB) Requirements

The procedure stored in the navigation database (NavDB) defines the lateral and vertical path. NavDB updates occur every 28 days, and the navigation data in every update are critical to the integrity of every RNP AR procedure.

Given the reduced obstacle clearance associated with these procedures, validation of navigation data warrants special consideration.

An aircraft operator's application to conduct RNP AR procedures shall specifically describe the extent and nature of the services provided by an outside entity contracted to perform NavDB validation services.

The operator shall implement procedures that ensure timely distribution and insertion of current and unaltered electronic navigation data to all aircraft that require it.

3.8.5.1 NavDB Suppliers

The NavDB supplier shall hold Type 2 LoA, or equivalent, issued by either EASA, FAA or Transport Canada. The Operator shall hold a copy of the LoA.

Note:

i) EASA Type 2 LoA is issued by EASA in accordance with EASA OPINION Nr. 01/2005 on "The Acceptance of Navigation Database Suppliers" dated 14 Jan 05.

ii) The FAA Type 2 LoA in accordance with AC 20-153A.

iii) Transport Canada (TCCA) issues an acknowledgement letter of an Aeronautical Data Process using the same basis.

3.8.5.2 NavDB Validation Programme

The operator by shall first validate any RNP AR procedure in the database formally by:

a) comparing the data in the database with the procedure published on the relevant approach chart. Any discrepancy shall be compared against the respective State's Aeronautical Information Publication (AIP);

b) flying the entire procedure either in a simulator or in the actual aircraft in VMC, or using a desktop/laptop computer utilising software identical to the aircraft (e.g. FMS software) and use of an aerodynamic model of the aircraft's flight characteristics to ensure that there is complete consistency and there are no disconnects;

c) comparing subsequent database updates with the validated master to ensure that there are no discrepancies.

3.8.5.3 TAWS Database

The procedure validation process shall include a compatibility check with the installed TAWS. The TAWS data shall only be obtained from a qualified source and the have a procedure in place for the management of the TAWS data.

3.8.6 RNP AR APCH Operational Criteria

This section provides guidance on the conduct of RNP AR APCH operations. In addition to this guidance, the operator shall also continue to ensure its flight crews comply with general RNAV operating requirements, review Notices to Airmen (NOTAM), determine availability of Navigational Aids (NAVAID), and confirm airworthiness of aircraft systems.

3.8.6.1 Pre-flight Considerations

a) Minimum Equipment List (MEL)

The operator's MEL shall address the equipment requirements for RNP AR instrument approaches. Guidance related to these equipment requirements is available from the aircraft manufacturer. The required equipment can depend on the intended RNP value and whether the missed approach requires RNP less than 1.0;

b) Class A Terrain Awareness Warning System (TAWS)

An operable TAWS Class A is required for all RNP AR procedures. The TAWS shall use altitude that is compensated for local pressure and temperature effects e.g. corrected barometric and Global Navigation Satellite System (GNSS) altitude, and include significant terrain and obstacle data;

c) Autopilot and Flight Director (FD)

RNP AR procedures with RNP values less than 0.3, or with radius to fix (RF) legs, require the use of autopilot or FD driven by the RNAV system in all cases. The autopilot/FD shall operate with suitable accuracy to track the lateral and vertical paths required by the RNP AR procedure;

d) RNP Prediction

The operator shall have a predictive performance capability, which can forecast if the specified RNP value will be available at the time and location of a desired RNP AR operation. This capability can be a ground service and need not be resident in the aircraft's avionics equipment. The operator shall establish procedures requiring use of this capability as both a pre-flight dispatch tool and as a flight-following tool in the event of reported failures;

i) This predictive capability shall account for known and predicted outages of GNSS satellites or other impacts on the aircraft navigation system. The prediction program shall not use a mask angle below 5 degrees, as operational experience indicates that satellite signals at low elevations are not reliable. The prediction shall use the actual GNSS constellation, and when equipped, the GNSS augmentations with the algorithm identical to or more conservative than that used in the actual equipment. The RNP prediction shall show the horizontal protection level (HPL) is less than the required RNP value. For RNP AR procedure with high terrain, a mask angle appropriate to the terrain shall be used;

ii) RNP AR procedures require GNSS updating. Therefore, there is no RNP prediction associated with distance measuring equipment (DME)/DME or very high frequency omni-directional radio range station (VOR)/DME updating of the aircraft's RNAV system;

e) NAVAID Exclusion

The operator shall establish procedures to exclude NAVAID facilities e.g. DMEs, VORs, localisers in accordance with NOTAMs. Internal avionics reasonableness checks can not be adequate for RNP AR operations;

f) Navigation Database (NavDB) Currency

During system initialization, pilots shall confirm the NavDB is current. NavDBs are expected to be current for the duration of the flight. If the Aeronautic Information Regulation and Control (AIRAC) cycle will change during flight, operators shall establish procedures to ensure the accuracy of navigation data, including suitability of navigation facilities used to define the routes and procedures for flight. Traditionally, this has been accomplished by verifying electronic data against paper products. One acceptable means is to compare aeronautical charts (new and old) to verify navigation fixes prior to dispatch. If an amended chart is published for the procedure, the RNP AR procedure shall not be carried out with the expired NavDB, and,

g) Flight Planning

The flight crew shall ensure that the ATC Flight Plan includes: -

- 'R' for PBN in item 10a; and
- PBN/T1 or T2 (as appropriate) to identify RNP AR APCH in item 18.

3.8.6.2 Flight Considerations

a) Modification of Flight Plan

Pilots shall not be authorised to fly a published RNP procedure unless it is retrievable by the procedure name from the aircraft navigation database and conforms to the charted procedure. The lateral path shall not be modified; with the exception of accepting a clearance to go direct to a fix in the approach procedure that is before the final approach fix (FAF) and that does not immediately precede an RF leg. The only other acceptable modification to the loaded procedure is to change altitude and/or airspeed waypoint constraints on the initial, intermediate, or missed approach segments flight plan fixes e.g. to apply cold temperature corrections or comply with an ATC clearance/instruction;

b) Required List of Equipment

The flight crew shall have a readily accessible list of equipment required for conducting RNP AR APCH, as well as methods to address in-flight equipment failures that would prohibit RNP AR APCH e.g. crew warning systems, quick reference handbook;

c) RNP Management

The flight crew's operating procedures shall ensure the navigation system uses the appropriate RNP values throughout the approach. If multiple lines of minima associated with different RNP values are shown on the approach chart, the flight crew shall confirm that the required RNP value is entered in the RNAV system. If the navigation system does not extract and set the RNP value from the on board navigation database for each leg of the procedure, then the flight crew's operating procedures shall ensure that the most restrictive RNP value required to complete the approach or the missed approach is selected before initiating the approach e.g. before the initial approach fix (IAF). Different IAF's can have different navigation accuracies, which are annotated on the approach chart;

d) Sensor Updating

RNP AR instrument procedures require GNSS performance. If at any time GNSS updating is lost and the navigation system does not have the performance to continue the approach, i.e. unable to comply with the current RNP value the flight crew shall abandon the RNP AR procedure unless visual conditions exist between the aircraft and the runway of intended landing;

Initiation of all RNP AR procedures is based on GNSS updating. Except where specifically designated on a procedure as 'Not Authorised', DME/DME updating can be used as a reversionary mode during the approach or missed approach when the system complies with the navigation accuracy. VOR updating is not authorised at this time. The flight crew shall comply with the operator's procedures for inhibiting specific facilities;

e) Approach Procedure Confirmation

The flight crew shall confirm the correct procedure has been selected. This process includes confirmation of the waypoint sequence, reasonableness of track angles and distances, and any other parameters that can be altered by the pilot, such as altitude or speed constraints.

A RNP AR procedure shall not be used if validity of the NavDB is in doubt. A navigation system textual display or map display shall be used for this procedure confirmation;

f) Track Deviation Monitoring

The flight crew shall use a lateral deviation indicator, flight director and/or autopilot in lateral navigation (LNAV) mode on RNP AR procedures. The flight crew of aircraft with a lateral deviation indicator shall ensure that lateral deviation indicator scaling (full scale deflection) is suitable for the navigation accuracy associated with the various segments of the RNP AR procedure. All flight crew are expected to maintain procedure centrelines, as depicted by on board lateral deviation indicators and/or flight guidance during all RNP AR operations unless authorised to deviate by ATC or under emergency conditions.

For normal operations, pilots shall limit cross-track error/deviation (the difference between the RNP system computed path and the aircraft position relative to the path) to +/- one half the navigation accuracy associated with the procedure segment. Brief lateral deviations from this standard e.g. overshoots or undershoots during and immediately after turns, up to a maximum of 1 times the navigation accuracy of the procedure segment, are allowable.

Vertical deviation shall be monitored above and below the glidepath. The vertical deviation shall be within ±75 feet of the glidepath during the final approach segment.

Flight crew shall execute a missed approach (MAP) if the lateral deviation exceeds 1xRNP or the vertical deviation exceeds 75 feet, unless the pilot has in sight the visual references required to continue the approach.

1) Some aircraft navigation displays do not incorporate lateral and vertical deviation indications, scaled for each RNP AR APCH operation, in the primary optimum field of view (FOV). Where a moving map, low resolution vertical deviation indicator (VDI), or numeric display of deviations are to be used, flight crew training and procedures shall ensure the effectiveness of these displays. Typically, this involves demonstration of the procedure with a number of trained crews and inclusion of this monitoring procedure in the recurrent RNP AR APCH training programme; and
2) For installations that use a CDI for lateral path tracking, the aircraft flight manual (AFM) or aircraft qualification guidance shall state which navigation accuracy and operations the aircraft supports and the operational effects on the CDI scale. The flight crew shall know the CDI full scale deflection value.

The avionics can automatically set the CDI scale (dependent on phase of flight) or the flight crew can manually set the scale. If the flight crew manually selects the CDI scale, the operator shall have procedures and training in place to assure the selected CDI scale is appropriate for the intended RNP operation. The deviation limit shall be readily apparent given the scale e.g. full scale deflection.

g) System Crosscheck

For approaches with RNP value less than RNP 0.3, the flight crew shall ensure the lateral and vertical guidance provided by the navigation system is consistent with other available data and displays provided by an independent means;

Note: This crosscheck can not be necessary if the lateral and vertical guidance systems have been developed and/or evaluated consistent with extremely remote failure conditions and if the normal system performance supports 1 x RNP containment.

h) Procedures with RF Legs

An RNP AR procedure can include an RF leg. As not all aircraft have this capability, flight crews shall know if they can conduct these procedures. When flying an RF leg, flight crew compliance with the desired path is essential to maintain the intended ground track;

1) If initiating a go-around during or shortly after the RF leg, the flight crew shall be aware of the importance of maintaining the published path as closely as possible. Operators shall develop specific procedures to ensure maintenance of the RNP AR ground track in those aircraft which do not remain in LNAV upon initiation of a go-around; and

2) Pilots shall not exceed the maximum airspeeds shown in the table below throughout the RF leg segment. For example, a Category (CAT) C aircraft shall slow to 140 knots indicated airspeed (KIAS) at the FAF or can fly as fast as 165 KIAS if using CAT D minima. A missed approach prior to Decision Altitude (DA) requires maintaining the segment speed to the DA and then observing any speed limitations specified for the missed approach segment.

Maximum Airspeed by Segment and Category

Indicated Airspeed (Knots)					
Segment	Indicated Airspeed by Aircraft Category				
	Cat A	Cat B	CAT C	Cat D	CAT E
Initial and Intermediate (IAF to FAF)	150	150	240	250	250
Final (FAF to DA)	90	120	140	165	As specified
Missed Approach (DA to MAHP)	110	150	240	265	As specified
Airspeed Restriction[1]	As specified				

[1] Airspeed Restriction: Airspeed restrictions can be used to reduce turn radius regardless of aircraft category.

Note: EASA AC 20-26 and AC 90-101A do not agree on some speed categories. The most restrictive speed has been selected for this table.

i) Temperature Compensation

For aircraft with temperature compensation, flight crews can disregard the temperature limits on RNP procedures if the operator provides pilot training on the use of the temperature compensation function. Temperature compensation by the system is applicable to the VNAV guidance and is not a substitute for the flight crew compensating for the cold temperature effects on minimum altitudes or the decision altitude. Flight crews shall be familiar with the effects of the temperature compensation on intercepting the compensated path described in EUROCAE ED-75B/ RTCA DO-236B Appendix H;

Note: As the charted temperature limits ensure obstacle clearance solely in the FAS, and since temperature compensation only affects the vertical guidance, the pilot can need to manually adjust the minimum altitude on the initial and intermediate approach segments and the DA. Pilots shall coordinate with ATC prior to use of temperature compensation in order to prevent loss of aircraft separation.

j) Altimeter Setting

Due to the performance based obstruction clearance inherent in RNP instrument procedures, the flight crew shall verify the most current airport altimeter setting is selected prior to the final approach fix (FAF). Operators shall take precautions to switch altimeter settings at appropriate times or locations and request a current altimeter setting if the reported setting cannot be recent, particularly at times when pressure is reported or is expected to be rapidly decreasing. Execution of an RNP instrument procedure requires the current altimeter setting for the airport of intended landing. Remote altimeter settings are not allowed;

k) Altimeter Crosscheck

The flight crew shall complete an altimetry crosscheck ensuring both pilots' altimeters agree within ±100 feet prior to the final approach fix (FAF) but no earlier than when the altimeters are set for the airport of intended landing. If the altimetry crosscheck fails then the procedure shall not be continued;

Note: This operational crosscheck is not necessary if the aircraft systems automatically compare the altitudes to within 75 feet.

l) Go-Around or Missed Approach

Where possible, the missed approach will require RNP 1.0. The missed approach portion of these procedures is similar to a missed approach of an RNP APCH procedure. Where necessary, navigation accuracy less than RNP 1.0 will be used in the missed approach. To be approved to conduct these approaches, aircraft equipment and procedures shall meet aircraft certification requirements for approaches with missed approach less than RNP 1.0. This information shall be included in the AFM;

1) In many aircraft when executing a go-around or missed approach activating Take-off/Go-around (TOGA) can cause a change in lateral navigation. In many aircraft, activating TOGA disengages the autopilot and flight director from LNAV guidance, and the flight director reverts to track hold derived from the inertial system. LNAV guidance to the autopilot and flight director shall be re-engaged as quickly as possible;

2) The flight crew procedures and training shall address the impact on navigation capability and flight guidance if the pilot initiates a go-around while the aircraft is in a turn. When initiating an early go-around, the flight crew shall follow the rest of the approach track and missed approach track unless issued a different clearance by ATC. The flight crew shall also be aware that RF legs are designed based on the maximum true airspeed at normal altitudes, and initiating an early go-around will reduce the manoeuvrability margin and potentially even make holding the turn impractical at missed approach speeds; and

3) Upon loss of GNSS updates, the RNAV guidance can begin to "coast" on the IRU, if installed, and drift, degrading the navigation position solution. Thus, when the RNP AR procedures missed approach operations rely on IRU "coasting" the inertial guidance can only provide acceptable navigation performance for a specified amount of time.

m) Contingency Procedures

1) Failure while En-Route

The aircraft RNP capability is dependent on operational aircraft equipment and GNSS satellites. The flight crew shall be able to assess the impact of equipment failure on the anticipated RNP approach and take appropriate action; and

2) Failure on Approach

The operator's contingency procedures shall address at least the following conditions:

i) Failure of the RNP system components, including those affecting lateral and vertical deviation performance e.g. failures of a GPS sensor, the flight director or automatic pilot.

ii) Loss of navigation signal-in-space (loss or degradation of external signal).

n) Engine Out Procedures

Aircraft can demonstrate acceptable flight technical error with one engine inoperative to conduct RNP AR operations. Otherwise, flight crews are expected to take appropriate action in event of engine failure during an approach so that no specific aircraft qualification is required. The aircraft qualification shall identify any performance limits in event of engine failure to support definition of appropriate flight crew procedures.

3.8.7 RNP AR APCH Monitoring Programme

The operator shall include in their SMS an RNP AR monitoring programme to ensure continued compliance with the IOMAR requirements and to identify any negative trends in performance.

As a minimum, this programme shall address the following information:

a) Total number of RNP AR procedures conducted;

b) Number of satisfactory approaches by aircraft/system (Satisfactory if completed as planned without any navigation or guidance system anomalies);

c) Reasons for unsatisfactory approaches, such as:

i) UNABLE REQ NAV PERF, NAV ACCUR DOWNGRAD, or other RNP messages during approaches;

ii) Excessive lateral or vertical deviation;

iii) TAWS warning;

iv) Autopilot system disconnect;

v) Nav data errors;

vi) Pilot report of any anomaly; and

d) Any pertinent crew comments.

The results of this monitoring programme will be required as part of the RNP AR APCH renewal process.

3.8.7.1 Reportable Events

A reportable event is one that adversely affects the safety of the operation and can be caused by actions/events external to the operation of the aircraft navigation system. The operator shall investigate such events to determine if it is due to an improperly coded procedure, or a navigation data base error. Responsibility for initiating corrective and preventative action rests with the operator.

Technical defects and exceeding technical limitations shall be subject to occurrence reports, including:

i) Significant navigation errors attributed to incorrect data or a database coding error;

ii) Unexpected deviations in lateral/vertical flight path not caused by pilot input or erroneous operation of equipment;

iii) Significant misleading information without a failure warning;

iv) Total loss or multiple navigation equipment failure; and

v) Loss of integrity e.g. RAIM function where integrity was predicted to be available during the pre-flight planning.

In all cases, the Pilot-in-Command or Operator shall ensure an Occurrence Report is submitted to the IOMAR.

3.8.7.2 Aircraft Modifications

If an aircraft system required for RNP AR operations is modified e.g. software or hardware change, the operator is responsible for validation of RNP AR procedures with the navigation database and the modified system. This can be accomplished without any direct evaluation if the manufacturer verifies that the modification has no effect on the navigation database or path computation. If no such assurance from the manufacturer is available, the operator shall conduct initial database validation with the modified system.

3.8.8 RNP AR APCH Flight Crew Training Syllabus

3.8.8.1 RNP AR Ground Training

Ground training segments shall address the following subjects as training modules in approved RNP AR academic training during the initial introduction of a crew member to RNP AR systems and operations. For recurrent programmes, the curriculum need only review initial curriculum requirements and address new, revised, or emphasised items.

3.8.8.1.1 General Concepts

RNP AR ground training shall cover RNP AR systems theory to the extent appropriate to ensure proper operational use. Flight crews shall understand basic concepts of RNP AR systems operation, classifications, and limitations. The training shall include general knowledge and operational application of RNP AR instrument approach procedures. This training module shall address the following specific elements:

a) Definitions of RNAV, RNAV (GPS)/RNAV (GNSS), RNP, RNP AR, RAIM, and containment areas;

b) The differences between RNAV and RNP;

c) The types of RNP AR procedures and familiarity with the charting of these procedures;

d) The programming and display of RNP and aircraft specific displays e.g. Actual Navigation Performance;

e) How to enable and disable the navigation updating modes related to RNP;

f) RNP values appropriate for different phases of flight and RNP AR instrument procedures and how to select (if required);

g) The use of GPS RAIM (or equivalent) forecasts and the effects of RAIM "holes" on RNP AR procedures (flight crew and dispatchers);

h) When and how to terminate RNP navigation and transfer to traditional navigation due to loss of RNP and/or required equipment;

i) How to determine if the FMC database is current and contains required navigational data;

j) Explanation of the different components that contribute to the total system error and their characteristics e.g. effect of temperature on Baro-VNAV, drift characteristics when using IRU with no radio updating, considerations in making suitable temperature corrections for altimeter systems;

k) Temperature Compensation. Flight crews operating avionics systems with compensation for altimetry errors introduced by deviations from ISA can disregard the temperature limits on RNP AR procedures, if pilot training on use of the temperature compensation function is provided by the operator and the compensation function is utilised by the crew. However the training shall also recognise the temperature compensation by the system is applicable to the VNAV guidance and is not a substitute for the flight crew compensating for the cold temperature effects on minimum altitudes or the decision altitude;

l) The effect of wind on aircraft performance during RNP AR procedures and the need to positively remain within RNP containment area, including any operational wind limitation and aircraft configuration essential to safely complete an RNP AR procedure;

m) The effect of groundspeed on compliance with RNP AR procedures and bank angle restrictions that can impact the ability to remain on the course centreline. For RNP procedures aircraft are expected to maintain the standard speeds associated with the applicable category;

n) Relationship between RNP and the appropriate approach minima line on an approved published RNP AR procedure and any operational limitations if the available RNP degrades or is not available prior to an approach (this shall include flight crew procedures outside the FAF versus inside the FAF);

o) Understanding alerts that can occur from the loading and use of improper RNP values for a desired segment of an RNP AR procedure;

p) Understanding the performance requirement to couple the autopilot/flight director to the navigation system's lateral guidance on RNP AR procedures requiring an RNP of less than RNP 0.3;

q) The events that trigger a missed approach when using the aircraft's RNP capability to complete an RNP AR procedure;

r) Any bank angle restrictions or limitations on RNP AR procedure; and

s) Ensuring flight crews understand the performance issues associated with reversion to radio updating, know any limitations on the use of DME and VOR updating.

3.8.8.1.2 ATC Communication and Coordination

Ground training shall instruct the flight crews on proper flight plan classifications and any Air Traffic Control (ATC) procedures applicable to RNP AR operations. The flight crews shall receive instruction on the need to advise ATC immediately when the performance of the aircraft's navigation system is no longer suitable to support continuation of an RNP AR procedure. Flight crews shall also know what navigation sensors form the basis for their RNP AR compliance, and they shall be able to assess the impact of failure of any avionics or a known loss of ground systems on the remainder of the flight plan.

3.8.8.1.3 RNP AR Equipment Components, Controls, Displays, and Alerts

Ground training shall include discussion of RNP terminology, symbology, operation, optional controls, and display features including any items unique to an operator's implementation or systems. The training shall address applicable failure alerts and limitations. The flight crews and dispatchers shall achieve a thorough understanding of the equipment used in RNP operations and any limitations on the use of the equipment during those operations.

3.8.8.1.4 AFM Information and Operating Procedures

The AFM or other operations manual shall address normal and abnormal flight crew operating procedures, responses to failure alerts, and any limitations, including related information on RNP modes of operation. Training shall also address contingency procedures for loss or degradation of RNP capability. The operations manuals approved for use by the flight crews e.g. Flight Crew Operations Manual (FCOM) or Pilot Operating Handbook (POH)) shall contain this information.

3.8.8.1.5 MEL Operating Provisions

Flight crews shall have a thorough understanding of the MEL requirements supporting RNP AR operations.

3.8.8.2 RNP AR Simulator Training

In addition to the ground training, the flight crews shall receive appropriate operational use training and experience of the actual RNP AR approaches being applied for. Training programmes shall cover the proper execution of RNP AR procedures in consultation with the OEM's documentation.

The operational training shall include:

a) RNP AR procedures and limitations;

b) Standardisation of the setup of the cockpit's electronic displays during an RNP AR procedure;

c) Recognition of the aural advisories, alerts and other annunciations that can impact compliance with an RNP AR procedure;

d) Timely and correct responses to loss of RNP AR capability in a variety of scenarios embracing the breadth of the RNP AR procedures the operator plans to complete; and

e) Experience the RNP AR approaches requested. This can be achieve by either:

f) Using a flight training simulator with an accurate model, a minimum of:

   1) 1 approach in VMC, followed by

   2) 2 in IMC with a go-around at some stage in the approach.

   Note: If no accurate model exists for the approach and aircraft type, please contact the IOMAR, or if the operator has CBT training which contains accurate approach details, obstacles, charting and procedures then this shall be completed prior to operating at least 1 approach as a crew at the airport in VMC before operating in IMC. Such training can also use approved flight training devices or simulators, and shall address the following specific elements:

g) Procedures for verifying that each pilot's altimeter has the current setting before beginning the final approach of an RNP AR procedure, including any operational limitations associated with the source(s) for the altimeter setting and the requirement for checking and setting the altimeters for landing;

h) Use of aircraft RADAR, TAWS, GPWS, or other avionics systems to support the flight crew's track monitoring and weather and obstacle avoidance;

i) Concise and complete flight crew briefings for all RNP AR procedures and the important role Cockpit Resource Management (CRM) plays in successfully completing an RNP AR procedure;

j) The importance of aircraft configuration to ensure the aircraft maintains any required speeds during RNP AR procedures;

k) The potentially detrimental effect of reducing the flap setting, reducing the bank angle or increasing airspeeds can have on the ability to comply with an RNP AR procedure;

l) Develop flight crew knowledge and skills necessary to properly conduct RNP AR operations (RNP AR Procedure Training);

m) Ensure flight crews understand and are capable of programming and operating the FMC, autopilot, autothrottles, RADAR, GPS, INS, EFIS(including the moving map), and TAWS in support of RNP AR procedures;

n) Handling of TOGA while in a turn;

o) Monitoring of FTE and related go-around operation;

p) Handling of loss of GPS during a procedure; and

q) Flight crew contingency procedures for a loss of RNP capability during a missed approach. Due to the lack of navigation guidance, the training shall emphasise the flight crew contingency actions that achieve separation from terrain and obstacles. The operator shall tailor these contingency procedures to their specific, approved RNP AR procedures.

3.8.8.3 RNP AR Recurrent Training

The operator shall incorporate recurrent RNP training that employs the unique AR characteristics of the operator's approved procedures as part of the overall programme.

A minimum of two RNP AR procedures shall be flown by each pilot for each duty position (pilot flying and pilot monitoring), with one culminating in a landing and one culminating in a missed approach, and may be substituted for any required "precision like" approach.

One of the above approaches will include either an interrupted approach resulting in vectors to resume the approach or a hold at an IAF or transition fix.

3.8.9 RNP AR APCH Flight Operations Safety Assessment (FOSA)

When RNP AR APCH is being implemented it is for a specific reason, e.g. improved access, safety, efficiency.

Traditionally, operational safety has been defined by a target level of safety (TLS) and specified as a risk of collision of 10^{-7} per approach operation. For RNP AR APCH operations, conducting the FOSA methodology contributes to achieving the TLS.

The FOSA is intended to provide a level of flight safety that is equivalent to the traditional TLS, but using methodology oriented to performance-based flight operations. Using the FOSA, the operational safety objective is met by considering more than the aircraft navigation system alone. The FOSA blends quantitative and qualitative analyses and assessments by considering navigation systems, aircraft performance, operating procedures, human factor aspects and the operational environment.

During these assessments conducted under normal and failure conditions, hazards, risks and the associated mitigations are identified. The FOSA relies on the detailed criteria for the aircraft capabilities and instrument procedure design to address the majority of general technical, procedure and process factors. Additionally, technical and operational expertise and prior operator experience with RNP AR APCH operations are essential elements to be considered in the conduct and conclusion of the FOSA.

3.8.9.1 What should be included in the FOSA?

The following aspects need to be considered during FOSA, in order to identify hazards, risks and mitigations relevant to RNP AR APCH operations:

1) Normal Performance: lateral and vertical accuracy are addressed in the aircraft airworthiness standards, aircraft and systems operate normally in standard configurations and operating modes, and individual error components are monitored/truncated through system design or flight crew procedure.

2) Performance Under Failure Conditions: lateral and vertical accuracy are evaluated for aircraft failures as part of the aircraft certification. Additionally, other rare-normal and abnormal failures and conditions for ATC operations, flight crew procedures, infrastructure and operating environment are assessed. Where the failure or condition results are not acceptable for continued operation, mitigations are developed or limitations established for the aircraft, flight crew and/or operation.

3) Aircraft Failures

   a) System failure: Failure of a navigation system, flight guidance system, flight instrument system for the approach, or missed approach (e.g. loss of GNSS updating, receiver failure, autopilot disconnect, FMS failure, etc.). Depending on the aircraft, this may be addressed through aircraft design or operating procedure to cross-check guidance (e.g. dual equipage for lateral errors, use of terrain awareness and warning system).

   b) Malfunction of air data system or altimetry: flight crew procedure cross-check between two independent systems may mitigate this risk.

4) Aircraft Performance

   a) Inadequate performance to conduct the approach operation: the aircraft capabilities and operating procedures ensure that the performance is adequate on each approach, as part of flight planning and in order to begin or continue the approach. Consideration should be given to aircraft configuration during approach and any configuration changes associated with a missed approach operation (e.g. engine failure, flap retraction, re-engagement of autopilot in LNAV mode).

   b) Loss of engine: loss of an engine while on an RNP AR APCH operation is a rare occurrence due to high engine reliability and the short exposure time. The operator needs to take appropriate action to mitigate the effects of loss of engine, initiating a go-around and manually taking control of the aircraft if necessary.

5) Navigation Services

   a) Use of a navigation aid outside of designated coverage or in test mode: aircraft airworthiness standards and operating procedures have been developed to address this risk.

   b) Navigation database errors: instrument approach procedures are validated through flight validation specific to the operator and aircraft, and the operator should have a process defined to maintain validated data through updates to the navigation database.

6) ATC Operations

   a) Procedure assigned to non-approved aircraft: flight crew are responsible for rejecting the clearance.

   b) ATC provides 'direct to' clearance to or vectors aircraft onto approach such that performance cannot be achieved.

   c) Inconsistent ATC phraseology between controller and flight crew.

7) Flight Crew Operations

   a) Erroneous barometric altimeter setting: flight crew entry and cross-check procedures may mitigate this risk.

   b) Incorrect procedure selection or loading: flight crew procedures should be available to verify that the loaded procedure matches the published procedure, line of minima and aircraft airworthiness qualification.

   c) Incorrect flight control mode selected: training on importance of flight control mode, flight crew procedure to verify selection of correct flight control mode.

   d) Incorrect RNP entry: flight crew procedure to verify RNP loaded in system matches the published value.

   e) Missed approach: balked landing or rejected landing at or below DA/H.

   f) Poor meteorological conditions: loss or significant reduction of visual reference that may result in a go-around.

8) Infrastructure

   a) GNSS satellite failure: this condition is evaluated during aircraft qualification to ensure obstacle clearance can be maintained, considering the low likelihood of this failure occurring.

   b) Loss of GNSS signals: relevant independent equipage, e.g. IRS/INS, is mandated for RNP AR APCH procedures with RF legs and approaches where the accuracy for the missed approach is less than 1 NM. For other approaches, operating procedures are used to approximate the published track and climb above obstacles.

   c) Testing of ground navigation aids in the vicinity of the approach: aircraft and operating procedures should detect and mitigate this event.

9) Operating Conditions

   a) Tailwind conditions: excessive speed on RF legs may result in inability to maintain track. This is addressed through aircraft airworthiness standards on the limits of command guidance, inclusion of 5 degrees of bank manoeuvrability margin, consideration of speed effect and flight crew procedure to maintain speeds below the maximum authorised for the RNP AR APCH procedure.

   b) Wind conditions and effect on FTE: nominal FTE is evaluated under a variety of wind conditions, and flight crew procedures to monitor and limit deviations to ensure safe operation.

   c) Extreme temperature effects of barometric altitude (e.g. extreme cold temperatures, known local atmospheric or weather phenomena, high winds, severe turbulence, etc.): the effect of this error on the vertical path is mitigated through the procedure design and flight crew procedures, with an allowance for aircraft that compensate for this effect to conduct procedures regardless of the published temperature limit. The effect of this error on minimum segment altitudes and the DA/H are addressed in an equivalent manner to all other approach operations.

3.8.9.2 When Should a FOSA be Completed?

A FOSA must be completed for each new RNP AR APCH procedure.

The FOSA must be reviewed and updated as required each time the approach designator changes.

The Company Operations Manual must include details of when a FOSA must be completed, and include the methodology for conducting a FOSA in accordance with the SMS.

Copies of all FOSAs may be requested at any point.

3.8.10 RNP AR APCH Application Process

The successful RNP AR application is one that addresses each requirement shown in Section 3.8 of this Registry Publication. Operators need to evidence that their aircraft meets the performance requirements and that they have adjusted their operating procedures and training programmes to take into account each of the procedural and training requirements as applicable. Operators are not required to submit entire flight crew operating and training manuals but rather shall provide copies of those portions of the manuals that have been amended to reflect the specific RNP AR APCH requirements;

3.8.10.1 Application Form

Operators seeking operational approval to conduct RNP AR APCH procedures shall provide their request for RNP AR APCH approval and the following information using Form 19.

Once approval has been granted by the IOMAR, the RNP AR APCH Approval will be added to the aircraft Operations Specification (Ops Spec) Certificate with any relevant operational limitation specified.

3.8.10.2 Supporting Document for RNP AR APCH Applications

To support the application, the operator shall supply the following supporting documentation: -

a) AFM (or AFM Supplement) evidencing RNP AR APCH Certification.

   The Operator shall provide documentation from the aircraft manufacturer showing the proposed aircraft equipment meets the airworthiness requirements for RNP AR APCH. This documentation shall contain any specific hardware or software equipment requirements, procedural requirements, or limitations;

   Alternatively, if a statement of compliance with any of the following specifications or standards is found in any of the document listed in 3.0.1.1 Acceptable Documentation for Demonstration of Compliance, the aircraft is eligible for RNP AR APCH operations:-

   vi) SAAAR; or

   vii) AMC 20-26.

b) Flight Operations Safety Assessment (FOSA)

   The Operator shall submit: -

   i) the requirements for when a FOSA is to be conducted;

   ii) the methodology for conducting a FOSA; and

   iii) completed FOSAs for the approach procedures intended to be conducted upon receipt of the initial approval;

c) Standard Operating Procedures

   The operator shall submit those portions of the Aircraft Flight Manual and required supplements which specifically relate to RNP AR performance along with any relevant operations manual entries;

d) Flight Crew Training Syllabus

   The operator shall provide the RNP AR APCH training syllabus which meets the requirements published in Part 2 Chapter 3.8.8;

e) Flight Crew Training Evidence

The Operator shall provide evidence to demonstrate a minimum of 2 validated pilot have completed RNP AR APCH training in the preceding 11 months;

f) Navigation Database (NavDB) Validation Programme

The operators shall submit the NavDB Validation Programme which describes the processes and procedures established to meet the requirements pertaining to aircraft navigation databases;

g) RNP AR Monitoring Programme

The operator shall evidence a RNP AR Monitoring Programme has been established to collect and analyse data on RNP AR operations to identify potential safety concerns; and

h) Minimum Equipment List

The operator shall update the MEL to account for RNP AR APCH minimum equipment requirements, and submit the MEL for approval in accordance with Part 2 Chapter 5.2.3.3.8.11 RNP AR APCH Renewal Process

To renew a RNP AR APCH Approval, a Form 4a must be completed by the Operator contact(s) or the FOR as recorded in the ARDIS Aircraft Record.

The supporting documentation required for RNP AR APCH renewal is detailed below.

a) A copy of the SOPs;
b) A copy of the current RNP AR APCH training syllabus;
c) Evidence of continued monitoring & validation of RNP AR procedures in the Navigation Database;
d) Evidence of continued monitoring & analysis of all practice and actual RNP AR approaches conducted since the issue of the current approval;

   Note: copies of the FOSA applicable to each approach designator may be requested.

e) Copies of any incident reports or unsatisfactory RNP AR approaches since the issue of the current approval.

CHAPTER 4: ATS COMMUNICATIONS & SURVEILLANCE APPROVALS

4.0 General

The following type of ATS Communications and Surveillance systems do not require an operational approval from the IOMAR: -

- FANS 1/A;
- ATN B1;
- ADS-B NRA; and
- ADS-B Out

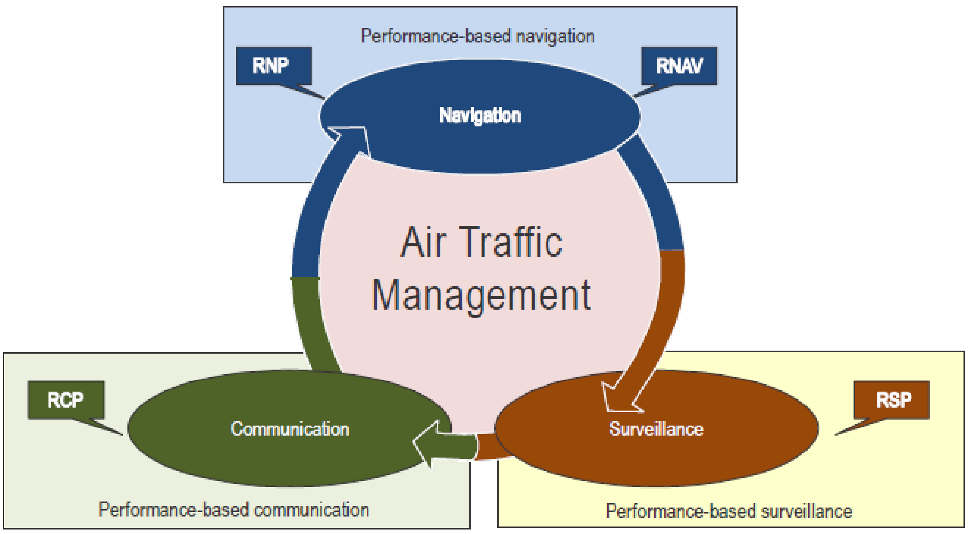
4.1 Performance Based Communication and Surveillance (PBCS)

4.1.0 General

The PBCS concept provides objective operational criteria to evaluate different and emerging communication and surveillance technologies, intended for evolving air traffic management (ATM) operations.

The PBCS concept is aligned with that of performance-based navigation (PBN). While the PBN concept applies required navigation performance (RNP) and area navigation (RNAV) specifications to the navigation element, the PBCS concept applies required communication performance (RCP) and required surveillance performance (RSP) specifications to communication and surveillance elements, respectively. Each RCP/RSP specification includes allocated criteria among the components of the communication and surveillance systems involved.

Where beneficial, RCP, RNP/RNAV and RSP specifications are applied to communication, navigation and surveillance elements to ensure that the operational system and its components perform in accordance with the specifications. The diagram below provides an overview of the performance-based communications, navigation, and surveillance (CNS)/ATM model, which characterizes the relationship of the performance-based specifications among CNS elements supporting an ATM operation.



4.1.1 FANS 1/A+ (PBCS)

FANS 1/A+ (PBCS) is an enhanced version of FANS 1/A (ADS-C and CPDLC) which includes a latency timing monitor.

FANS 1/A+ (PBCS) approval is required in order to demonstrate compliance with Performance Based Communication and Surveillance (PBCS).

Performance-based communication and surveillance (PBCS) is a concept that applies required communication performance (RCP) and required surveillance performance (RSP) specifications to ensure appropriate performance levels for relevant ATM operations (e.g. application of a reduced separation minimum). Information on the performance based communication and surveillance (PBCS) concept and guidance material on its implementation are contained in ICAO Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869).

4.1.1.1 FANS 1/A+ (PBCS) Application Process

To apply for FANS 1/A+ (PBCS), the operator shall complete the appropriate section of Form 4 together with a copy of the AFM Limitations Section or AFM supplement showing a statement of compliance that the aircraft is certificated for FANS 1/A+ (CPDLC with the RCP value and ADS-C with the RSP Value).

The submission must include any relevant supporting documentation to evidence embodiment of the required equipment.

The dedicated PBCS page on the IOMAR website provides additional information including modifications required to correct recent latency timer issues and recommended avionics data link software versions.

4.1.1.2 FANS 1/A+ (PBCS) Operational Criteria

In order to issue an approval for FANS 1/A+ (PBCS), the operator must comply with the following operational criteria.

When signing the declaration on Form 4 & Form 4a, the applicant is confirming that: -

1) normal and abnormal procedures, including contingency procedures are documented that meet the specific operational criteria for airspace where FANS 1/A+ (PBCS) is mandatory and flight crews & other personnel (e.g. aircraft maintenance, flight operations officer/flight dispatcher) are suitably trained and competent to operate the data link communication equipment;

   note: flight crew procedures and training should include normal operations, as well as those associated with alerts provided by the aircraft system to indicate failures when the aircraft is no longer capable of meeting the RCP/RSP specification prescribed for the associated ATM operations;

2) contracted services, such as those with communication service providers (CSPs), are bound by contractual arrangements stipulating the RCP/RSP allocations, including any monitoring or recording requirements;

3) contractual arrangements include a provision for the CSP to notify the appropriate ATS units for the route system of the aircraft operator in case failure conditions impact PBCS operations;

   note: An "alternate means of compliance" is for operators to sign up to the PBCS Global Charter using http://www.fans-cra.com/ where stakeholders can obtain proof of respective CSP signature, as required by approval process.

4) the aircraft system will be properly maintained, including configuring user-modifiable software, such as those used to manage communication media and routing policies, to meet the appropriate RCP/RSP specification(s); and

5) procedures have been established for the reporting of problems, identified either by the flight crew or other personnel, to the IOMAR.

4.1.2 Reserved

Reserved for future PBCS Standards.

CHAPTER 5: MISCELLANEOUS OPERATIONAL APPROVALS

5.1 Master Minimum Equipment List Permission

Large and Turbojet Aircraft joining the IOMAR are legally required to have an MEL approved by the IOMAR in accordance with Article 99M (refer to Part 2 Chapter 5.2.0.1.2).

The IOMAR will consider an application from an aircraft operator to use the Master Minimum Equipment List (MMEL) for a limited period until the MEL is approved by the IOMAR.

The IOMAR's standard service level agreement to review and approve an MEL is 20 working days; therefore please ensure that the correctly prepared MEL is submitted to the IOMAR with sufficient time for the review and approval process to be completed. When preparing your MEL, please use the latest version of the MMEL referred to on the 90 day MMEL Permission Certificate.

Aircraft **recorded by the Registry** as 'Transitional' do not require a MMEL Permission (please refer to the Transitional Aircraft exemption on the IOM CAA website for further details). Please contact the Registry for further details.

5.1.1 Application Process

Operators wishing to apply for a MMEL Permission need to submit to the IOMAR the following documents: -

- Completed Form 15 Master Minimum Equipment List (MMEL) Permission Application; and
- Electronic copy of the front page of the MMEL.

The IOMAR will only grant a Permission for the use of an MMEL approved by the national aviation authority which approved the Type Certificate of the aircraft.

Conditions for the use of the Permission will be published on the certificate.

5.2 Minimum Equipment List

5.2.0 General

Most aircraft are designed and certified with a significant amount of equipment redundancy, such that the airworthiness requirements are satisfied by a substantial margin.

A **Master Minimum Equipment List (MMEL)** is developed by the aircraft manufacturer and is usually prepared and approved as part of the Type Certification process. The MMEL includes those items related to airworthiness, air operations, airspace etc. which can be inoperative and yet maintain an acceptable level of safety by appropriate conditions and limitations; it does not contain obviously required items such as wings, flaps, and rudders. In order to maintain an acceptable level of safety, the MMEL establishes limitations on the duration of and conditions for operation with inoperative items.

A **Minimum Equipment List (MEL)** is developed by the operator based upon the MMEL taking into consideration their particular aircraft equipment configuration and their type and area of operation.

5.2.0.1 Legal Requirements – Air Navigation (Isle of Man) Order 2015

The IOMAR will approve an MEL under the following legal basis.

5.2.0.1.1 Article 35

In accordance with Article 35, an M- Registered aircraft cannot commence a flight if any of the equipment required by, or under the Order is not carried or is not in a fit condition for use, unless a Permission to do so has been issued by the IOMAR. The IOMAR carries out its obligations under the terms of this Article by authorising the use of MELs. Any such permission will in no circumstances permit operations outside the constraints of the MMEL. In the context of this document, the term 'MMEL' shall be interpreted to mean MMEL or MMEL Supplement.

By approving an MEL the IOMAR is providing the required permission.

5.2.0.1.2 Article 99M

Article 99M requires the operator of a Large and Turbojet aircraft (refer to Part 1 Chapter 13.9) of a type that has a MMEL established to prepare and ensure that a MEL for the aircraft is approved by the IOMAR and include the details of the MEL procedures in the company operations manual.

As such an approved MEL is required for all Large and Turbojet aircraft which have been issued with a Certificate or Registration.

5.2.0.2 MEL Concept

The MEL is a joint operational and maintenance document prepared by an aircraft operator to:

a) Identify the minimum equipment and conditions for an aircraft to maintain the validity of the Certificate of Airworthiness in force and to meet the operating rules for the intended flight;

b) Define operational and maintenance procedures necessary to maintain an acceptable level of safety and to deal with inoperative equipment.

What does inoperative mean?

An item is deemed to be "inoperative", when it does not satisfactorily fulfil its intended function, regardless of the reason.

An item is deemed to be inoperative, when:

- It does not work at all, or
- It does not perform one or more of the functions for which it was designed, or
- It does not consistently work within its designed operating limits or tolerances, or
- It is requested to be considered inoperative by the dispatch conditions, or
- It is not available due to a primary failure.

Therefore an ELT is still "operative" when it can transmit, regardless of whether it has been coded to the state of registry, which is why an incorrectly coded ELT cannot be deferred in accordance with an MMEL/MEL if it has not been coded to the new State of Registry.

In essence, the MEL is a document that attributes each item a "**GO**", "**GO IF**" or "**NO GO**" status.

	"**GO**" items can remain inoperative for a limited period of time.
	"**GO IF**" items can remain inoperative for a limited period of time, but are subject to conditions of either (or both) and Operational Procedure, or Maintenance Procedure.
	"**NO GO**" items prevent the dispatch of the aircraft.

5.2.0.3 Operations outside the Scope of the MEL

The IOMAR can permit an operator from compliance with the appropriate MEL on an individual case by case basis, provided such permission complies with applicable limitations in the MMEL and AFM.

5.2.0.4 Non-Standard Operations

Aircraft are often flown for purposes other than those associated with their most common use. Such non-standard uses can well allow less stringent minimum equipment requirements. Examples of non-standard use can be:

a) Maintenance Check Flights;

b) Training Flights; or

c) Positioning Flights – carrying neither passengers nor freight, to return the aircraft to a place for maintenance.

Any reference to a reduction in minimum equipment requirements in an MEL shall be clearly labelled as such, together with the type of non-standard flight applicable.

Note: Such non-standard flights can only be undertaken if the aircraft Flight Manual contains the appropriate procedures and are agreed to by the IOMAR.

5.2.0.5 Dispatch with Inoperative Equipment

The MMEL and associated MEL are alleviating documents. Their purpose is not, however, to encourage the operation of aircraft with inoperative equipment. It is undesirable for aircraft to be dispatched with inoperative equipment and such operations are permitted only as a result of careful analysis of each item to ensure that the acceptable level of safety is maintained. A fundamental consideration is that the continued safe operation of an aircraft in this condition shall be minimised. Refer to Part 2 Chapter 5.2.2.3 for the limitations governing rectification intervals.

The pilot in command retains the option to decline the use of MEL alleviations, and can elect not to operate the aircraft with any particular MEL item inoperative.

5.2.1 MEL Application Process

Form 8 shall be used to request approval for an operators MEL, together with all the required documentation as stipulated on the application form.

The MEL shall be prepared in accordance with the standards set by the IOMAR, refer to Part 2 Chapter 5.2.2.

The MEL shall be based on the MMEL which is approved by the aviation authority that approved the Type Certificate of the aircraft, contact the IOMAR if unable to meet this requirement.

Once approval has been granted by the IOMAR, the MEL approval will be added to the aircraft Operations Specification (Ops Spec) Certificate, including the revision number.

An MEL can take up to a maximum of 20 working days to review.

5.2.1.1 Aircraft Affected By Other Civil Aviation Legislation (e.g. Part-NCC)

Operators who are affected by other civil aviation legislation e.g. Part-NCC, shall ensure that their MEL primarily complies with the standards set by the IOMAR as the State of Registry in for the IOMAR to issue an approval.

5.2.1.1.1 Operators of Aircraft Declared to the UK

Operator of aircraft declared to the UK must ensure that the MEL is based on the MMEL approved by the aviation authority which approved the Type Certificate of the aircraft (State of TCDS Compliance) and UK CS-MMEL. The IOM MMEL Supplement mirrors the UK CS-MMEL, therefore in practice this is achieved by ensuring the MEL is based on the MMEL State of TCDS Compliance and the IOM MMEL Supplement.

5.2.1.1.2 Operators of Aircraft Declared to an EU Member State

Operators of non-EASA type certificate aircraft who are affected by EASA Part-NCC are required under the EASA Air Operations Rules to ensure their MEL is no less restrictive than the EASA OSD MMEL.

In order to comply with both the State of Registry and state of operator requirements, the IOMAR will accept an MEL which is based on the MMEL approved by the aviation authority which approved the Type Certificate of the aircraft and is no less restrictive than the EASA OSD MMEL. Appendix 4.1 Preamble shall be used in these circumstances.

A flow diagram has been produced to assist operators of non-EASA TCDS aircraft affected by EASA Part-NCC, refer to Appendix 4.2.

5.2.2 MEL Preparation & IOMAR Standards

5.2.2.0 MEL General Principles

When preparing the MEL, the operator shall ensure that the correct MMEL is used as the source document.

The MEL shall be no less restrictive than the MMEL on which it is based.

The Flight Operations Representative (FOR) is considered by the IOMAR to be responsible for the MEL.

FORs shall take operational and maintenance procedures referenced in the MMEL into account when preparing an MEL. The procedures themselves, or symbols to indicate them, are required in the operator's MEL. (See Part 2 Chapter 5.2.2.2.2 (d) for acceptable means of compliance).

Where the MEL is prepared by a contractor, the FOR shall ensure that the MEL is tailored to the specific aircraft and their operation.

The MEL shall correctly reflect the modification status of the individual aircraft – please note fleet MELs are not permitted by the IOMAR.

Unless specifically permitted or accepted by the IOMAR, an inoperative item cannot be removed from the aircraft.

a) Operational procedures shall be accomplished in planning for and/or operating with the listed item inoperative. Normally these procedures are accomplished by the flight crew; however, other personnel can be qualified and authorised to perform certain functions. The satisfactory accomplishment of all procedures, regardless of who performs them, is the responsibility of the operator.

b) Maintenance procedures shall be accomplished prior to operating with the listed item inoperative. Normally these procedures are accomplished by maintenance personnel; however, other personnel can be qualified and authorised to perform certain functions. The satisfactory accomplishment of all maintenance procedures, regardless of who performs them, is the responsibility of the operator.

5.2.2.1 MEL Structure

The MEL Manual sequence shall follow the ATA 2200 classification:

a) List of Effective Pages;

b) Amendment record page.

c) Table of Contents;

d) Preamble, Notes and Definitions (refer to Part 2 Chapter 5.2.5 Appendix 1 or Appendix 5; and

e) List of minimum equipment required for PBN Airspace and/or AWOPS approvals held or where it can be found, i.e. Aircraft Flight Manual.

5.2.2.1.1 MEL Front Page

The front page of the MEL shall identify the aircraft (serial number and/or registration) and operator.

5.2.2.1.2 MEL Manual Administration

The MEL shall include: -

a) List of Effective Pages

A List of Effective Pages shall be used which lists the date of the last amendment for each page of the MEL. The date and revision status of each page of the MEL shall correspond to that shown on the List of Effective Pages. *Exception:* Where the entire MEL is re-issued at each amendment AND it is produced in digital format *only*, a List of Effective Pages is not required.

b) Amendment Record Page

The MEL shall include an amendment record page to reflect the changes implemented in the MEL.

c) Table of Contents

The Table of Contents page shall list the section for each aircraft system using the ATA 2200 listing as found in the MMEL.

d) Amendment Procedure

The MEL must include details of the Amendment requirements and process (refer Part 2 Chapter 5.2.3.)

5.2.2.1.3 Preamble

A preamble acceptable to the IOMAR is provided in Part 2 Chapter 5.2.5 Appendix 1.

FORs are strongly encouraged to use this preamble to ensure compliance with IOMAR standards.

Note: aircraft affected by EASA Part-NCC shall use the preamble in Part 2 Chapter Appendix 5.2 when the State of TCDS compliance is a state other than EASA (see Part 2 Chapter 5.2.1.1).

The preamble must include: -

- An Introduction which includes details of the MMEL which the MEL is based upon, including the revision status;
- MEL Administration (refer Part 2 Chapter 5.2.2.1.2);
- Contents of the MEL (refer to Part 2 Chapter 5.2.2.1);
- Criteria for Dispatch (refer to Part 2 Chapter 5.2.2.8);
- Maintenance Action (refer to Part 2 Chapter 5.2.2.6.2.2);
- Rectification Intervals (refer to Part 2 Chapter 5.2.2.3);
- Definitions (refer to Part 2 Chapter 5.2.2.1.4);
- Centralised Message Systems (if applicable);
- Operations outside of the Scope of the MEL (refer to Part 2 Chapter 5.2.0.3); and
- Minimum Equipment Required for Operational Approvals (refer to Part 2 Chapter 5.2.2.1.5).

5.2.2.1.4 Definitions

Definitions are required to allow the user to interpret the MEL properly.

Minimum definitions applicable to IOM registered aircraft are included in Part 2 Chapter 5.2.54 Appendix 3).

The FOR shall ensure that the definitions in the applicable MMEL and transcribe relevant definitions into the MEL.

5.2.2.1.5 List of Equipment Required for Specific Approvals

The MEL shall identify the equipment, where applicable, that is required for specific approval(s) held, e.g. PBN, RVSM, NAT HLA, & AWOPS etc. or alternatively identify where it can be found. i.e. Aircraft Flight Manual.

5.2.2.2 MEL Customisation

The MEL shall be fully customised to an individual aircraft specifications and also clearly identify the operator.

Whilst the MMEL is for an aircraft type, the MEL shall be tailored to the individual aircraft. This can be achieved by removing the items listed in the MMEL which not are applicable to the aircraft, or, annotating those items with 'N/A to M-XXXX' or similar statement(s).

The number of each item of equipment must be specified in the 'Number Installed' column. Where this number is variable, a '-' must be used.

The number required for dispatch must be specified in the "Number Required For Dispatch" column. Where this number is variable, the remarks and exceptions must make it clear to the crew members the operational dispatch requirements in order for the PIC to legally dispatch the aircraft.

Any "Notes" contained within MMEL 'Remarks or Exceptions' provide additional information for flight crew or maintenance consideration. Notes are used to identify applicable material which is intended to assist with compliance, but do not relieve the operator of the responsibility for compliance with all applicable requirements. "Notes" are not a part of the dispatch conditions.

Operational Requirements shall be determined by the Operator when preparing the MEL, taking into account the route structure, geographical location and availability of maintenance support. The MMEL cannot address these individual variables.

5.2.2.2.1 Customisation to Isle of Man National Requirements

The MMEL will be based on the national requirement for that particular State. The national requirement will be identified by terms such as "National Regulations", "14 CFR", "Any in excess of those required…" etc.

The national regulations must be replaced with the applicable IOM National Requirement.

To assist in meeting the Isle of Man National Requirements, FORs and MEL authors should refer to Appendix 3 IOM MMEL Supplement.

5.2.2.2.2 Operational and Maintenance Procedures

a) Dispatch with inoperative items is often acceptable only with the creation of special operational or maintenance procedures. Where the MMEL indicates that this is the case, the aircraft operator shall establish appropriate procedures.

b) Procedures recommended by the Type Certificate Holder in most cases can be adopted for this purpose, but the ultimate responsibility for providing acceptable procedures with the MEL rests with the aircraft operator. These procedures will ensure that an acceptable level of safety will be maintained. The Type Certificate Holder produces operational and maintenance procedures such as Dispatch Deviation Guides, for use by aircraft operators.

These procedures can be inserted into the appropriate MEL pages, and submitted by the aircraft operator to form part of the MEL. Dispatch Deviation Guides, and other similar documents are not approved by the IOMAR, nor can they replace the MEL. If the Type Certificate Holder has not published operational or maintenance procedures, the aircraft operator shall develop appropriate procedures.

c) Aircraft operators, when comparing their MEL against the MMEL, shall ensure that where the (O) or (M) symbols appear, an operational or maintenance procedure has been developed that provides clear direction to crewmembers and maintenance personnel of the action to be taken. This procedure shall be included in the MEL;

d) Alternatively, when the procedure is already contained in another document that is routinely available; e.g. elsewhere in the Operator's Manuals for "(O)" procedures or the Maintenance Manual for "(M)" procedures, the MEL can refer to a section of the appropriate document;

e) Other than the examples c) and d), it is not acceptable to only make reference to other documents, as these cannot be carried on board the aircraft and could be subject to misinterpretation. The objective is to provide personnel with clear, concise direction on how they are to proceed.

5.2.2.3 Rectification Intervals

The operator shall take account of the Rectification Interval given in the MMEL when preparing an MEL. The Rectification Interval in the MEL shall not be less restrictive than the corresponding Rectification Interval in the MMEL.

The operator is responsible for establishing an effective rectification programme that includes tracking of the inoperative items and co-ordinating parts, personnel, facilities and procedures necessary to ensure timely rectification.

Continued operation of the aircraft is prohibited after expiry of the Rectification Interval specified in the MEL, unless the defect has been rectified or with a Permission granted by the IOMAR Part 2 Chapter 5.2.2.3.3 refers.

Where the applicable MMEL or MMEL Supplement does not contain Rectification Intervals, all such entries included within the MMEL shall be classified with a Rectification Interval category 'C' (relating to 10 calendar days, excluding the day of discovery) in the MEL, except where there is an existing repair limit stated within the proviso for a particular MMEL entry. The stated limit will remain in force but the entry shall be identified as a category 'A' Rectification Interval in the MEL.

Once the applicable MMEL has been revised to include Rectification Intervals, this will supersede the guidance given in the paragraph above, and operators will need to reflect the rectification intervals in their MEL.

5.2.2.3.1 Rectification Interval Categories

The maximum time an aircraft can be operated between the deferral of an inoperative item and its rectification shall be specified in the MEL. Non-safety related equipment such as reading lights and entertainment units need not be listed. However, if they are listed, they shall include a rectification interval category. These items can be given a 'D' Category rectification interval provided any applicable (M) procedure (in the case of electrically supplied items) is applied – refer to Part 2 Chapter 5.2.2.4.

The Rectification Interval Categories are defined as follows:

CATEGORY A – No standard interval is specified. Items in this category shall be rectified in accordance with the conditions stated in the MEL.

- Where the time interval is specified in calendar days or flight days, it shall start at 00:01 on the day following the day of discovery*.

- Where the time period is specified other than in calendar days or flight days, it shall start at the point where the defect is deferred in accordance with the MEL.

CATEGORY B – Items in this category shall be rectified within three (3) consecutive calendar days, excluding the day of discovery*.

CATEGORY C – Items in this category shall be rectified within ten (10) consecutive calendar days, excluding the day of discovery*.

CATEGORY D – Items in this category shall be rectified as soon as is reasonably practical but within one hundred and twenty (120) consecutive calendar days, excluding the day of discovery*.

* - refer to the 'Day of Discovery' definition in Part 2 Chapter 5.2.5 Appendix 2.

5.2.2.3.1.1 Category A – Calendar Days Vs Flight Day

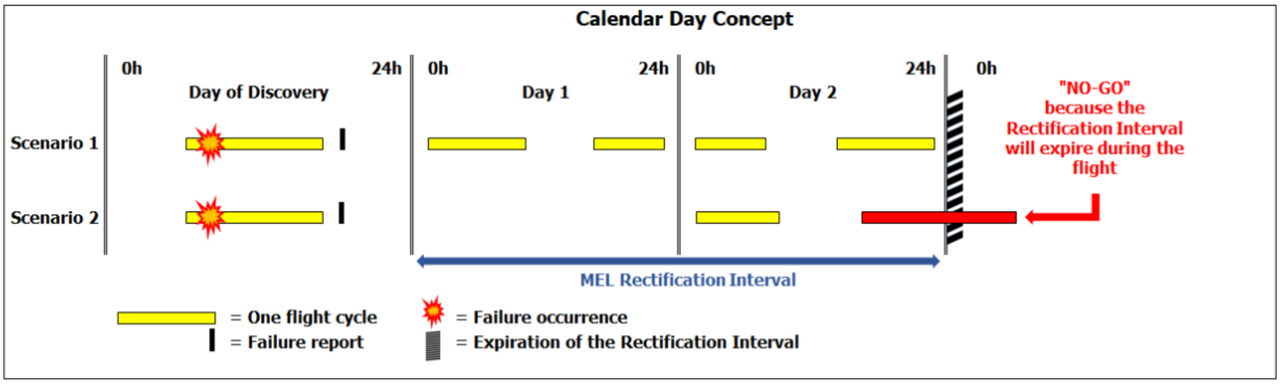
5.2.2.3.1.1.1 Calendar Days

Where the Category A interval is specified in calendar days, it shall start at 00:01 on the day following the day of discovery.

In the diagram below a defect which is limited to 2 Calendar days has occurred.

In scenario 1, the planned flights on Day 2 can be operated.

In scenario 2 however, the last flight on Day 2 cannot be operated as the defect must be cleared by the end of Day 2. Therefore the defect is a NO-GO item for the last sector on Day 2.



5.2.2.3.1.1.2 Flight Days

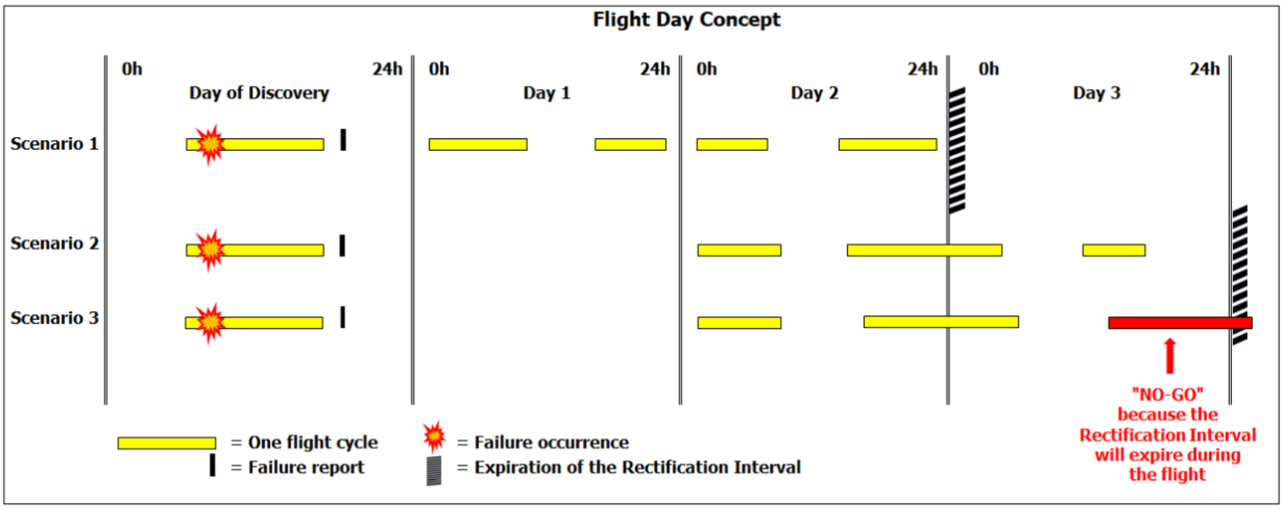
Where the Category A interval is specified in flight days, it shall start at 00:01 on the day following the day of discovery.

In the diagram below, a defect which is limited to 2 Flight days has occurred.

In scenario 1, the aircraft operates for 2 consecutive flight days, and therefore the defect must be cleared by the end of Day 2.

In scenario 2, the aircraft does not operate on Day 1, but does on Days 2 & 3. The defect must be cleared by the end of the 3rd day.

In scenario 3 again the aircraft does not operate on Day 1, but does on Days 2 & 3. However in this scenario the planned flight commencing on Day 3 cannot be operated as the rectification interval would expire during the flight. Therefore the defect is a NO-GO item for the last sector on Day 3.



5.2.2.3.3 Extension to a Rectification Interval without RIE Programme Approval

If a deferred defect cannot be rectified within the rectification period specified in the MEL or an RIE, the NATR should refer to RP9 and complete the applicable application form to obtain a permission to operate with a known defect.

5.2.2.4 Non-Essential Equipment & Furnishing (NEF)

Non-Essential Equipment & Furnishings (NEF) (sometimes referred to as Non-Safety Related Item List) are those items installed on an aircraft as part of the original certification, supplementary type certificate, or engineering order or other form of alteration that have no effect on the safe operation of flight and would not be required by the applicable certification rules or operational rules. They are those items that if inoperative, damaged or missing have no effect on the aircraft's ability to be operated safely under all operational conditions.

NEF items can be installed in areas including, but not limited to, the passenger compartment, flight deck area, service areas, cargo areas, crew rest areas, lavatories and galley areas. Examples can include items such as galley equipment, entertainment system, ashtrays, stereo equipment, and overhead reading lamps.

NEF items are not items already identified in the MMEL or CDL of the applicable aircraft. If an aircraft operator chooses to list this equipment in the MEL, the IOMAR recommends that the rectification interval does not exceed 365 days.

The exceptions to this rule are:

a) Where non-safety related equipment serves a second function, such as entertainment system being used for passenger briefings, aircraft operators shall develop and include operational contingency procedures in the MEL in case of an equipment malfunction.

b) Where non-safety related equipment is part of another aircraft system, for example the electrical system, procedures shall be developed and included in the MEL for deactivating and securing in case of malfunction.

In these cases, the item shall be listed in the MEL, with compensating provisions and deactivation instructions if applicable. The rectification interval will be dependent on the secondary function of the item and the extent of its effect on other systems.

5.2.2.4.1 Operators' NEF Programme

Where an operator chooses to implement a NEF Programme, whilst the programme shall be referenced in the MEL under ATA Chapter 25 NEF (FAA/TC) or Passenger Convenience Items (EASA) to reflect the entry in the MMEL, it shall be clearly separate from the approved MEL and will not be subject to IOMAR review or approval.

Please note an operator's NEF process shall not provide for deferral of items within serviceable limits identified in the Manufacturers Maintenance Manual or the Operator's approved Maintenance Programme such as wear limits, fuel/hydraulic leak rates, oil consumption etc. Cosmetic items that are fully serviceable but worn or soiled can be deferred under an operators NEF process.

The following guidance is provided to operators on the establishment of NEF programmes.

5.2.2.4.2 Inclusion Criteria for an NEF Programme

Operators intending to produce a NEF programme, shall establish an effective decision making process for failures that are not listed to determine if they are related to airworthiness and required for safe operation. In order for inoperative installed equipment to be considered non-safety-related, the following questions shall be asked and criteria considered:

- Is the item required for any operational rules relevant to the operation of the aircraft?
- Is there a potential for fire/smoke or other hazardous conditions?
- Could it impact on other required systems or components?
- Could it have a negative impact on normal, emergency or abnormal procedures?
- Does it create additional workload for the flight crew at critical times of flight or flight preparation?
- Is the operation of the aircraft adversely affected such that standard operating procedures related to ground personnel, and crew members are impeded?
- Is the condition of the aircraft/equipment adversely affected such that the safety of passengers and/or personnel is jeopardised?
- Is the condition of the aircraft configured to minimise the probability of a subsequent failure that can cause injury to passengers/personnel and/or cause damage to the aircraft?
- Does the condition include the use of required emergency equipment and impact emergency procedures such that personnel could not perform them?

5.2.2.4.3 NEF Programme Elements

The fundamental elements for each NEF Program are:

1) appropriate procedures and processes for identifying items that can be deferred in place?
2) appropriate forms to document inoperative, damaged, missing items and fit for purpose?
3) appropriate procedures for follow-up maintenance, as required fit for purpose?

5.2.2.4.4 NEF Programme Defect Process

NEF items shall be tracked through the use of the aircrafts' (technical) log which shall be reviewed prior to each flight.

The deferred items also shall be tracked using the Aircrafts Cabin Defects Log (if applicable) and Allowable Cabin Defects Page and then entered in the aircraft maintenance tracking system.

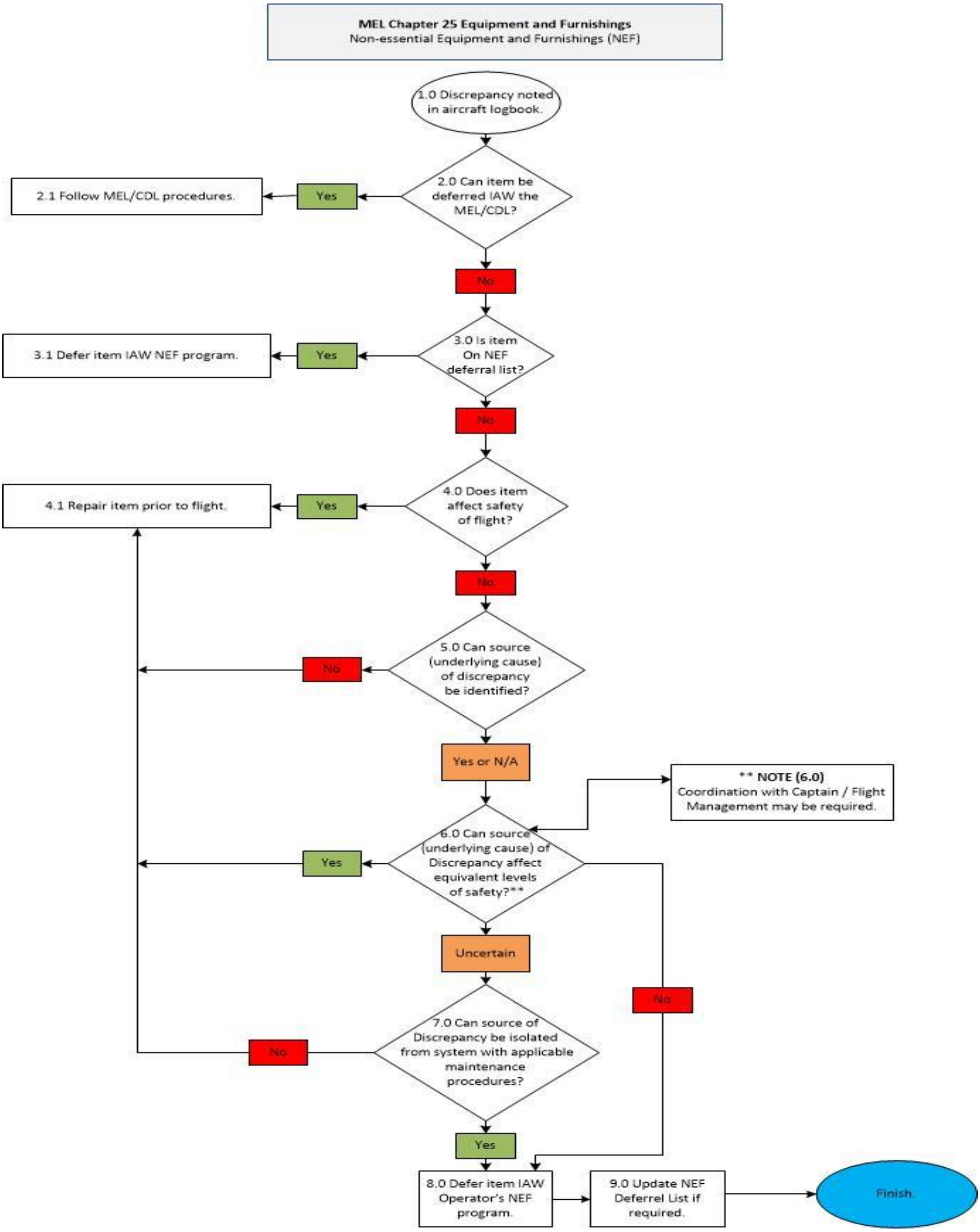
NEF items can have a deferral category similar to MEL items. The deferment period is usually decided upon by the operator, which is normally the equivalent of a 'D' Category, 120 days from the day following the day of discovery, however it is recommended that the maximum deferment period is limited to 365 days.

The NEF list shall include procedures for each NEF item as applicable:

- Maintenance (M) Procedure
- Operational (O) Procedure
- Placarding (P) Procedure

The document containing the procedures shall be identified and available to flight crew, cabin crew (if carried), operational and maintenance personnel.

5.2.2.4.5 NEF Decision Tree



5.2.2.4.6 NEF Decision Tree Detailed Actions

1.0 Discrepancy Noted In Aircraft Logbook

The inoperative, damaged or missing item shall be identified and documented in the aircraft logbook (or other approved location) by:

1) Flight Crew; or

2) Company maintenance personnel; or

3) Personnel authorized and approved to perform such functions as outlined in the maintenance program.

2.0 Can The Item Be Deferred In Accordance With (IAW) The CDL Or The MEL?

If the inoperative, damaged, or missing item is listed in the CDL, or the MEL, then the deferral procedures for that item shall be followed. If the item is a subcomponent of a primary system identified in the MEL/CDL, where no previous relief was authorized, the subcomponent cannot be deferred in accordance with the NEF procedures outlined in chapter 25 of the MEL.

2.1 Follow MEL/CDL Procedures

If the item is identified in another part of the MEL/CDL, then the procedures approved for the deferral of such item shall be followed.

3.0 Is Item On The NEF Deferral List?

Is the item on the NEF list? If yes, then follow the NEF deferral procedures in step 3.1. (Items that are not previously on the NEF list shall proceed to step 4.0.)

3.1 Defer Item IAW The NEF Deferral Programme

If the item is identified in the NEF deferral list, then the procedures approved for the deferral of such item shall be followed.

4.0 Does The Item Affect The Safety Of Flight?

Is it obvious from a maintenance or operational perspective that the item, in and of itself, could have an adverse effect on the safe conduct of flight? If there is an obvious safety-of-flight issue, then the inoperative, damaged, or missing item cannot be deferred and step 4.1 shall be followed.

4.1 Repair Item Prior To Flight

The item cannot be deferred and shall be repaired prior to flight.

5.0 Can Underlying Cause Of The Discrepancy Be Identified? (If Applicable)

Can the source of the discrepancy be identified? This step can or cannot apply to the item under consideration. If the source can be identified, then proceed to step 6.0, otherwise proceed to step 4.1.

6.0 Can Underlying Cause Of Discrepancy Affect Equivalent Levels Of Safety?

1) If the source (underlying cause) of the discrepancy affect equivalent levels of safety, then it shall be determined if it can be isolated from all other systems so as to alleviate any safety concern.

   ** **Note:** In making this determination, very close coordination between the flight crew, cabin crew (if carried), operational and maintenance personnel can be required.

2) If, after review, the source of the discrepancy could be considered a safety-of-flight concern, the item shall be repaired prior to flight (step 4.1). If the source of the discrepancy is not a safety-of-flight concern then defer the item in accordance with the approved NEF procedures in step 8.0. If it cannot be determined, or is uncertain, that the source of the discrepancy is a safety-of-flight concern then proceed to 7.0.

7.0 Can Underlying Cause Of Discrepancy Be Isolated From The System With Applicable Maintenance Procedures?

1) If applicable, the source (underlying cause) of the discrepancy shall be isolated from all other systems so as to alleviate the safety-of-flight concern.

2) If the item cannot be safely isolated then the item shall be repaired prior to flight (step 4.1).

3) If isolated, the isolation of the source shall pass the entire test identified in the evaluative process (steps 4.0-7.0) for the item.

4) If source can be isolated then proceed to step 8.0.

8.0 Defer Item IAW The Operators' NEF Program

1) Defer the item if, after completing the previous 8 steps, the item can be deferred IAW the NEF program.

   Note: Before an item can be deferred as an NEF item, the NEF program evaluation process for determining shall be followed if an item can be considered a NEF. Although NEF items are not safety-of-flight items, they have not been evaluated through the normal AEG review process and therefore require the concurrence of the Flight Crew, Maintenance, and Operational personnel, if applicable. NEF items are not deferred under the authority of an airframe and powerplant certificate but rather the item is deferred under the NEF program.

2) The evaluation process shall determine items such as:

   i) Is the item required for the operational rules in which the aircraft is operated?

   ii) Does it create the potential for fire/smoke or other hazardous conditions?

   iii) Could it have an adverse effect on other required systems or components?

   iv) Does its condition potentially affect the safety of passengers, crew, or service personnel?

   v) Could it have a negative impact on emergency or abnormal procedures?

   vi) Does it create additional workload for the crew at critical times of flight or flight preparation?

   vii) Crewmembers can need to evaluate the deferred NEF on a flight-by-flight basis.

   Note: The above evaluation process shall be accomplished for the inoperative, damaged, or missing items at its face value, and also for the underlying cause of the discrepancy.

9.0 Update NEF Deferral List As Required

The operator should continually update the NEF list as required.

5.2.2.5 Removal of Equipment

In some cases the MMEL includes wording which states that the aircraft can operate with a defective item removed, provided operations do not require its use. HOWEVER, the MMEL, and by extension the MEL ***does not in itself authorise the removal of the equipment*** - but can be used to support a modification change document.

The correct procedures must be followed for any de-modification of equipment i.a.w approved data and appropriate authorisation from the IOMAR.

5.2.2.6 Deferral of Items

Procedures for the deferral and management of MEL items shall be included in the aircraft operators' Technical Log, Journey log or equivalent document. The aircraft operator shall ensure these procedures are referenced in the MEL.

5.2.2.6.1 Requirements

These procedures comprise a method for:

a) Recording deferral, transfer and/or rectification of inoperative equipment;
b) Placarding requirements as per the MEL;
c) Dispatching of an aircraft with deferred MEL item(s);
d) Using a remote deferral system (if applicable);
e) Controlling categorised times; and
f) Training of personnel who are responsible for MEL compliance procedures.

Refer to Part 2 Chapter 5.2.5 Appendix 4 for the use of the MEL/CDL as it applies to the Certificate of Release to Service.

5.2.2.6.2 Operational and Maintenance Items

Any item of equipment in the MEL which, when inoperative, would require an operational or maintenance procedure to ensure an acceptable level of safety shall be so identified in the "remarks or exceptions" column of the MEL. This will normally be "(O)" for an operational procedure, or "(M)" for a maintenance procedure. (O)(M) means both operational and maintenance procedures are required.

(M) Procedures are part of that pre-requirement to reach a compliance status to enter the deferment for operation, (O) Procedures are continuing requirements during Operation to remain compliant.

5.2.2.6.2.1 (O) Operational Procedure

1) Aircraft with inoperative equipment requiring an operational procedure can continue in service following completion of the required MEL procedure for deferral.

2) Operational procedures are normally carried out by the operating crew but can be accomplished by other competent personnel.

5.2.2.6.2.2 (M) Maintenance Procedure

1) Aircraft with inoperative equipment requiring a maintenance procedure can continue in service following completion of the required MEL procedure for deferral.

2) A Maintenance Procedure can be a physical task, or a verification function, or both.

3) Maintenance procedures are normally accomplished by maintenance personnel, but some elementary maintenance tasks can be carried out by personnel authorised by the IOMAR, refer to RP9 Chapter 2.

4) Upon completion of the (M) Procedure a CRS must be issued by an authorised person (see above). Without a CRS being issued by a suitably qualified person (see below for exception), the CofA is no longer in force and therefore any flight would be contravening Article 17 of the ANO – even if a deferment has been recorded in the aircraft records.

5.2.2.6.2.3 (M*) Maintenance Procedure

A CRS is not required where the maintenance procedure in an approved MEL requires: -

i) pulling and collaring circuit breakers;

ii) tests conducted from the flight deck utilising Built-in Test Equipment (BITE); or

iii) installing placards.

In these specific cases, a flight crew member can complete the maintenance procedure in the absence of an authorised person.

The MEL shall clearly identify these specific maintenance procedures by use of (M*) against the specific entries in the MEL.

The Preamble and Definition in the approved MEL shall also reflect the use of (M*) Maintenance Procedures and be included in the Definitions.

5.2.2.6.3 Review of Deferred Items

The operator of an M- Registered aircraft shall ensure that any deferred items are periodically reviewed to ensure that any accumulation of deferred defects neither conflict with each other nor create an unacceptable increase in pilot workload. Notwithstanding the categorisation of item rectification intervals, it shall be the aim of aircraft operators to ensure that inoperative items are repaired as quickly as possible. It is the policy of the IOMAR that optional inoperative equipment shall be rectified or removed i.a.w. an approved de-modification process from an aircraft.

5.2.2.7 Placarding

Inoperative items shall be placarded to inform crewmembers of equipment condition as appropriate. When they are accessible to the crew in flight, the control(s), and/or indicator(s) related to inoperative unit(s) or component(s) shall be clearly placarded.

Though the MEL for some items can require specific wording, the majority of items leave the placard wording and location to be determined by the aircraft operator.

The aircraft operator shall provide the capability and instructions to the pilot in command to ensure that the placard is in place prior to the aircraft being dispatched.

Note Some MMEL's indicate the need for a placard through the use of an asterisk. However, the exclusion of an asterisk in a MMEL does not preclude the requirement for placarding.

5.2.2.7.1 Requirements to Placard/Placard Control

Placarding shall be carried out in accordance with the placarding procedures established and set out in the aircraft operator's Technical Log, Journey log or equivalent document. The method of placarding shall ensure that all inoperative items are placarded and that placards are removed and accounted for when the defect is cleared.

The defective equipment/system is placarded to inform the pilot in command of the inoperative condition(s) of the item. To the extent practicable, placards shall be located as indicated in the MEL, or adjacent to the control or indicator affected.

5.2.2.7.2 Placard Criteria

Where possible placards shall be self-adhesive and contain sufficient information about the defect such that the pilot in command clearly understands the effect of the defect on the aircraft's continued safe operation.

5.2.2.7.3 Multiple Placards

If more than one placard is required for an MEL item, aircraft operators shall ensure that all placards are removed when the defect is cleared.

5.2.2.7.4 Temporary Placards

The pilot in command can install a temporary placard as required by the MEL thereby enabling the aircraft to continue to a location where the defect can be rectified or be re-deferred in accordance with the deferral system.

5.2.2.8 Dispatch

"Dispatch" for the purpose of the MEL/MMEL refers to the commencement of flight, which is defined as "the point when an aircraft begins to move under its own power for the purpose of preparing for take-off." The MEL is approved on the basis that equipment will be operative for flight unless the appropriate MEL procedures have been carried out.

The MEL shall include procedures to deal with any failures which occur between the start of taxi or push back and take-off brake release. Any failure which occurs after the commencement of flight shall be dealt with as an in-flight failure, by reference to the appropriate section of the Aircraft Flight Manual or Operating Manual, as necessary.

5.2.2.9 Training

5.2.2.9.1 Familiarisation Programme — Ground Personnel

Aircraft operators shall ensure that when utilising the services of ground personnel, they are familiarised with the MEL when appropriate including placarding inoperative equipment, deferral procedures, aircraft dispatch and any MEL related procedures.

5.2.2.9.2 Familiarisation Programme — Pilot in Command

Aircraft operators shall ensure that the pilot in command is familiar in the use of the MEL with particular regard to pilot in command responsibilities.

5.2.3 MEL Amendments

All amendments to a MEL must be approved by the IOMAR.

Amended MELs shall be submitted to the IOMAR together with a list of, and justification for the changes included on Form 8.

Once the amendment has been approved, the Ops Spec will be updated to include the approved MEL revision number.

5.2.3.1 Revisions to the MMEL

The MEL shall remain compliant with the latest edition of the relevant MMEL(s).

Therefore revisions to the source MMEL(s) shall be reviewed in a timely manner and resulting amendments to the MEL submitted to the IOMAR for approval so that the amended MEL is approved by the IOMAR within **90 days** from the **effective date of the amended MMEL**.

Where an amendment to the MMEL does not affect the MEL, the Preamble must still be updated to reflect the latest MMEL revision, and therefore the MEL must still be submitted to the IOMAR for approval.

Where the operator is legitimately unable to update the MEL within the 90 day timescale, please contact flightoperations@gov.im to request an extension along with the justification for the request. An extension will be considered on a case by case basis, however operator must make all reasonable efforts to achieve the 90 day requirement.

5.2.3.1.1 Temporary Revisions (TRs) to the MMEL

Some manufacturers' issue Temporary Revisions (TRs) to the MMEL.

Where a TR to the MMEL is more restrictive, the operator must incorporate the change to the MEL and submit for approval.

Where a TR to the MMEL is less restrictive, the operator has the option to incorporate the change into the MEL and submit for approval.

The MEL preamble should include details (temporary revision number and date of issue) of any TR that has been incorporated into the MEL.

5.2.3.2 Revisions to the Manufacturers O&M Procedures Manual

Revisions to the Manufacturers O&M Procedures, shall be reviewed in a timely manner. The Operator shall determine whether the amendments to the Manufacturers O&M source documents are to be included in the MEL and submitted to the IOMAR for approval.

In order to provide the greatest flexibility for operators, the IOMAR strongly recommend that the Preamble does not include the revision status of the O&M procedures source documents.

5.2.3.3 Voluntary Amendments

Voluntary amendment of the MEL can be carried out as required by the operator and submitted to the IOMAR for approval – provided the proposed change(s) are no less restrictive than the source MMEL(s).

5.2.4 Rectification Interval Extension (RIE) Programme

A Rectification Interval Extension (RIE) programme allows an operator in exceptional circumstances to permit a one-time extension to a Category B, C, or D, item by 100%. This is also known as Continuing Authorization – Single Extension (CASE).

5.2.4.0 General

Operators may be unable to comply with specified rectification intervals under certain conditions, such as a shortage of parts from manufacturers or suppliers, additional trouble shooting required to identify a problem, unavailability of test equipment or other unforeseen situations beyond their control.

Operators must ensure that rectification is accomplished at the earliest opportunity. The utilisation of RIEs is to be used to allow operators to continue to operate an aircraft after the rectification interval has expired if the rectification has not been possible. To this end an operator who utilises RIEs will be required to report retrospectively all such uses, together with the reasons for them, to the IOMAR using an RIE Report Form.

RIEs are not to be used as a normal means of conducting MEL item rectification. The RIE programme should only be used when events beyond the control of the operator have precluded rectification. Such as shortage of parts from manufacturers or other unforeseen situations (e.g. inability to obtain equipment necessary for proper troubleshooting and repair).

5.2.4.1 RIE Programme Approval Requirements

Operators may request approval for an RIE Programme by satisfying the IOMAR that sufficient control over the process exists to ensure the procedure is not abused.

In order to receive approval for an RIE programme, the Operator must demonstrate that a sufficient level of control over the process will be in place to ensure the procedure is carefully managed.

As the RIE Programme is an integral part of the MEL, the IOMAR expects the FOR to have overall control of the RIE Programme.

In order for the RIE Programme to be approved, the FOR (or Operator) must: -

- Produce and submit a procedure to control the RIE process (refer to Part 2 – Chapter 5.2.4.1.1);
- Produce and submit a RIE form (refer to Part 2 – Chapter 5.2.4.1.2)
- Amend and submit the MEL (refer to Part 2 – Chapter 5.2.4.1.3); and
- Amend MCM (refer to Part 2 – Chapter 5.2.4.1.4).

Application for an RIE Programme should be applied for using Form 8a – Rectification Interval Extension (RIE) Programme Approval.

> ***Note: As the RIE Programme requires an amendment to the MEL, the Form 8a RIE Application Form MUST be accompanied by a Form 8 MEL Approval.***

Once approval has been granted, the aircraft Operations Specification Certificate will be updated to include 'Rectification Interval Extension (RIE)' approval, and a copy will be provided to the operator.

5.2.4.1.1 RIE Procedure

The Operator must implement a robust process to control the issuance of a RIEs.

This procedure must be a controlled document.

The procedure(s) must include: -

- Assessment of the authorising personnel to ensure they are adequately trained in technical and/or operation disciplines to accomplish their duties, including changes to authorising personnel in the MEL;
- When the RIE process can be used (e.g. B, C, & D) (and when it can't be used – i.e. A);
- Review of why the defect could not be cleared within the Rectification Interval;
- Assessment of the defect being considered for the RIE, including impact on operating crew;
- Completion of the RIE form and allocation of sequential numbering;
- Provision of information to the certifying engineer and/or PIC, refer to Part 2 Chapter 5.2.4.1.1.1;
- Notification method to IOMAR (flightoperations@gov.im) within 5 days, refer to Part 2 Chapter 5.2.4.1.1.2; and
- RIE Form retention requirements, refer to Part 2 Chapter 5.2.4.1.1.3.

5.2.4.1.1.1 Procedures to Notify the Certifying Engineer and/or the PIC

Instruction must be provided to the certifying engineer and/or PIC.

The fully completed RIE form can be used to defer the defect by 100% of the previous Category B, C, or D rectification interval, thus restoring the airworthiness of the aircraft.

5.2.4.1.1.2 Procedures to Notify the Authority

The procedure must include instruction for the FOR (or their nominated deputy) to notifying the IOMAR (flightoperations@gov.im) within 5 days that an RIE has been issued by the Operator and provide a copy of the RIE form.

A control sheet listing the RIEs which have been issued must accompany the RIE form where the operator: -

- has more than 1 IOM registered aircraft with an RIE Approval; or
- raises an RIE, but does not use the RIE to defer a defect and wishes to retain the RIE for audit purposes; or
- uses a standard RIE Programme for more than 1 regulatory authority.

The RIE control sheet must as a minimum identify the RIE number, aircraft registration, date raised, and MEL reference.

5.2.4.1.1.3 RIE Form Retention

The fully completed RIE form must be provided to the NATR for retention with the airworthiness records, and review at the next CofA survey.

5.2.4.1.2 RIE Form Requirements

The RIE form must include as a minimum: -

- Aircraft Registration/Serial Number;
- Sequential RIE number for record purposes (e.g. RIE/001)*;
- Information on defect, date raised and original MEL rectification expiry date;
- Reason for the need to exceed the MEL rectification interval;
- Justification for RIE;
- New rectification date; and
- Names and Signatures of 2 authorising individuals (1 from Airworthiness and 1 from Flight Operations).

An example form is included on the next page.

5.2.4.1.2.1 Example RIE Form

Example Rectification Interval Extension Form

Aircraft Registration:	**M –**	RIE Serial Number:	**RIE/**
Date Defect Raised:		Expiry date of Rectification Interval:	

Details of Defect * :			
Reason defect could not be rectified within the Rectification Interval:			
MEL Reference:		Rectification Interval Category:	
Justification for Rectification Interval Extension:			

Duration of RIE Authorised: (Calendar Days)		**Latest Rectification:** (Date)	

Airworthiness Authorisation (as listed in the MEL)			
Name		**Signed:**	

Flight Ops Authorisation (as listed in the MEL)			
Name		**Signed:**	

Once authorised in accordance with the approved RIE Programme, this form may be used as authority to defer the above defect to the date/hours/cycles shown above.

The aircraft records shall be annotated with the RIE Serial Number.

A copy of this form will be provided to the PIC.

* No further deferments of this defect are permitted under the RIE programme.

5.2.4.1.3 MEL Requirements

The MEL Preamble must be amended to include: -

- instructions to the certifying engineer and/or PIC, and
- the list of the operators' nominated signatories for both Flight Ops and the Airworthiness sections (see notes 1 & 2), who are nominated under the programme who are authorised to issue an RIE.

Notes:

1. The NATR and FOR should be the primary signatories, however, however other individuals with the required experience and authority in the operator's organisation can also be nominated.
2. The Preamble must clearly identify which nominated individual can sign: -
    a. on behalf of the Flight Operations section; and,
    b. on behalf of the Airworthiness section.

    together with their position in the company.

The MEL Amendment must be submitted to the IOMAR, refer to Part 2 Chapter 5.2.3.

5.2.4.1.4 Maintenance Control Manual

The Maintenance Control Manual requires operators to record 'procedures for ensuring that any unserviceability affecting an aircraft's airworthiness is recorded and rectified' (item i)).

Consequently the MCM must be amended to reflect the operators' ability to self-issue a Rectification Interval Extension.

The IOMAR does not require the MCM to be submitted in order for an RIE Programme Approval, however reserves the right to request a copy of the MCM as part of its ongoing oversight programme.

5.2.4.2 Changes to the RIE Programme

Following approval, any changes to the RIE procedure and/or RIE form must remain compliant with the requirements stated in Part 2 Chapter 5.2.4.1.1 and Part 2 Chapter 5.2.4.1.2.

5.2.5 MEL Appendices

Appendix 1 MEL Preamble

MEL Preamble

(OPERATOR'S NAME)

MINIMUM EQUIPMENT LIST

(AIRCRAFT TYPE)

PREAMBLE

Note This Preamble meets the IOMAR Standards.
Text in blue font is for guidance, and shall not appear in the submitted MEL
Text in red font requires the operator to enter the indicated information

1 Introduction

The Minimum Equipment List (MEL) is based on the following source documents:

- ***(Certificating Authority)*** Master Minimum Equipment List (MMEL) ***(Aircraft Type) (Revision, dated)***, and
- ***(Aircraft Type)*** Operational & Maintenance (O&M) Procedures Manual.

This MEL takes into consideration ***(the operator's)*** particular aircraft equipment, configuration and operational conditions, routes being flown and requirements set by the IOMAR.

This MEL will not deviate from any applicable Airworthiness Directive or any other Mandatory Requirement and will be no less restrictive than the MMEL.

The MEL is intended to permit operations with inoperative items of equipment for a period of time until rectification can be accomplished.

Rectification is to be accomplished at the earliest opportunity.

MEL Conditions and Limitations do not relieve the Pilot in Command from determining that the aircraft is in a fit condition for safe operation with specified unserviceabilities allowed by the MEL.

The provisions of the MEL are applicable until the aircraft commences the flight.

Any decision to continue a flight following a failure or unserviceability which becomes apparent after the commencement of a flight shall be the subject of pilot judgement and good airmanship. The Pilot in Command can continue to make reference to and use of the MEL as appropriate.

By approving the MEL, the IOMAR permits dispatch of the aircraft for flight with certain items or components inoperative provided an acceptable level of safety is maintained by use of appropriate operational or maintenance procedures, by transfer of the function to another operating component, or by reference to other instruments or components providing the required information.

2 MEL Administration

The MEL must remain compliant with the latest edition of the relevant MMEL.

Therefore revisions to the source MMEL will be reviewed and resulting amendment to the MEL submitted to the IOMAR for approval within 90 days from the effective date of the amended MMEL.

Temporary Revisions (TR) to the MMEL which are more restrictive will be incorporated into the MEL and submitted to the IOMAR for approval within 90 days from the effective date of the TR.

3 Contents of MEL

The MEL contains only those items required by operating regulations or those items of airworthiness significance which can be inoperative prior to dispatch, provided that appropriate limitations and procedures are observed. Equipment obviously basic to aircraft airworthiness such as wings, rudders, flaps, engines, landing gear, etc. are not listed and must be operative for all flights.

It is important to note that:

ALL ITEMS WHICH ARE RELATED TO THE AIRWORTHINESS OF THE AIRCRAFT AND ARE NOT INCLUDED ON THE LIST ARE **AUTOMATICALLY REQUIRED TO BE OPERATIVE.**

4 Criteria for Dispatch

The decision of the Pilot in Command of the flight to have allowable inoperative items corrected prior to flight will take precedence over the provisions contained in the MEL. The Pilot in Command can request requirements above the minimum listed whenever, in his judgement, such added equipment is essential to the safety of a particular flight under the special conditions prevailing at the time.

The MEL cannot take into account all multiple unserviceabilities. Therefore, before dispatching an aircraft with multiple MEL items inoperative, it must be assured that any interface or inter-relationship between inoperative items will not result in degradation in the level of safety and/or an undue increase in crew workload. It is particularly in this area of multiple discrepancies and especially discrepancies in related systems that good judgement – based on the circumstances of the case, including climatic and en-route conditions – must be used.

5 Maintenance Action

Every effort shall be made by Maintenance to correct all technical defects as early as practicable and that the aircraft is released from a maintenance station in fully operational condition. The Pilot in Command shall be informed by Maintenance as soon as practicable, shall it be impossible to rectify the inoperative item prior to departure.

Whenever an aircraft is released by Maintenance for dispatch with items inoperative, the following is required:

a) The log book, or equivalent, aboard the aircraft must contain a detailed description of the inoperative item(s), special advice to the flight crew, if necessary, and information about corrective action taken.

b) When they are accessible to the crew in flight, the control(s), and/or indicator(s) related to inoperative unit(s) or component(s) **must be clearly placarded.**

c) If inadvertent operation could produce a hazard, such equipment shall be rendered inoperative (physically) as given in the appropriate maintenance procedure.

d) The relevant operational and maintenance procedures are contained in ***(identify the particular Manual, Section, Chapter or Part etc.).***

Maintenance Procedures which do not require a CRS are identified by (M*) and can be completed by a flight crew member. In all other cases an (M) Procedure still requires a CRS issued by an authorised person.

6 Rectification Intervals

Inoperative items or components, deferred in accordance with the MEL, must be rectified at or prior to the Rectification Intervals established by the following letter designators given in the 'Rectification Interval Category' column of the MEL.

Category A – Items in this category shall be rectified within the limitations specified in the MEL entry.

- Where the time interval is specified in calendar days or flight days, it shall start at 00:01 on the day following the day of discovery*.
- Where the time period is specified other than in calendar days or flight days, it shall start at the point where the defect is deferred in accordance with the MEL.

Category B – Items in this category shall be rectified within three (3) consecutive calendar days, excluding the day of discovery.

Category C – Items in this category shall be rectified within ten (10) consecutive calendar days, excluding the day of discovery.

Category D – Items in this category shall be rectified within one hundred and twenty (120) consecutive calendar days, excluding the day of discovery.

7 Definitions

For the purpose of this MEL the following definitions shall apply:

Operator to insert the relevant definitions from Appendix 2.1 or 2.2 (as applicable) and include any additional definitions which from the MMEL.

8 Centralised Message Systems *(if appropriate)*

The aircraft is equipped with a system (such as ECAM/EICAS) which provides different levels of systems information messages (Warning, Caution, Advisory, Status, Maintenance etc.). Any aircraft discrepancy message that affects dispatch will normally be at status message level or higher. Therefore, system conditions that result only in a Maintenance Message are not normally addressed in the MEL as they, in themselves, do not prohibit dispatch of the aircraft. However, maintenance discrepancy messages must be recorded and corrected in accordance with the approved maintenance programme.

9 Operations outside the Scope of the MEL

In exceptional circumstances, the IOMAR can issue a Permission to ***(operator's name)*** to dispatch with an inoperative item of equipment on a case by case basis, provided such Permission complies with the applicable limitations in the MMEL.

Flights for the purpose of returning the aircraft to a place where it can be repaired can be dispatched with less than the equipment specified in the MEL, provided all the equipment expected to be utilised in flight is operable and any relevant Sections of the Flight Manual are applied. The Permit to Fly **must be granted by the IOMAR** before the flight takes place and also permission from all states which are to be overflown and the state in which the aircraft lands will be required prior to flight.

10 Minimum Equipment Required for Operational Approvals

(Operator to list operational approvals granted by the IOMAR together with the minimum equipment required for each approval, or alternatively: -
1. where operational approvals currently granted by the IOMAR can be found, e.g. Ops Spec, and
2. where the minimum equipment requirements for the operational approval granted by the IOMAR be located, e.g. AFM)

Appendix 2 IOM MEL Definitions

2.1 Fixed Wing Definitions

'Aircraft Flight Manual (AFM)' is the document required for type certification and approved by ***(insert aircraft State of TCDS Compliance)***. The approved AFM for the specific aircraft is listed on the applicable Type Certification Data Sheet.

'As required by Air Navigation Legislation / Operating Requirements' the associated item must comply with legal provisions such as the Air Navigation (Isle of Man) Order or any other legislation in force during the flight.

'Authority' the competent regulatory authority according to the country of registry; for an aeroplane registered in the Isle of Man it is the Isle of Man Aircraft Registry.

'Calendar Day' means a 24-hour period from midnight to midnight UTC/Local Time ***(delete as applicable)***. All calendar days are considered to run consecutively.

'Combustible Material' is material which is capable of catching fire and burning;

'Commencement of flight / Dispatch' is the point when an aircraft begins to move under its own power for the purpose of preparing for take-off.

'Considered Inoperative' as used in the dispatch conditions, means that item shall be treated for dispatch, taxiing and flight purposes as though it were inoperative. The item shall not be used or operated until the original deferred item is repaired. Additional actions include: documenting the item on the dispatch release (if applicable), placarding, and complying with all remarks, exceptions, and related MEL provisions, including any (M), (M*) and (O) procedures and observing the rectification interval.

'Day' or 'Daylight' means the period between the beginning of morning civil twilight and the end of evening civil twilight relevant to the local aeronautical airspace.

'Day of Discovery' is the calendar-day that a malfunction was recorded in the Journey (Technical) Log'.

'Day operation' is any flight conducted from the point of take-off to landing between 30 minutes before sunrise and 30 minutes after sunset being determined at surface level, both times exclusive.

'Extended Range (ER) Operations' are conducted by an aeroplane with one or more turbine engines that contains a point further than 120 minutes ***(or the MMEL specified time if lower)*** from an en-route adequate alternate aerodrome at the OEI cruise speed under ISA conditions in still air from any point along the proposed route of flight.

'Extended Overwater Operations' is any flight operated at a distance away from land, which is suitable for making an emergency landing, greater than that corresponding to 120 minutes at cruising speed or 400 nautical miles, whichever is the lesser.

'Flight' the period of time between the moment when an aircraft begins to move under its own power, for the purpose of preparing for take-off, until the moment the aircraft comes to a complete stop on its parking area, after the first landing.

'Flight Day' means a 24-hour period from midnight to midnight UTC/Local Time ***(delete as applicable)***, during which at least one flight is initiated for the affected aircraft.

'Icing Conditions' the atmospheric environment is such that ice can form on the aircraft or engine(s) as defined in the AFM.

'Inoperative' means that the equipment does not accomplish its intended purpose or is not consistently functioning within its design operating limits or tolerances. Some systems have been designed to be fault tolerant and are monitored by digital computers which transmit fault messages to a centralised computer for the purpose of maintenance. The presence of this category of message does not mean that the system is inoperative.

'Instrument Flight Rules' (IFR) means Instrument Flight Rules prescribed by Section 5 of Schedule 2 to the Civil Aviation (Rules of the Air) Order 2021.

'Instrument Meteorological Conditions' (IMC) means meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minima specified for visual meteorological conditions.

'(M*)' means a maintenance procedure that does not require a CRS and can be completed by a flight crew member.

'(M)' indicates a requirement for a specific maintenance procedure which must be accomplished prior to operation with the listed item inoperative. These procedures must be accomplished by appropriately validated maintenance personnel or an individual holding an appropriate authorisation from the IOMAR to perform the specific function. A CRS is required.

'Minimum Equipment List (MEL)' is a document which is based on the Master Minimum Equipment List (MMEL) for the aircraft type. The MEL is prepared by the Operator and approved by the Isle of Man Aircraft Registry. The MEL will enable the pilot-in-command to determine whether a flight can be commenced or continued from any intermediate stop for various periods of time/number of flights should any instrument, equipment or systems become inoperative, provided an acceptable level of safety is maintained within the framework of a controlled and sound programme of repairs and parts replacement.

'Notes' provide additional information for flight crew or maintenance consideration. Notes are used to identify applicable material which is intended to assist with compliance, but do not relieve the operator of the responsibility for compliance with all applicable requirements. Notes are not a part of the dispatch conditions.

'(O)' indicates a requirement for a specific operational procedure which must be accomplished in planning for and/or operating with the listed item inoperative.

'Operative' means that the system and/or component can accomplish its intended purpose and consistently functions normally within its design operating limit(s) and tolerance(s).

'Placarding' Each inoperative item must be placarded, as applicable, to inform and remind the crew members and maintenance personnel of the item's condition.

'Visual Flight Rules' (VFR) means Visual Flight Rules prescribed by Section 5 of Schedule 2 to the Civil Aviation (Rules of the Air) Order 2021.

'Visual Meteorological Conditions' (VMC) means weather permitting flight in accordance with the Visual Flight Rules, as defined in the Civil Aviation (Rules of the Air) Order 2021.

Note This is not an exhaustive list and operators shall include in their MELs all definitions from the MMEL which are considered to be relevant.

2.2 Rotorcraft Definitions

'As required by Air Navigation Legislation / Operating Requirements' the associated item must comply with legal provisions such as the Air Navigation (Isle of Man) Order or any other legislation in force during the flight.

'Authority' the competent regulatory authority according to the country of registry; for a helicopter registered in the Isle of Man it is the Isle of Man Aircraft Registry.

'Calendar Day' means a 24-hour period from midnight to midnight UTC/Local Time ***(delete as applicable)***. All calendar days are considered to run consecutively.

'Combustible Material' is material which is capable of catching fire and burning.

'Commencement of flight / Dispatch' is the point when an aircraft begins to move under its own power for the purpose of preparing for take-off.

'Considered Inoperative' as used in the dispatch conditions, means that item shall be treated for dispatch, taxiing and flight purposes as though it were inoperative. The item shall not be used or operated until the original deferred item is repaired. Additional actions include: documenting the item on the dispatch release (if applicable), placarding, and complying with all remarks, exceptions, and related MEL provisions, including any (M), (M*) and (O) procedures and observing the rectification interval.

'Day' or 'Daylight' means the period between the beginning of morning civil twilight and the end of evening civil twilight relevant to the local aeronautical airspace.

'Day of Discovery' is the calendar-day that a malfunction was recorded in the Journey (Technical) Log.'

'Day operation' is any flight conducted from the point of take-off to landing between 30 minutes before sunrise and 30 minutes after sunset being determined at surface level, both times exclusive.

'Flight' the period of time between the moment when the rotor of the helicopter starts to turn for the purpose of taking off, until the moment when the rotor is stopped after the helicopter finally comes to rest at the end of the flight.

'Flight Day' means a 24-hour period from midnight to midnight UTC/Local Time ***(delete as applicable)***, during which at least one flight is initiated for the affected aircraft.

'Icing Conditions' the atmospheric environment is such that ice can form on the aircraft or engine(s) as defined in the RFM.

'Inoperative' means that the equipment does not accomplish its intended purpose or is not consistently functioning within its design operating limits or tolerances. Some systems have been designed to be fault tolerant and are monitored by digital computers which transmit fault messages to a centralised computer for the purpose of maintenance. The presence of this category of message does not mean that the system is inoperative.

'Instrument Flight Rules' (IFR) means Instrument Flight Rules prescribed by Section 5 of Schedule 2 to the Civil Aviation (Rules of the Air) Order 2021.

'Instrument Meteorological Conditions' (IMC) means meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minima specified for visual meteorological conditions.

'(M*)' means a maintenance procedure that does not require a CRS and can be completed by a flight crew member.

'(M)' indicates a requirement for a specific maintenance procedure which must be accomplished prior to operation with the listed item inoperative. These procedures must be accomplished by appropriately validated maintenance personnel or an individual holding an appropriate authorisation from the IOMAR to perform the specific function. A CRS is required.

'Minimum Equipment List (MEL)' is a document which is based on the Master Minimum Equipment List (MMEL) for the aircraft type. The MEL is prepared by the Operator and approved by the Isle of Man Aircraft Registry. The MEL will enable the pilot-in-command to determine whether a flight can be commenced or continued from any intermediate stop for various periods of time/number of flights should any instrument, equipment or systems become inoperative, provided an acceptable level of safety is maintained within the framework of a controlled and sound programme of repairs and parts replacement.

'Notes' provide additional information for flight crew or maintenance consideration. Notes are used to identify applicable material which is intended to assist with compliance, but do not relieve the operator of the responsibility for compliance with all applicable requirements. Notes are not a part of the dispatch conditions.

'(O)' indicates a requirement for a specific operational procedure which must be accomplished in planning for and/or operating with the listed item inoperative.

'Operative' means that the system and/or component can accomplish its intended purpose and consistently functions normally within its design operating limit(s) and tolerance(s).

'Placarding' Each inoperative item must be placarded, as applicable, to inform and remind the crew members and maintenance personnel of the item's condition.

'Rotorcraft Flight Manual (RFM)' is the document required for type certification and approved by ***(insert aircraft State of TCDS Compliance)***. The approved RFM for the specific aircraft is listed on the applicable Type Certification Data Sheet.

'Visual Flight Rules' (VFR) means Visual Flight Rules prescribed by Section 5 of Schedule 2 to the Civil Aviation (Rules of the Air) Order 2021.

'Visual Meteorological Conditions' (VMC) means weather permitting flight in accordance with the Visual Flight Rules, as defined in the Civil Aviation (Rules of the Air) Order 2021.

Note This is not an exhaustive list and operators shall include in their MELs all definitions from the MMEL which are considered to be relevant.

Appendix 3 IOM MMEL Supplement

The manufacturer's Master Minimum Equipment List (MMEL) is intended to be used by aircraft on the issuing State(s) Register; therefore it will refer to their own national rules (14 CFR, Air Ops, CAR etc.).

However, when writing an MEL for an M-registered aircraft all such references must be changed to reflect the IOM MEL National Requirement. The purpose of the IOM MMEL Supplement is to provide FOR of M-registered aircraft and MEL Authors with this information in an easy-to-read format.

How to Use the IOM MMEL Supplement

The IOM MMEL Supplement identifies the IOM National Requirements and any differences from the MMEL approved by the State of TCDS Compliance.

In some cases, the IOM deferment period may be more restrictive than the MMEL, for example: ELT deferment period.

Where the MMEL is more restrictive than the IOM National Requirements, the most restrictive entry must be used in the operators MEL.

National MEL Requirements for Operational and Maintenance Procedures

The IOM MMEL Supplement does not include Operational (O) or Maintenance (M) procedures. Any relevant O & M's from the manufacturer's source documents (MMEL and O&M's/DDG or MOPP) should be included in the operators MEL and customised where necessary.

The IOM MMEL Supplement does identify where an Operational Procedure is required by the inclusion of '(O)' in the remarks and exceptions column. For example, when 'Procedures are established and used…' is included in column 5 'Remarks or Exceptions', the remarks or exceptions must be customised. The procedure can be included in the (O) Operational Procedure or directly into the Remarks or Exceptions column, in which case the (O) symbol may not be required.

Notes

There are 2 types of "Notes" contained in column 5 'Remarks or Exceptions' of the IOM MMEL Supplement.

1) Notes in **Bold** are provided for flight crew or maintenance consideration. Notes are used to identify applicable material which is intended to assist with compliance, but do not relieve the operator of the responsibility for compliance with all applicable requirements.
2) Notes in *Italics* provide additional information to the FOR and/or MEL author to consider when constructing the MEL and must not be included in the MEL.

In situations where an item appearing in the MMEL refers to the National rules of the certifying authority (for example: 14 CFR for FAA MMEL), but is not included in the IOM MMEL Supplement, the Remarks or Exceptions should read 'May be inoperative provided procedures do not require its use', and any other remarks included in the MMEL should be included in the MEL.

ATA Chapter 22 – Autoflight

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Navigation Database *(EASA TCDS State of Compliance)*	C	-	0	One or more may be inoperative for the intended flight route where conventional (non-RNAV/RNP) navigation is sufficient, provided: a) Current aeronautical information (e.g. charts) is available for the entire route and for the aerodromes to be used, and b) Navigation database information is disregarded, and c) Radio navigation aids, which are required to be flown for departure, arrival and approach procedures are manually tuned and identified. *Note: A navigation database which is operative, but out of currency, is NOT considered to be inoperative and therefore does not need to be deferred in accordance with an MEL approved by the IOMAR. Refer to RP4 Part 1 Chapter 9.6 for the operational criteria for operating with an out of date Navigation Database.* *Operators may still include an MEL entry for an out of currency navigation database if they wish for tracking purposes.*

ATA Chapter 23 – Communications

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Headset	D	-	-	Any in excess of one headset (including boom microphone) for each required crew member on flight crew compartment duty may be inoperative or missing.
VHF Communication Systems	D	-	-	Any in excess of those required for the intended route may be inoperative.
HF Communication Systems	A	-		(O) Any in excess of one may be inoperative for a maximum of 3 calendar days provided alternate communication procedures are established and used.
	C	-		(O) Any in excess of one may be inoperative provided: a) SATCOM air-ground communications with Air Traffic Service Providers (ATSPs) are available for the intended flight route; **and** b) SATCOM Voice or Data transfer functions are operative; **and** c) Prior to each flight, coordination with the appropriate Air Navigation Service Provider(s) is established where INMARSAT codes, or equivalent, are not available whilst using SATCOM voice function; **and** d) Alternate communication procedures are established and used. Note: The intended flight route corresponds to any point on the route including diversions to reach alternate aerodromes required to be selected by the operational rules.
	D	-	0	Any in excess of those required for the intended flight route, may be inoperative.

ATA Chapter 23 – Communications (cont.)

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Cockpit Voice Recorder (CVR) *(for aircraft WITHOUT FDR installed)*	A	-	0	May be inoperative provided the aircraft does not exceed: a) 8 further consecutive flights with the CVR inoperative; **or** b) A maximum of 72 hours have elapsed since the CVR was found to be inoperative; whichever occurs first.
	D	-	1	Any in excess of those required may be inoperative.
Cockpit Voice Recorder (CVR) *(for aircraft WITH FDR installed)*	A	-	0	May be inoperative provided the aircraft does not exceed: a) 8 further consecutive flights with the CVR inoperative; **or** b) A maximum of 72 hours have elapsed since the CVR was found to be inoperative; **whichever occurs first**; **and** c) Any Flight Data Recorder required to be carried is operative. *Note: This alleviation is not applicable to Flight data and cockpit voice combination recorders. For those combined systems, see the entry for combination recorders (ATA Chapter 31).*
	D	-	1	Any in excess of those required may be inoperative.

ATA Chapter 25 – Equipment Furnishings

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Independent Portable Light	D	-	0	May be inoperative or missing for daylight operations.
	C	-	-	May be inoperative or missing provided each required crew member has an operative independent portable light readily available when seated at designated station.
Survival Equipment, clothing and rations – tropical and/or polar conditions	D	-	0	(O) Any in excess of those required for the intended route may be inoperative or missing provided: a) Inoperative equipment and its installed location are placarded inoperative; **and** b) Inoperative equipment is secured out of sight; **and** c) Procedures are established and used to alert crew members of inoperative equipment.
First Aid Kit (FAK)	A	-	1	Required FAK may be incomplete for a maximum of 2 flight days, provided the Operator has determined that the remaining contents are sufficient for the intended flight(s).
	D	-	1	Any in excess of one may be incomplete or missing.

ATA Chapter 25 – Equipment Furnishings (cont.)

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Emergency Locator Transmitter (ELT) Fixed/Automatic type *(Aeroplanes)*	A	-	0	May be inoperative provided the aircraft does not exceed 6 flights **or** 25 flight hours, whichever occurs first.
	D	-	0	May be inoperative provided the aircraft does not fly over water at a distance of more than 10 minutes flying time at normal cruising speed away from land suitable for making an emergency landing and/or flying over areas designated by the State as especially difficult for search and rescue.
Emergency Locator Transmitter (ELT) Survival type *(Aeroplanes)*	D	-	0	(O) Any in excess of those required may be inoperative or missing provided: a) Inoperative equipment and its installed location are placarded inoperative; **and** b) Inoperative equipment is secured out of sight; **and** c) Procedures are established and used to alert crew members of inoperative or missing equipment.
Emergency Locator Transmitter (ELT) Fixed/Automatic type *(Rotorcraft)*	A	-	0	May be inoperative provided the aircraft does not exceed a maximum of 6 flight hours **or** a maximum of 24 hours since the ELT was found to be inoperative, **whichever occurs first.**

ATA Chapter 25 – Equipment Furnishings (cont.)

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Lifejackets *(Aeroplanes)*	D	-	0	Any in excess of those required may be inoperative or missing provided: a) A lifejacket equipped with a whistle and survivor locator light for each person on board, accessible from the intended user's approved seated location when flying over water beyond gliding distance from land suitable for an emergency landing & at a greater distance from land suitable for making an emergency landing than that corresponding to 30 minutes at cruising speed or 100 nautical miles, whichever is the less; **and** b) Inoperative lifejacket and its installed location are placarded inoperative; **and** c) Inoperative lifejacket is secured out of sight; **and** d) All crew members are alerted of inoperative or missing equipment. **NOTE:** Children's lifejackets constructed for children less than 3 years old need not be equipped with a whistle.

ATA Chapter 25 – Equipment Furnishings (cont.)

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Lifejackets *(Rotorcraft)*	D	-	0	May be inoperative or missing provided: a) A lifejacket equipped with a whistle and survivor locator light for each person on board, accessible from the intended user's approved seated location when flying over water beyond autorotational gliding distance from land suitable for a emergency landing, & on all flights on which in the event of any emergency occurring during the take-off or during the landing at the intended destination or any likely alternate destination it is reasonably possible that the helicopter would be forced to land onto water, & where the flight involves manoeuvres on water; **and** b) Inoperative lifejacket and its installed location are placarded inoperative; **and** c) Inoperative lifejacket is secured out of sight; **and** d) All crew members are alerted of inoperative or missing equipment. **NOTE:** Children's lifejackets constructed for children less than 3 years old need not be equipped with a whistle.

ATA Chapter 25 – Equipment Furnishings (cont.)

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Liferafts and liferaft equipment *(Aeroplanes)*	D	-	0	(O) May be inoperative or missing provided: a) Extended overwater flights are not conducted; **and** b) Procedures are established and used to alert crew members of inoperative or missing equipment.
	C	-	-	(O) Any in excess of those required for the intended flight may be inoperative or missing when operating overwater at a greater distance from land suitable for making an emergency landing than that corresponding to 30 minutes at cruising speed or 50 nautical miles, whichever is less provided: a) Inoperative liferaft and its installed location are placarded inoperative; **and** b) When practical, the inoperative liferaft is secured out of sight; **and** c) Procedures are established and used to alert crew members of inoperative equipment. *Note: Operator should refer to Exemption 2020/103 for details on when Life Rafts are required.*

ATA Chapter 25 – Equipment Furnishings (cont.)

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Liferafts and liferaft equipment *(Rotorcraft)*	D	-	0	(O) May be inoperative or missing provided: a) intended flight does not involve manoeuvres on water; **and** b) inoperative liferaft(s) and its installed location are placarded inoperative, when practical, the inoperative liferaft(s) is secured out of sight; **and** c) Procedures are established and used to alert crew members of inoperative equipment.

ATA Chapter 26 – Fire Protection

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Hand Fire Extinguisher	D	-	-	(O) Any in excess of those required may be inoperative or missing provided: a) The inoperative hand fire extinguisher is secured out of sight, and the hand fire extinguisher and its installed location are placarded inoperative; and b) One hand fire extinguisher in the flight crew compartment and in each passenger compartment separate from flight crew compartment*; and c) Procedures are established and used to alert crew members of inoperative equipment. ** Unless the passenger compartment is readily accessible to flight crew i.e. curtain or no flight deck door.*

ATA Chapter 30 – Ice Protection

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Ice Formation Prevention Equipment	D	-	-	May be inoperative provided weather reports or forecasts available at the aerodrome at the time of departure do not indicate that conditions favouring ice formation are likely to be present.

ATA Chapter 31 – Indicating/Recording Systems

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Flight Data Recorder (FDR)	A	-	0	May be inoperative provided the aircraft does not exceed: a) 8 further consecutive flights with the FDR inoperative; or b) A maximum of 72 hours have elapsed since the FDR was found to be inoperative; **whichever occurs first; and** c) Any Cockpit Voice Recorder required to be carried is operative. ***Note:*** *This alleviation is not applicable to Flight data and cockpit voice combination recorders. For those combined systems, see the entry for combination recorders.*
Flight Data Recorder (FDR) *For aircraft without CVR installed*	A	-	0	May be inoperative provided the aircraft does not exceed: a) 8 further consecutive flights with the FDR inoperative; or b) A maximum of 72 hours have elapsed since the FDR was found to be inoperative; **whichever occurs first.** *Note: This alleviation is not applicable to Flight data and cockpit voice combination recorders. For those combined systems, see the entry for combination recorders.*

ATA Chapter 31 – Indicating/Recording Systems (Cont.)

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Flight Data and Cockpit Voice Combination Recorder	A	-	0	May be inoperative provided the aircraft does not exceed: a) 8 further consecutive flights with the CVR inoperative; **or** b) A maximum of 72 hours have elapsed since the CVR was found to be inoperative; **whichever occurs first;** **and** c) The other function, where required, is operative.

ATA Chapter 34 – Navigation

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
ADS-B OUT	C	-	0	One or more extended squitter transmissions may be inoperative when required for the intended flight route.
	D	-	0	One or more extended squitter transmissions may be inoperative when not required for the intended flight route.
Terrain Awareness Warning System (TAWS) *Class A or Class B*	A	-	0	May be inoperative for a maximum of 6 flights **or** 2 calendar days, whichever occurs first.
	A	-	-	*(Any 'A' rectification interval item found in the MMEL…)* May be inoperative for a maximum of 6 flights **or** 2 calendar days whichever occurs first. ***Note**: Any other entries referring to national legislation (e.g. 14 CFR) must be removed.* *For example:* *Advisory Callouts –* *(O) May be inoperative provided:* *a) Advisory callouts not required by 14 CFR; **and*** *b) Alternate procedures are established and used.* *Must be amended to:* *Advisory Callout –* *(O) May be inoperative provided alternate procedures are established and used.*

ATA Chapter 34 – Navigation (Cont.)

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Airborne Collision Avoidance System (ACAS)	A	-	0	(O) May be inoperative for a maximum of 10 calendar days provided: a) ACAS is deactivated; **and** b) Operating procedures and/or airspace requirements do not require its use; **and** c) Alternate procedures are established and used.
	C	-	-	Any in excess of those required may be inoperative provided it is deactivated.
Radio Navigation Systems (based on VOR, DME, ADF)	-	-	-	*Where the MMEL refers to the National rules of the certifying authority (for example: 14 CFR for FAA MMEL) the Remarks or Exceptions should read: -* *'May be inoperative provided procedures do not require its use',* ***and*** *any other remarks included in the MMEL.*
Anti-Collision Light System	B	2	0	May be inoperative for daylight operations.
	B	2	1	The upper light must be operative for night operations.

ATA Chapter 34 – Navigation (Cont.)

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Navigation Database *(ANAC, FAA & TC State of TCDS Compliance)*	C	-	0	One or more may be inoperative for the intended flight route where conventional (non-RNAV/RNP) navigation is sufficient, provided: a) Current aeronautical information (e.g. charts) is available for the entire route and for the aerodromes to be used, **and** b) Navigation database information is disregarded, **and** c) Radio navigation aids, which are required to be flown for departure, arrival and approach procedures are manually tuned and identified. *Note: A navigation database which is operative, but out of currency, is NOT considered to be inoperative and therefore does not need to be deferred in accordance with an MEL approved by the IOMAR. Refer to RP4 Part 1 Chapter 9.6 for the operational criteria for operating with an out of date Navigation Database.* *Operators may still include an MEL entry for an out of currency navigation database if they wish for tracking purposes.*

ATA Chapter 35 – Oxygen

ITEM	RECTIFICAITON INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	REMARKS OR EXCEPTIONS
Protective (Portable) Breathing Equipment (PBE) *(Aeroplanes for which cabin crew are NOT required by AFM)*	D	-	1	(O) Any in excess of those required may be inoperative or missing provided: a) Operative PBE is readily available to the flight crew member(s) when seated at designated station readily accessible; **and** b) Inoperative PBE and its installed location are placarded inoperative; **and** c) Inoperative PBE unit is secured out of sight in an approved stowage; **and** d) Procedures are established and used to alert crew members of inoperative equipment. **Note:** Inoperative PBE units may be subject to IOM Dangerous Goods Legislation and requirements.
Protective (Portable) Breathing Equipment (PBE) *(Aeroplanes for which cabin crew ARE required by AFM)*	D	-	-	(O) Any in excess of those required may be inoperative or missing provided: a) Operative PBE are readily accessible to all cabin crew members when seated at designated station(s); **and** b) Inoperative PBE and its installed location are placarded inoperative; **and** c) Inoperative PBE unit is secured out of sight in an approved stowage, **and** d) Procedures are established and used to alert crew members of inoperative equipment. **Note:** Inoperative PBE units may be subject to IOM Dangerous Goods Legislation and requirements.

Appendix 4 MEL/CDL Use as it applies to the Certificate of Release to Service

Example 1 – Deferred Defect with NO (M) Procedures

If an item/system on an aircraft becomes inoperative, it can only be deferred in accordance with the MEL or CDL (or via an IOMAR individual permission).

Where a system or item, as specified in the MEL, does not indicate (M), therefore no maintenance action, a CRS is not required to be issued, the deferment can be made by the Flight Crew. (The deferral procedure will normally be subject to a procedure identified within the aircraft Ops manual).

The following is an example where there is no (M) item and therefore no CRS is required.

28-25-02	**Fuel Quantity on the Refuel/Defuel Control Panel**

28-25-02A

Repair interval	Nbr installed	Nbr required	Placard
C	–	0	**Yes**

One or more indications may be inoperative provided that the fuel quantity is continuously monitored on the FUEL SD page during refueling and defueling.

Example 2 – Deferred Defect WITH (M) Procedures

Where an item or system requires a maintenance task in order to defer it in accordance with the MEL, such items will be identified (M) and a CRS will be required. In this case, the CRS is actually for the physical maintenance task performed and not for simply deferring the item under the MEL.

The actual CRS statement will be entered in the appropriate method of recording, such as Tech Log, defect card paperwork etc., and will contain the information stated within RP9.

If for example, the MEL or CDL requires an inspection prior to each flight whilst the system remains defective, then a new CRS would be required certifying the inspection has been performed, following the Technical data contained within the MEL as reference.

36-22-03	**APU Leak Detection Loop**

36-22-03A APU bleed check valve replaced by a blanking cap

Repair interval	Nbr installed	Nbr required	Placard
C	1	0	**No**

(m) May be inoperative provided that:

1) The APU bleed check valve is removed and replaced by a blanking cap, and

2) The APU bleed air supply system is considered inoperative.

Refer to Item 36-12-01 APU Bleed Air Supply System

Reference(s)

(m) *Refer to AMM Task 36-12-00-040-801*

Example 3 –Deferred Defect With NO (M) Procedure, But Engineering Action Is Performed

In the example below of the Landing Light, there is no (M) task and therefore no CRS is required. However, if the engineer decides to start trouble shooting the item, perhaps opening a panel etc., the system has now been disturbed. A CRS will be required for the work carried out even if the light is not replaced at this time. Such a CRS would cover what has been disturbed, example continuity checks of the power supply performed, access panel removed and re-installed etc.

33-40-03	Landing Light

33-40-03B Daylight operations

Repair interval	Nbr installed	Nbr required	Placard
C	2	0	Yes

One or both may be inoperative for daylight operations.

Example 4 – Deferred Defect in which the (M) Procedure Requires Troubleshooting

There can be an occasion where there are 2 maintenance factors involved. This example has an (M) Procedure which requires the CRS to cover both troubleshooting (i.e. Leak Check) and a Maintenance task i.a.w. the AMM (in this example, AMM 36-22-00-040-001) for the deactivation of the detection loop.

The CRS would cover both tasks in accordance with AMM 36-22-00-040-001. The CRS is for the work performed and not for simply deferring the item in accordance with the MEL.

36-22-01	Pylon Leak Detection System

36-22-01A

Repair interval	Nbr installed	Nbr required	Placard
C	2	1	No

(m) One may be inoperative provided that:

1) The associated pylon leak detection loop is deactivated, and
2) The AIR ENG 1(2) BLEED LEAK alert is confirmed to be false by troubleshooting, and
3) The associated bleed air supply system is considered inoperative.
Refer to Item 36-11-01 Engine Bleed Air Supply System

Reference(s)

(m) *Refer to AMM 36-22-00-040-001*

Appendix 5 Non-EASA TCDS aircraft affected by EASA Part-NCC

In order to receive an approval from the IOMAR, the MEL must be based on the State of TCDS Compliance MMEL.

However, operators affected by the EASA Part-NCC rules must be no less restrictive than the corresponding EASA MMEL.

As stated in Part 2 Chapter 5.2.1.1.2, the IOMAR has no objection to this provided the Operators MEL is: -

- initially based on the State of TCDS Compliance MMEL;
- uses the ATA numbering as per the State of TCDS Compliance MMEL; and
- is no less restrictive than the EASA MMEL.

Appendix 5.1 Preamble

In addition to the approval of the MEL by the IOMAR, the competent authority which has oversight of the operator under the EASA Air Ops legislation are also required to approve an operators MEL. The competent authority is to review the MEL against the EASA MMEL.

For non-EASA type certificated aircraft, the MEL shall be no less restrictive than both the MMEL acceptable to the IOMAR and the EASA OSD MMEL, therefore the Preamble Introduction shall be amended as per below.

1 Introduction

The Minimum Equipment List (MEL) is based on the following documents:

- (Certificating Authority) Master Minimum Equipment List (MMEL) (Aircraft Type) (Revision, dated), and
- ***(Aircraft Type)*** Operational & Maintenance (O&M) Procedures Manual.

Owing to operations conducted under Part-NCC, and requirement for ***(Applicable EASA Competent Authority)*** approval, the MEL has also been reviewed against and is no less restrictive than:

- EASA Operational Suitability Data (OSD) Master Minimum Equipment List (MMEL), ***(Aircraft Type) (Revision, dated)***, and the applicable Operational & Maintenance (O&M) Procedures Manual.

This MEL takes into consideration ***(the operator's)*** particular aircraft equipment, configuration and operational conditions, routes being flown and requirements set by the IOMAR.

This MEL will not deviate from any applicable Airworthiness Directive or any other Mandatory Requirement and will be no less restrictive than both the ***(State of TCDS Compliance)*** MMEL and EASA OSD MMEL.

The MEL is intended to permit operations with inoperative items of equipment for a period of time until rectification can be accomplished.

Rectification is to be accomplished at the earliest opportunity.

MEL Conditions and Limitations do not relieve the Pilot in Command from determining that the aircraft is in a fit condition for safe operation with specified unserviceabilities allowed by the MEL.

The provisions of the MEL are applicable until the aircraft commences the flight.

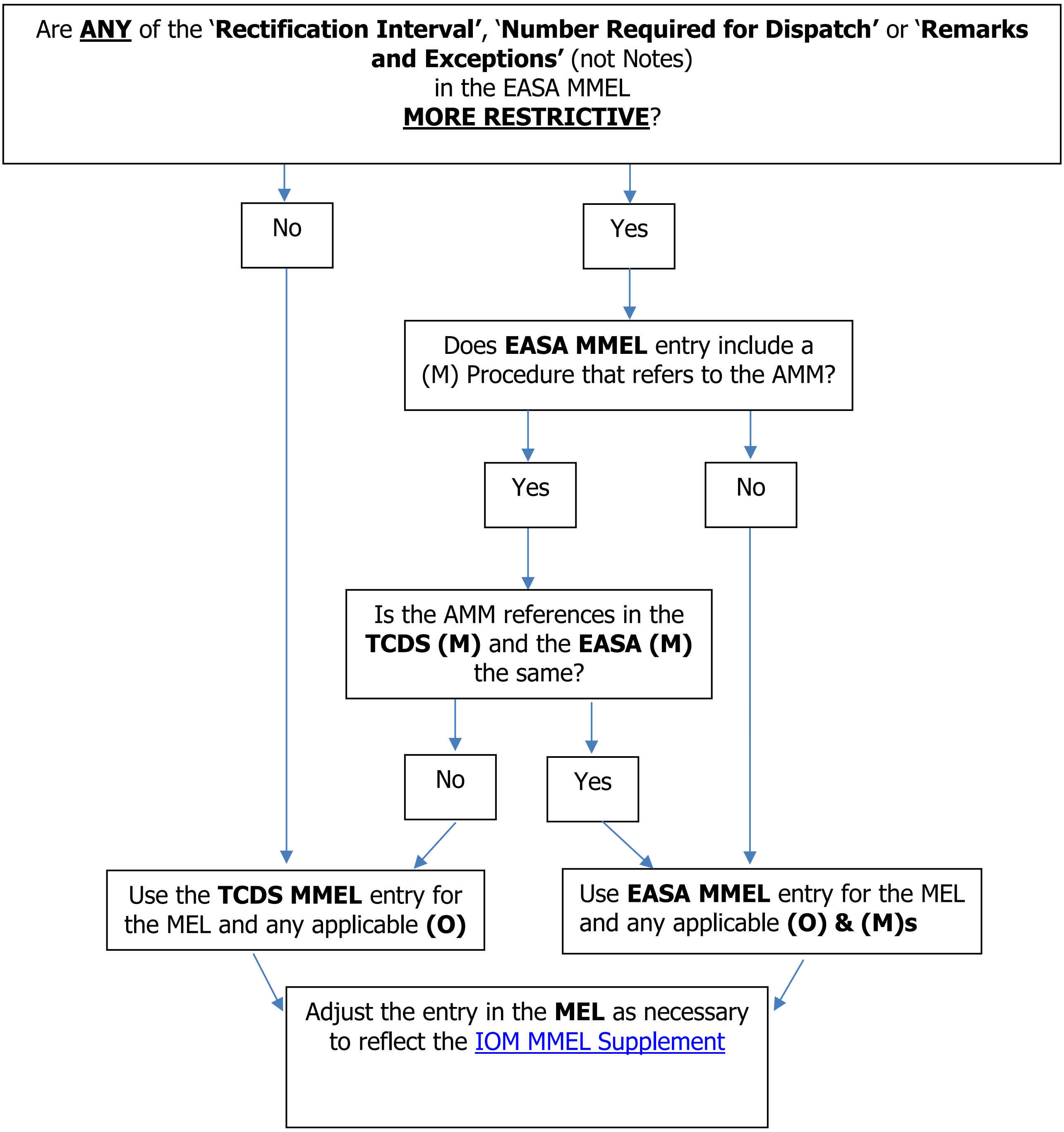
Any decision to continue a flight following a failure or unserviceability which becomes apparent after the commencement of a flight shall be the subject of pilot judgement and good airmanship. The Pilot in Command can continue to make reference to and use of the MEL as appropriate.

By approving the MEL, the IOMAR permits dispatch of the aircraft for flight with certain items or components inoperative provided an acceptable level of safety is maintained by use of appropriate operational or maintenance procedures, by transfer of the function to another operating component, or by reference to other instruments or components providing the required information.

Continue using the remainder of the Preamble from Appendix 1.

Appendix 5.2 Which MMEL to use?

The flow chart below has been designed to assist MEL Authors on when to use the EASA MMEL entry instead of the TCDS MMEL, although it must be recognised that it may not cover every circumstance.



5.3 Electronic Flight Bag (EFB)

5.3.0 General

Information and data for flight crews to use on the flight deck has traditionally been in paper format but now much, if not all, of this information is available electronically. The Electronic Flight Bag (EFB) is an electronic storage, retrieval and display system designed to replace traditional paper products in the cockpit. EFB devices can also store and display a variety of aviation data or perform calculations such as performance and mass and balance considerations. The scope of the EFB system functionality can also include various other hosted databases and applications. Physical EFB displays can use various technologies, screen sizes, formats and forms of communication.

The use of an EFB introduces a wide variety of hazards and risk that shall be carefully managed.

Contrary to common perception, the application process for use of installed EFB's on M-Registered aircraft is considerably simpler than most applicants initially thought, requiring less supporting documentation than portable EFB's. The IOMAR fully encourage the use of flight crews taking advantage of the full functionality of installed EFB's where possible.

The IOMAR categorises an EFB system as either 'portable' or 'installed' (replacing the previous Class 1, 2, and 3). Portable or Installed EFBs harmonise with the ICAO (and FAA & EASA) terminology and helps to accommodate increasingly complex systems integrating both installed and portable equipment. These new system classifications will help to assist the scoping of the Operational Risk Assessment (see Part 2 Chapter 5.3.5.1). EFBs can be either portable or installed (i.e., part of the aircraft definition).

5.3.1 EFB Definitions

'Electronic Flight Bag' (EFB) is an electronic information system, comprised of equipment and applications for flight crew, which allows for storing, updating, displaying and processing of EFB functions to support flight operations or duties.

'Portable EFB' is not part of the aircraft configuration and are considered to be PEDs. They generally have self-contained power and can rely on data connectivity to achieve full functionality. Modifications to the aircraft to use portable EFBs require the appropriate airworthiness approval depending on the State's regulatory framework.

'Installed EFB' is integrated into the aircraft, subject to normal airworthiness requirements and under design control. The approval of these EFBs is included in the aircraft's type certificate (TC) or in a supplemental type certificate (STC).

'Critical phases of flight' in the case of helicopters means taxiing, hovering, take-off, final approach, missed approach, the landing and any other phases of flight as determined by the pilot-in-command or commander.'

'Critical phases of flight' in the case of aeroplanes means the take-off run, the take-off flight path, the final approach, the missed approach, the landing, including the landing roll, and any other phases of flight as determined by the pilot-in-command or commander.'

'Portable Electronic Device' (PED) is any kind of electronic device, typically but not limited to consumer electronics, brought on board the aircraft by crew members, passengers, or as part of the cargo and that are not included in the approved aircraft configuration. All equipment that is able to consume electrical energy falls under this definition. The electrical energy can be provided from internal sources as batteries (chargeable or non-rechargeable) or the devices can also be connected to specific aircraft power sources.

Note: A PED becomes an EFB when:

1) it is used to display operational information during the flight;
2) it is used to calculate operational information relating to the flight, i.e. performance and/or mass & balance; Or
3) as a back-up for an installed or portable EFB or paper charts.

5.3.2 Regulatory Requirements

The Isle of Man the State of Registry is required by ICAO Annex 6 Part II & Part III, Section III to "establish criteria for the operational use of EFB functions to be used for the safe operation of aeroplanes/helicopters" and ensure that:

1) The EFB equipment and its associated installation hardware, including interaction with aeroplane/helicopter systems (if applicable) meet the appropriate airworthiness certification requirements.
2) The operator/owner has assessed and mitigated as far as possible the risks associated with the operations supported by the EFB functions
3) The operator/owner has established requirements for redundancy of the information contained in and displayed by the EFB functions.
4) The operator/owner has established and documented procedures for the management of the EFB functions including any databases it can use.
5) The operator/owner has established and documented the procedures for the use of, and training requirements for, the EFB functions.

Note: aircraft operators shall ensure that portable EFBs do not affect the performance of the aeroplane/helicopter systems, equipment or the ability to operate the aeroplane/helicopter.

5.3.2.1 Operator Responsibility

For portable and installed EFBs the aircraft operator shall:

1) assess the safety risk(s) associated with each EFB function (see Part 2 Chapter 5.3.5.1 Operational Risk Assessment);
2) establish the procedures for the use of, and training requirements for, the device and each EFB function; and
3) ensure that, in the event of an EFB failure, sufficient information is readily available to the flight crew for the flight to be conducted safely.

5.3.2.2 Regulatory Standards

The IOMAR recognises that different regulatory standards prevail and that strict alignment with one of the main regulatory regimes can present obstacles that do not enhance safety. Therefore, the use of appropriate supplementary guidance from ICAO, EASA or other aviation sources can be used as an aid to meeting these standards. This can include:

1) ICAO Doc 10020: Manual of Electronic Flight Bags.
2) FAA Advisory Circular No.120-76(): Authorization for Use of Electronic Flight Bags.
3) (EU) ED Decision 2014/001/R, 09/02/2014 Annex II, AMC 20-25.
4) Transport Canada Advisory Circular AC 700-020: Electronic Flight Bags.

5.3.3 Requirement for Non-Approved EFB On Board Aircraft

Any EFBs on board an aircraft that are not approved for operational use by the IOMAR shall be suitably placarded to state 'EFB is not approved for Operational Use' or similar wording.

In addition: -

a) The EFB shall be in working order and not defective
b) The EFB does not have to contain up to date data or software
c) All instructions for continuing airworthiness for the EFB system are to be carried out as part of the maintenance programme.
d) All crew are to be made aware that the EFB is not for operational use.

5.3.4 Operational Approval Application Process

An application for the approval of an EFB system shall be submitted for each registered aircraft by the Operator/Flight Operations Representative (FOR) on Form 91, which includes the minimum Operational Risk Assessment (ORA) requirement acceptable to the IOMAR.

The ORA shall be completed after the EFB system has been assessed by the EFB Administrator against the standards and guidance in this document.

5.3.5 Operator Assessment

5.3.5.1 Operational Risk Assessment

The Operator shall undertake an Operational Risk Assessment (ORA) which shall be submitted to the IOMAR as part of the application process. The ORA shall demonstrate that all the hazards arising from the use of an EFB system have been identified, and that the associated risks have been assessed and mitigated as far as possible.

The ORA shall be conducted in accordance with the Operators Safety Management System procedures for risk assessment and mitigation. If an operator already holds an existing EFB approval of the same EFB system classification (installed and/or portable)for other aircraft, of the same type, the ORA can take into account existing measures and processes where appropriate and subject to the proposed EFB having equivalent EFB technical and operational characteristics.

The scope of the ORA will for the most part depend on whether it is installed or portable. Particular attention shall be paid to those functions that are safety critical and have caused accidents in the past, such as performance calculations and mass and balance calculations. This shall include ensuring that there are explicit procedures for the flight crew management of last minute changes such as revised runway entry points and consequent reduced take off run available.

Guidance on generic hazards, risks, and possible mitigation measures for installed and portable EFBs is at Part 2 Chapter 5.3.8 - Appendix A. The ORA is also embedded within Form 91 to ensure the ORA submitted as part of the application meets the minimum standards acceptable to the IOMAR.

Additional guidance is provided on the IOMAR website concerning lithium battery fires and rapid decompression testing for portable hardware devices.

5.3.5.2 Human Machine Interface Assessment

For portable EFB systems, an assessment of the human/machine interface (HMI) aspects of the EFB device(s) shall be carried out, documented and retained by the operator. The assessment shall include workload, usability, integration into the flight deck, display and lighting issues. Evidence of an HMI assessment from the EFB manufacturer shall be sought in the first instance.

Further guidance on the contents of a HMI assessment is at Part 2 Chapter 5.3.8 - Appendix B.

5.3.6 Operational Management

5.3.6.1 EFB Administrator

The role of the EFB Administrator is a key factor in the effective management of an operator's EFB system. Complex EFB systems can require more than one individual to conduct the administration process, but one person shall be designated as the EFB Administrator responsible for the complete system with appropriate authority within the operator's management system.

Initial and recurrent training shall be provided to the EFB Administrator to ensure that they are capable to undertake the responsibilities.

The operator shall make arrangements to ensure the continuity of the management of the EFB system in the absence of the EFB Administrator.

The EFB Administrator responsibilities include ensuring: -

a) the Operational Risk Assessment and HMI Assessment are completed accurately and completely, and are updated as necessary;

b) any hardware conforms to the required specification;

c) the hardware, software and data packages conform to the required specification and are the correct versions;

d) that no unauthorised software is installed;

e) only the current versions of application software and data packages are installed;

f) all staff who can be involved with the system are aware of their roles and responsibilities, and the hazards that are associated with the use of an EFB;

g) security knowledge of EFB systems is up to date and that potential security issues associated with the application installed have been checked;

h) EFB users are appropriately supported on the use of the applications;

i) an appropriate level of testing on new/updated EFB software and operating system is conducted;

j) appropriate safeguards are provided to protect the integrity of electronically held documentation and data from unauthorised changes;

k) oversight of sub-contracted services associated with the EFB system; and

l) coordination of the flow of information within the Operator's departments required to maintain an effective EFB system, e.g. when an EFB system is introduced or modified the MEL can require amending, refer to Part 2 Chapter 5.2.3 for MEL Amendments.

The EFB Administrator will interface with the operator's Compliance Monitoring and/or Safety Management Systems, and ensure that appropriate action is taken when required by these systems.

5.3.6.2 Quality/Compliance Monitoring and Safety Management Systems

The Operator's Quality/Compliance Monitoring System and Safety Management System shall incorporate the EFB into the respective audit schedules and processes. The systems shall provide for incident and fault reporting associated with the EFB system.

5.3.6.3 Incorporation of ADs and/or STCs into an EFB

Airworthiness Directives (ADs), Supplementary Type Certificates (STCs) or other documents, sometimes require a page(s) to be inserted into an AFM/RFM or amended by hand – where the AFM/RFM is held on an EFB approved by the IOMAR, this can be difficult or impossible to achieve. The IOMAR recognise the difficulties of achieving full compliance with this requirement of the AD or STC, where such a supplement requirement exists.

Therefore the IOMAR accepts the following alternative means of compliance where an AD or STC requires an AFM page to be insertion or amended by hand:

- A copy of the applicable page identified in the AD or STC to be kept on-board the aircraft in hard copy; or
- A copy of the applicable page identified in the AD or STC can be available on the EFB or other digital equipment.

In both cases, the operator shall implement a robust process to ensure that all flight crew are made aware of the AD or STC information and where it is stored.

Operators can choose to keep both a hard copy of the AFM/RFM and an electronic copy on the EFB, however both copies shall be at the same/latest revision status.

5.3.6.4 Changes to Approved EFB System

Changes to the use of an approved EFB system does not require additional approval from the IOMAR. However, the Operator shall update the Operational Risk Assessment (see Part 2 Chapter 5.3.5.1) and document the results in accordance with their own Safety Management System requirements (see Part 2 Chapter 5.3.6.2).

Note: updates to operating system and databases are not considered to be changes but instead shall be managed, controlled and tested as part of the ongoing EFB operation.

Operator with an approved EFB who wish to remove the hard copies of documents/manuals etc., which are available on the EFB shall ensure that the transfer is managed appropriately with appropriate mitigations implemented.

5.3.7 Training

5.3.7.1 General

All personnel who have a role in the EFB system shall be trained initially and on a recurrent basis. All training requirements shall be described in appropriate manuals, and training records completed and retained for at least the period of employment plus 1 year.

5.3.7.2 EFB Administrator Training

Initial and recurrent training shall be provided to the EFB Administrator to ensure that they are capable to undertake the responsibilities.

5.3.7.3 Flight Crew Training

Initial and recurrent Ground Training shall include at least the following:

a) an overview of the system architecture;
b) pre-flight checks of the system;
c) limitations of the system;

d) specific training on the use of each application and the conditions under which the EFB can and cannot be used;

e) restrictions on the use of the system, including where some or all of the system is not available;

f) procedures for normal operations;

g) procedures to handle abnormal situations, such as a late runway change or diversion to an alternate aerodrome;

h) procedures to handle emergency situations;

i) procedures for cross-checking of data entry and computed information;

j) phases of flight when the EFB system can and cannot be used;

k) CRM and human factor considerations on the use of the EFB; and

l) additional training for new applications, or changes to the hardware configuration.

5.3.7.4 Simulator or Aircraft Training:

a) Initial and recurrent simulator or aircraft training shall incorporate use of the EFB. As far as practicable, it is recommended that the training simulator environment includes the EFBs in order to offer a higher level of representativeness.

b) Consideration shall also be given to the role that the EFB system plays in operator proficiency checks as part of recurrent training and checking, and to the suitability of the training devices used during training and checking.

c) As new aircraft types are introduced, simulator operators can be unable to equip training devices with fully-functional EFB systems, which reflect the hardware and/or software status of the Operator's aircraft. Operators shall liaise with simulator operators at the earliest opportunity and determine how to provide adequate EFB training. Where no flight simulator is available to reflect the EFB equipage, suitable methods shall be established for initial and recurrent EFB training.

d) Small Operators can lack sufficient expertise or resources to adequately support the management of EFB software and data. Where such functions are outsourced, the Operator shall be aware of the need to monitor the accuracy of the sub-contractor's services.

e) Small Operators can introduce EFB-equipped aircraft for which no flight simulator is available. Suitable methods shall be established for initial and recurrent EFB training.

5.3.8 EFB Appendices

Appendix A Guidance on Conducting an EFB ORA

The objective of the Operational Risk Assessment is to demonstrate that the EFB achieves at least the same level of integrity and availability as the "traditional" means that it is intended to replace and risks are appropriately mitigated and controlled. This analysis can make use of assessments previously carried out by the manufacturer or EFB supplier, which should be reviewed, validated and built upon to ensure that is appropriately reflects the operator's particular scope and type of use and the requirements of this publication.

The following is intended to act as a guide to operators in developing their EFB Operational Risk Assessment. It is recommended that operators consider each issue as relevant depending on the EFB system classification, consider the risk posed and identify appropriate measures to mitigate the risk.

Where a mitigation listed below is used, this shall not be just copied and pasted into the Operational Risk Assessment but shall be evidenced e.g. by providing appropriate references to documents or recording specific actions completed.

Category	Risk	Possible Mitigations	Portable	Installed
Power and batteries	Lithium battery leakage and/or overheat, or fire	*Ensure replacement batteries and chargers are approved by manufacturer of EFB*	√	
		Procedures for storage of spares that prevents the potential for short circuit	√	
		Procedures and limitations for recharging of batteries so as to prevent battery overheating or overcharging.	√	
		Appropriate lithium battery firefighting procedures and equipment.	√	
	Battery discharge – loss of power	*Backup procedures for battery loss of power*	√	
Aircraft Interface	EFB places undue power load on aircraft system	*Limitations for use of certified power sources*	√ Only when connected into the aircraft for power	

Category	Risk	Possible Mitigations	Portable	Installed
Hardware	EFB causes physical and/or visual obstruction to other instruments/controls and, or external vision	*Assessment of placement for operational use and emergency evacuation*	√	
		EFB stowage area with securing mechanism that avoids interference with flight controls and instruments and is readily accessible in flight	√	
		Procedures for unsecured EFB stowage to prevent the device jamming flight controls, damaging flight deck, or injuring crew in the event of turbulence etc.	√	
		Cabling secured and of appropriate length so as to not cause a safety hazard but to enable safe use.	√ Only when connected into the aircraft for power	
	Effect of turbulence, hard landings, or other action on EFB **viewable stowage**	*Procedures have been established (e.g. crew procedures, checks, or maintenance actions) to ensure that the stowage characteristics remain within acceptable limits for the proposed operations.* *It has been demonstrated that viewable stowage devices have been proven to be able to withstand all foreseeable conditions including turbulence or hard landings.* *The manufacturer has demonstrated that if the viewable stowage is unsecured from the aircraft (as a result of turbulence, manoeuvring, or other action), it will not jam flight controls, damage flight deck equipment, or injure flight crew members.*	√	
	Effect of rapid depressurisation on EFB within pressurised aircraft	*Reference to testing completed by the COTS supplier for aviation use.* *Rapid decompression testing (type B software only) in accordance with accepted procedures e.g. EUROCAE ED-14D/RTCA DO-160* *For an EFB that has failed rapid decompression testing while turned on but successfully completed it when off, procedures in place to ensure that at least one EFB on board the aircraft remains off during the applicable flight phases, or alternative paper back up available.*	√	
	Complete or partial failure of a single EFB	*Back up procedures and data (paper, alternative EFB from a different power source etc.)*	√	√

Category	**Risk**	**Possible Mitigations**	**Portable**	**Installed**
Operations	Software updates	*Test software on clean device before live operation* *Backup procedures and data* *Virus protection procedures and tools*	√	
	Database updates	*Procedures for monitoring database expiry*	√	
	Erroneous input / output NOTE: For performance and mass and balance calculations in particular, errors can easily lead to catastrophic outcomes. Therefore, the IOMAR requires applicants to pay particular attention to these risks.	*Cross check procedures that define any roles that the flight crew and others involved in performance calculations may have in creating, reviewing, cross checking, communicating and using performance calculations supported by EFB systems.* *Cross check procedures that define any roles that the flight crew and others involved in the calculation of the mass and balance in creating, reviewing, cross checking, communicating and using mass and balance calculations supported by EFB systems.*	√	√
		Procedures implemented to delete calculation results and any outdated input fields, when modifications are entered, the Performance App is closed, or either the App or EFB have been in stand-by or background mode too long.	√	√
		Procedures to ensure that the flight crew know which aircraft system (e.g. Engine Indicating and Crew Alerting System, Flight Management System or EFB system) to use for a given purpose, especially when both the aircraft and EFB systems provide similar information. *Procedures to define the actions to be taken when information provided by an EFB system does not agree with that from other flight deck sources, or when one EFB system disagrees with another.* *If an EFB system generates information similar to that generated by existing flight deck automation, procedures should clearly identify which information source will be primary, which source will be used for back up information, and under what conditions to use the back-up source.*	√	√

Category	Risk	Possible Mitigations	Portable	Installed
Operations (Cont.)	Flight crew workload	*The EFB software design should minimize flight crew workload and head-down time.* *Procedures to mitigate and/or control any additional workload created by using an EFB system and to avoid both flight crew members becoming preoccupied with the EFB system at the same time.* *Procedures for workload sharing between flight crewmembers to ensure ease of use and continued monitoring of other flight crew functions and aircraft equipment.* *Procedures to specify when the EFB may not be used. Avoid complex, multi-step data entry tasks during take-off, landing, and other critical phases of flight.*	√	√
	EFB non availability (pre-flight)	*Impact of the EFB system on the Minimum Equipment List (MEL) determined.* *Availability of the EFB to be confirmed by pre-flight checks.* *Instructions to flight crew should clearly define actions to be taken in the event of any EFB system deficiency and whether dispatch is allowed.*	√	√
	Moving Map Display (MMD) Procedures and Training	*Flight crew training includes MMD crew procedures & limitations and has been developed highlighting that it is only an aid to positional awareness and not to be used as the basis for ground manoeuvring.* *When MMD is in use, the primary means of navigation whilst taxiing remains the use of normal procedures and direct visual observation out of the cockpit window.*	√	√
	Abrasion and ageing	*Protective screen covers* *Routine inspections* *Damage reporting procedures*	√	
Security	Unauthorised intervention	*Security procedures to protect the system at software level and to manage hardware.*	√	

Appendix B Guidance ON Conducting A HMI Assessment

HMI assessments should include a review of the complete system to include at least the points below (unless previously carried out by the manufacturer or EFB supplier).

INTERFACES, COLOURS, SYMBOLOGY:

- The EFB user interface should be consistent and intuitive within and across various EFB applications, including, but not limited to, data entry methods, colour-coding philosophies, terminology, and symbology).

LEGIBILITY OF TEXT:

- Information displayed on the EFB should be legible to the typical user at the intended viewing distance(s) and under the full range of lighting conditions expected on a flight deck, including use in direct sunlight.
- Users should be able to adjust the screen brightness of an EFB independently of the brightness of other displays on the flight deck. Brightness should be adjustable in fine increments. In addition, when incorporating an automatic brightness adjustment, it should operate independently for each EFB in the flight deck. Brightness adjustment using software should not adversely affect flight crew workload.
- Buttons and labels should have adequate illumination for night use.
- All controls must be properly labelled for their intended function.
- The EFB should not produce objectionable glare or reflections that could adversely affect the pilot's visual environment.

APPROACH/DEPARTURE AND NAVIGATION CHART DISPLAY:

- Electronic aeronautical charts should provide a level of information comparable to paper charts. This requires appropriate screen size and resolution that is comparable to the readability of the paper information it is intending to replace.

RESPONSIVENESS OF APPLICATION:

- The system should provide feedback to the user when user input is accepted.
- If the system is busy with internal tasks that preclude immediate processing of user input (e.g. calculations, self-test, or data refresh), the EFB should display a "system busy" indicator (e.g. clock icon) to inform the user that the system is occupied and cannot process inputs immediately.
- The timeliness of system response to user input should be consistent with an application's intended function. The feedback and system response times should be predictable to avoid flight crew distractions and/or uncertainty.

OFF-SCREEN TEXT AND CONTENT:

- If the document segment is not visible in its entirety in the available display area, such as during "zoom" or "pan" operations, the existence of off screen content should be clearly indicated in a consistent way. For some intended functions it can be unacceptable if certain portions of documents are not visible. The basis of this evaluation should be on the application and intended operational function.
- If there is a cursor, it should be visible on the screen at all times while in use. The default position should be easily accessible after any active manipulation (e.g. zooming, panning, or decluttering).

ACTIVE REGIONS:

- Active regions are regions to which special user commands apply. The active region can be text, a graphic image, a window, a frame, or another document object. If the display uses active regions, these regions should be clearly indicated.

MANAGING MULTIPLE OPEN APPLICATIONS AND DOCUMENTS:

- If the electronic document application supports multiple open documents, or the system allows multiple open applications, indication of which application and/or document is active should be continuously provided. The active document is the one that is currently displayed and responds to user actions.
- Under non-emergency, normal operations, the user should be able to select which of the open applications or documents is currently active. In addition, the user should be able to find which flight deck applications are running and switch to any one of these applications easily. When the user returns to an application that was running in the background, it should appear in the same state as when the user left that application—other than differences associated with the progress or completion of processing performed in the background.

MESSAGES

- EFB messages and reminders should be integrated with (or compatible with) presentation of other flight deck system alerts.
- EFB messages, both visual and auditory, should be inhibited during critical phases of flight. Flashing text or symbols should be avoided in any EFB application.
- Messages should be prioritised and the message prioritisation scheme evaluated and documented. Additionally, during critical phases of flight, required flight information should be continuously presented without un-commanded overlays, pop-ups, or pre-emptive messages, except those indicating the failure or degradation of the current EFB application.
- System error messages: If an application is fully or partially disabled, or is not visible or accessible to the user, it can be desirable to have a positive indication of its status available to the user upon request. Certain nonessential applications such as email connectivity and administrative reports can require an error message when the user actually attempts to access the function, rather than an immediate status annunciation when a failure occurs. EFB status and fault messages should be prioritised and the message prioritisation scheme evaluated and documented.

DATA ENTRY SCREENING AND ERROR MESSAGES

- If user-entered data is not of the correct format or type needed by the application, the EFB should not accept the data. An error message should be provided that communicates which entry is suspect and specifies what type of data is expected. The EFB system and application software should incorporate input error checking that detects input errors at the earliest possible point during entry, rather than on completion of a possibly lengthy invalid entry.

INPUT DEVICES:

- In choosing and designing input devices such as keyboards or cursor-control devices, operators should consider the type of entry to be made and flight deck environmental factors, such as turbulence and other normal vibrations that could affect the usability of that input device. Typically, the performance parameters of cursor-control devices are tailored for the intended application function as well as for the flight deck environment. Input devices should provide feedback to indicate when operational.

POSITION:

- If it has a stowed position the EFB should be easily accessible when stowed.
- When the EFB is in use and is intended to be viewed or controlled, it should be within 90 degrees on either side of each pilot’s line of sight.

- If an EFB is being used to display flight critical information such as for navigation, terrain and obstacle warnings that require immediate action, take-off and landing V-speeds, or for functions other than situational awareness, then such information needs to be in the pilot's primary field of view. This requirement does not apply if the information is not being directly monitored from the EFB during flight. For example, an EFB can generate take-off and landing V-speeds, but these speeds are used to set speed bugs or are entered into the AFMS, and the airspeed indicator is the sole reference for the V-speeds. In this case, the EFB need not be located in the pilot's primary field-of-view. A 90-degree viewing angle can be unacceptable for certain EFB applications if aspects of the display quality are degraded at large viewing angles (e.g. the display colours wash out or the displayed colour contrast is not discernible at the installation viewing angle).
- In addition, consideration should be given to the potential for confusion that could result from presentation of relative directions (e.g. positions of other aircraft on traffic displays) when the EFB is positioned in an orientation inconsistent with that information. For example, it can be misleading if own aircraft heading is pointed to the top of the display and the display is not aligned with the aircraft longitudinal axis.

REFLECTION:

- In the position in which it is intended to be used, the EFB should not produce objectionable glare or reflections that could adversely affect the pilot's visual environment.

5.4 Airport Specific Approval

Where an airport requires an approval to be issued by the State of Registry, the IOMAR may issue an approval if the applicant demonstrates the requirements stated in the applicable local airport regulations published in the Aeronautical Information Publication (AIP) or similar official document.

5.4.0 Application Process

To apply for an airport specific approval, the operator must compete and submit a Form 40, together with a copy of the applicable local airport regulations published in the Aeronautical Information Publication (AIP) and all the required supporting documentation.

5.4.1 London City (EGLC) Steep Approach

5.4.1.0 General

With the development of airports typically in congested city areas there is a need for aircraft to operate safely into such airports whilst avoiding obstacles by use of a steep approach.

The lowest value of approach path angle to be considered for steep approach landing rules is 4.5°.

London City Airport (EGLC) is an airport in the docklands of London City very close to the financial district and has a 5.5° steep approach equipped runway.

5.4.1.1 EGLC Steep Approach Approval Process

In order to apply for EGLC Steep Approach Approval, an Airport Specific Application Form shall be submitted to the IOMAR together with: -

1) a copy of the AFM Steep Approach evidence (including evidence of embodiment of any modifications referred to); and
2) procedures for approach path angles of 5.5° or steeper.

Once satisfied that the approval can be issued, the IOMAR will add 'London City Steep Approach' to the aircraft Operations Specification (Ops Spec) certificate.

The operator should then provide a copy of the Ops Spec certificate to London City Jet Centre to obtain permission to operate into London City Airport.

5.4.1.2 Changes to London City (EGLC) Steep Approach Approval

Once approval has been granted, any changes to the procedures must be submitted to the IOMAR for approval using the Form 40.

5.4.2 Lugano Airport (LSZA) Approval

5.4.2.0 General

Lugano international airport is only 6 km away from the centre of Lugano, the 3rd most important financial centre in Switzerland, and on the border with Italy, allowing easy and fast connections to Milan.

The use of IFR approach or departure procedures at Lugano airport is limited to flight crews holding a Pilot Qualification

Lugano Airport has a 6.65° steep approach to Runway 01 with a circling to land on Rwy 19.

5.4.2.1 LSZA Specific Approval Requirements

Depending on the type of approach or departure, the State of Registry is required to approve the Training Syllabus and/or Contingency Procedures.

- Runway 01 Increased Glide Slope (IGS) 6.65° Approach, requires approval of Type C Training Syllabus.
- Runway 19 LOC DME Circling Charlie Approach requires approval of both Type B Training Syllabus and Contingency Procedures.
- Runway 01/19 Take-off with vis between 400 – 3000 m, requires approval of both Type B Training Syllabus and Contingency Procedures.

In order to apply for Lugano Special Approval, the Airport Specific Application Form shall be submitted to the IOMAR together with: -

1) A copy of the AFM Steep Approach evidence (including evidence of embodiment of any modifications referred to) (and letter of non-objection if applicable); and
2) Type B or Type C training (as applicable) flight crew training Syllabus; and
3) Copy of contingency procedures (acc. PANS OPS).

Once satisfied that the approval can be issued, the IOMAR will issue an Operations Specification (Ops Spec) certificate which will include the details of the approval for Lugano.

The Operator must then liaise with Lugano Airport Authority to obtain permission to operate into Lugano Airport.

More details can be found Lugano Airport Authority Training Requirements Application Manual (TRAM) which can be accessed via the Lugano Airport website.

The TRAM contains the training syllabus requirements for both Type B and Type C pilot qualifications.

5.4.2.2 Changes to Lugano Airport (LSZA) Approval

Once approval has been granted, any changes to the training syllabus and/or the Contingency Procedures must be submitted to the IOMAR for approval using the Form 40.

5.5 Carriage of Dangerous Goods Approval

5.5.0 General

An operator can only carry dangerous goods (apart from those items which do not require an approval), when approved by the IOMAR.

To obtain an approval to carry dangerous goods, the operator shall demonstrate to the IOMAR, how they meet the requirements of the Technical Instructions (refer to Part 1 Chapter 7.1.2) in accordance with the Dangerous Goods Order, refer to Part 1 Chapter 7.1.3.

In order for an approval to carry dangerous goods to be granted, the operator must demonstrate compliance with the requirements of this sub-chapter, in addition to the following 'non-carry operators' requirements: -

Part 1 Chapter 7.2.3 - Provision of Information to Passengers;

Part 1 Chapter 7.2.5 – Recognition of Undeclared Dangerous Goods;

Part 1 Chapter 7.2.8 – Reporting of Dangerous Goods Occurrences; and

Part 1 Chapter 7.5 – Carriage of Weapons and Munitions of War.

5.5.0.1 Initial Application Process

Operators wishing to apply for approval to carry dangerous goods must submit to the IOMAR a completed Form 22, together with the following documents: -

- Initial & recurrent dangerous goods training material, including exam papers & example completion certificate;
- Dangerous goods acceptance procedures & checklist;
- Dangerous Goods section of the Company Operations Manual (COM), or equivalent document; and
- Occurrence Reporting section of the COM, or equivalent document.

Approval to carry dangerous goods will be added to the aircraft specific Operations Specification certificate (Ops Spec) and will be granted for up to 3 years, or the expiry of the current Ops Spec.

5.5.0.2 Renewal Application Process

Form 4a should be used to renew a dangerous goods approval.

Form 4a lists the additional documentation which must be submitted to the IOMAR to support the renewal of the carriage of dangerous goods approval.

5.5.0.3 Changes to Dangerous Goods Approval

Changes to the Scope of the Approval, Dangerous Goods section of the COM (or equivalent document), Dangerous Goods Training Material or Acceptance Procedures/Checklist must be submitted to the IOMAR for approval, using Form 22a.

Changes to the Dangerous Goods section of the COM (or equivalent document) **which are purely administrative**, do not require approval from the IOMAR.

5.5.1 Dangerous Goods Policy & Procedures

The Company Operations Manual (COM), or equivalent document, shall include the policy and procedures relating to the carriage of dangerous goods.

5.5.1.1 Policy on the Carriage of Dangerous Goods

The COM shall include details of the operator's policy in relation to the carriage of DG, including: –

- the rules and regulations pertaining to the approval (i.e. Civil Aviation (Safe Transport of Dangerous Goods by Air) Order 2020 and the latest edition of the ICAO Technical Instructions, including any exemptions and conditions included in the approval; (**Note:** the current IATA Dangerous Goods Regulations can be used to comply with the latest edition of the ICAO Technical Instructions;)
- any restrictions imposed by the operator;
- items that can be carried by passengers & crew (refer to Part 1 Chapter 7.2.4);
- items required for medical assistance (refer to Part 1 Chapter 7.2.6); and
- items required for veterinary aid (refer to Part 1 Chapter 7.2.7).

5.5.1.2 Dangerous Goods Manager

An operator applying for approval to carry dangerous goods shall nominate an individual to be responsible for all matters relating to the carriage of dangerous goods. That individual shall have sufficient authority to perform these functions.

The name and contact information (email and telephone) shall be included in the COM.

The Dangerous Goods Manager is responsible for ensuring that the relevant section(s) of the Company Operations Manual (COM) relating to the carriage of dangerous goods is up to date and disseminated to all relevant personnel, refer to Part 2 Chapter 5.5.0.3.

5.5.1.3 Duties of Personnel Involved

To ensure all operational staff are aware of their responsibilities, the COM shall include details of the duties associated with the carriage of dangerous goods.

PERSONNEL	DUTIES
Dangerous Goods Manager Responsible for Operator's Dangerous goods Approval	• Oversight and control of the carriage of dangerous goods. • Ensuring all necessary permissions, approvals and exemptions are held. • Arranging for approval of any changes to the: - ➢ Scope of the Approval, ➢ Dangerous Goods section of the COM (or equivalent document), ➢ Dangerous Goods Training Material or ➢ Acceptance Procedures/Checklist. • Generation (or acceptance) of relevant procedures. • Responding to queries regarding the carriage of dangerous goods.

PERSONNEL	**DUTIES**
Compliance Monitoring Manager, Auditors and Safety Manager	• Ensuring that activities are monitored for compliance with dangerous goods requirements and that these activities are carried out properly under the supervision of the relevant head of functional area. • Ensuring the initiation and follow-up of internal occurrence / accident investigations.
Shipper	• Correct Packaging, marking & labelling i.a.w. the ICAO Technical Instructions. • Responsible for completing the Dangerous Goods Transport Document (Shippers Declaration)
Cargo Department	• Arrangement of the carriage of dangerous goods only in accordance with the operator's stated policies. • Recognition of undeclared dangerous goods.
Persons receiving or handling dangerous goods	• Acceptance procedures for dangerous goods are carried out as required by the Technical Instructions. • Inspection procedures during the processing of dangerous goods for transport are carried out as required by the Technical Instructions. • Dealing with dangerous goods that are found damaged or leaking during processing for transport. • Dangerous goods are loaded, segregated, stowed and secured on an aircraft in accordance with the Technical Instructions. • Generation of written information to the commander (NOTOC). • Provision of written information about dangerous goods loaded on board to the commander for signature. • Retention of documentation on the ground. • Recognition of undeclared dangerous goods. • Reporting of dangerous goods occurrences (refer to Part 1 Chapter 7.2.8).
Operations Personnel	• If there is an aircraft incident or accident, information is passed to emergency services and state Authorities as required by the Technical Instructions (refer to Part 2 Chapter 5.5.6.1). • Reporting of dangerous goods occurrences (refer to Part 1 Chapter 7.2.8).

PERSONNEL	**DUTIES**
Flight Crew	• Ensuring that the provisions concerning passengers and dangerous goods are complied with. • With the aim of preventing dangerous goods which passengers are not permitted to have from being taken on board an aircraft in their baggage, seeking confirmation from a passenger about the contents of any item where there are suspicions that it could contain dangerous goods. • When baggage intended as carry-on is taken by the operator and placed into the cargo compartment for carriage, seeking confirmation from the passenger that dangerous goods which are only permitted in carry-on baggage (e.g. lithium batteries, including power banks) have been removed. • Recognition of undeclared dangerous goods. • Signature of NOTOC to indicate receipt of information. • If an in-flight emergency occurs, as soon as the situation permits, passage of details of dangerous goods on board to the appropriate Air Traffic Services Unit. • Reporting of dangerous goods occurrences (refer to Part 1 Chapter 7.2.8).
Cabin Crew (if operation does not have cabin crew, the Flight Crew shall carry out these functions).	• Ensuring that the provisions concerning passengers and dangerous goods are complied with. • When baggage intended as carry-on is taken by the operator and placed into the cargo compartment for carriage, seeking confirmation from the passenger that dangerous goods which are only permitted in carry-on baggage (e.g. lithium batteries, including power banks) have been removed. • Responding to a dangerous goods incident or accident in the cabin. • Ensuring that the provisions concerning passengers and dangerous goods are complied with. • Reporting of dangerous goods occurrences (refer to Part 1 Chapter 7.2.8).
Trainers	• Provision of initial and recurrent dangerous goods training commensurate with the responsibilities of the personnel concerned.

5.5.1.4 Dangerous Goods Transport Documents

The Shipper must provide a Dangerous Goods Transport Document (otherwise known as a Shippers Declaration) when items containing dangerous goods, apart from those which do not require approval, are to be carried on board.

The Dangerous Goods Transport Document must include the following information: -

a) UN/ID number preceded by the letters 'UN' or 'ID';

b) Proper Shipping Name;

c) Primary Hazard class, or where assigned, the division of the goods;

d) Subsidiary hazard or division number(s) corresponding to the subsidiary hazard label(s) required to be applied; and

e) Where assigned, the packing group for the item.

And any other information as required by the ICAO Technical Instructions.

Note: limitations on the use of the aircraft apply, i.e. the aircraft cannot be used for commercial operations, therefore no remuneration can be provided by the shipper to the owner or operator.

5.5.1.5 Retention of Dangerous Goods Documentation

Dangerous Goods Transport Documents (refer to Part 2 Chapter 5.5.1.4), Acceptance Checklist (refer to Part 2 Chapter 5.5.3) and NOTOCs (refer to Part 2 Chapter 5.5.5.8) must be retained for a minimum of three months.

5.5.2 Dangerous Goods Training Programme Approval

Operators approved to carry dangerous goods must establish and maintain initial and recurrent dangerous goods training programmes for all personnel involved in the transport of dangerous goods, including:

- Flight crew and other crew members,
- loadmasters, load planners and flight operations officers/flight dispatchers; and
- acceptance staff.

Both initial and recurrent training programmes must be approved by the IOMAR.

Changes to the ICAO Technical Instructions and/or company procedures/policies must be reflected in the training material.

All changes to the training material must be approved by the IOMAR, refer to Part 2 Chapter 5.5.0.3.

5.5.2.1 Objective of Dangerous Goods Training/Curricula

The operators must ensure that personnel are competent to perform any function for which they are responsible prior to performing any of these functions. This must be achieved through training and assessment commensurate with the functions for which the individual is responsible. Such training must include:

a) **general awareness/familiarization training** — Personnel must be trained to be familiar with the general provisions;

b) **function-specific training** — Personnel must be trained to perform competently any function for which they are responsible; and

c) **safety training** — Personnel must be trained on how to recognize the hazards presented by dangerous goods, on the safe handling of dangerous goods, and on emergency response procedures.

5.5.2.2 Recurrent Dangerous Goods Training and Assessment

The operator must ensure that all personnel receive recurrent training and assessment within 24 months of previous training and assessment to ensure that competency has been maintained. However, if recurrent training and assessment is completed within the final three months of validity of the previous training and assessment, the period of validity extends from the month on which the recurrent training and assessment was completed until 24 months from the expiry month of that previous training and assessment.

The operator must have a process for employees who fail the dangerous goods assessment.

The expiry date of dangerous goods training is absolute and an offence against the regulations will be committed if an operator's staff continue to work after their training qualification has expired. It is therefore essential that operators have a structured system that ensures the timely programming and delivery of recurrent dangerous goods training.

5.5.2.3 Training Records & Certificate of Training

The operator must maintain a record of training and assessment for all applicable personnel which must include: -

a) the individual's name;

b) the month of completion of the most recent training and assessment;

c) a reference to the training material used;

d) the name and address of organisation providing the training and assessment; and

e) evidence which shows that the personnel have been assessed as competent.

Training and assessment records must be retained by the operator for a minimum period of 36 months from the most recent training and assessment completion month and must be made available upon request to the individual or the IOMAR.

5.5.2.4 Instruction Qualifications and Competencies

Instructors delivering classroom based initial and recurrent dangerous goods training programmes must at least every 24 months deliver such courses, or in the absence of this attend recurrent training.

5.5.3 Acceptance of Dangerous Good for Transportation

5.5.3.1 Acceptance Procedures

The operator must establish and use an Acceptance Checklist before accepting a consignment consisting of a package or overpack containing dangerous goods, a freight container containing radioactive material or a unit load device. The acceptance checklist must, verify the following:

a) the documentation or, when provided, the electronic data is compliant with the applicable requirements

b) the quantity of dangerous goods stated on the dangerous goods transport document is within the limits per package on a passenger or cargo aircraft as appropriate;

c) the package, overpack or freight container marks accord with the details stated on the accompanying dangerous goods transport document and is clearly visible;

d) where required, the letter in the packaging specification marking designating the packing group for which the design type has been successfully tested is appropriate for the dangerous goods contained within. This does not apply to overpacks where the specification marking is not visible;

e) proper shipping names, UN numbers, labels, and special handling instructions appearing on the interior package(s) are clearly visible or reproduced on the outside of an overpack;

f) the labelling of the package, overpack or freight container is as required for the consignment;

g) the outer packaging of a combination package or the single packaging is permitted by the applicable packing instruction, and when visible is of the type stated on the accompanying dangerous goods transport document;

h) the package or overpack does not contain different dangerous goods which require segregation from each other; and

i) the package, overpack, freight container or Unit Load Device (ULD) is not leaking and there is no indication that its integrity has been compromised.

The operator must be able to identify the person who performed the acceptance check.

Changes to the Acceptance Procedure must be approved by the IOMAR, refer to Part 2 Chapter 5.5.0.3.

Note 1: An acceptance check is not required for dangerous goods in excepted quantities, radioactive material in excepted packages and lithium batteries consigned in accordance with Section II of the applicable packing instruction.

Note 2: Persons conducting dangerous goods acceptance checks must have received dangerous goods training commensurate with this responsibility.

Note 3: A copy of the dangerous goods transport document must accompany the consignment and a copy held on the ground at a location where it can be accessed within a reasonable period until the dangerous goods have arrived at their final location.

5.5.3.2 Rejection Procedure

In the event that an item of dangerous goods is presented for carriage which does not pass the acceptance checklist, the Operator must establish a rejection procedures.

5.5.3.3 Pilot Procedure

The operator must establish procedures to ensure that the PIC adequately supervises the loading and unloading of dangerous goods.

5.5.4 Storage & Handling of Dangerous Goods

5.5.4.1 Storage of Dangerous Goods

The Operators must establish procedures to ensure items of dangerous goods are stored correctly, and that dangerous goods marks and labels are not covered or obscured by any part of or attachment to the packaging or any other label or marking.

5.5.4.2 Handling of Dangerous Goods

The Operators must establish procedures to ensure items of dangerous goods are handled correctly.

5.5.5 Loading of Dangerous Goods

The Operators must establish procedures to ensure items of dangerous goods are loaded, secured, segregated and separated in accordance with the Technical Instructions.

The Operators must establish procedures to ensure that dangerous goods marks and labels are not covered or obscured by any part of or attachment to the packaging or any other label or marking.

5.5.5.1 Prohibition on the Carriage of Dangerous Goods Within a Cabin Occupied by Passengers

The operator must specify in the COM that dangerous goods must not be carried in the cabin of an aircraft occupied by passengers or on the flight deck, except as provided for in the Technical Instructions.

5.5.5.2 Prohibition on the Carriage of Passengers with 'Cargo Aircraft Only' (CAO) Dangerous Goods

The operator must identify in the COM the restrictions on the carriage of passengers with CAO Dangerous goods identified as suitable for transport only on a cargo aircraft must not be carried on an aircraft on which passengers are being carried. In this context "passenger" excludes a crew member, an operator's employee and a person with duties in respect of a particular shipment of dangerous goods or other cargo on board.

5.5.5.3 Inspections for Damage or Leakage

The operator must include in the COM procedures to ensure that any package(s) or overpack(s) containing dangerous goods are inspected immediately prior to loading and found free from evidence of leakage or damage.

The operator must include in the COM procedures to ensure that any ULDs are not be loaded aboard an aircraft unless the device has been inspected and found free from any evidence of leakage from or damage to any dangerous goods contained therein.

5.5.5.3.1 Removal of Contamination

The operator must include in the COM procedures to appropriately remove contamination in the event of spillages or leakages of dangerous goods within an aircraft.

5.5.5.4 Securing of Dangerous Goods

The operator must specify in the COM how dangerous goods are to be secured to prevent movement inflight and to protect from damage by the movement if other items.

5.5.5.5 Segregation and Separation of Dangerous Goods

The operator must specify in the COM how dangerous goods are to be segregated and separated in accordance with the Technical Instructions.

5.5.5.6 Loading of Dry Ice and/or Magnetised Material

The COM must include the restrictions/limitations on the carriage of Dry Ice and/or Magnetised Material.

5.5.5.7 Loading of Electric Mobility Aides

The COM must include information on the correct loading and Stowage of electric mobility aides, if applicable.

5.5.5.8 Notification to Captain (NOTOC)

The operator must establish procedures to ensure that the PIC is provided with accurate and legible written or printed information concerning dangerous goods that are to be carried as cargo. This is usually referred to as the NOTOC.

The NOTOC must be provided to the PIC, as early as practicable before departure of the aircraft, but in no case later than when the aircraft moves under its own power.

The operator must also provide a copy of the NOTOC to personnel with the responsibility for operational control of the aircraft (e.g. the flight operations officer, flight dispatcher, or designated ground personnel responsible for flight operations). This is to facilitate notifying emergency services and authorities of the dangerous goods on board in the event of an aircraft accident or incident.

The NOTOC must include as a minimum (except as otherwise provided by the ICAO Technical Instructions): -

a) Date of flight;
b) Proper shipping name and UN/ID number;
c) Class or Division (and subsidiary hazard(s) corresponding to the subsidiary hazard label(s) applied);
d) Packing group on the dangerous goods transport document;
e) Number of packages and their exact location;
f) Net quantity, or gross mass is applicable, of each package or where the net quantity or gross mass is not required on the transport document;
g) Whether the package can be carried on cargo aircraft only;
h) Aerodrome where the package(s) is to be unloaded;
i) Where applicable, an indication that the dangerous goods are being carried under a State exemption; and
j) Emergency contact telephone number where a copy of the NOTOC (or the information contained on it) can be obtained during flight.

5.5.6 Emergency Procedures

The operator must establish emergency procedures for flight crew and other employees to follow in the event of an emergency involving dangerous goods.

The IOMAR recommends operator use the ICAO published "Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (ICAO Doc 9481)", which provides operators with guidance on how to handle such emergencies and checklists to be followed. Example checklists for incidents involving dangerous goods can be found in RL7.

5.5.6.1 Information to be Provided by PIC in Case of In-Flight Emergency

The operator must establish procedures to ensure that as soon as the situation permits, the PIC informs the appropriate air traffic services of any dangerous goods carried as cargo on board an aircraft in accordance with the ICAO Technical Instructions.

5.5.6.2 Emergency Response Plans

The operator's emergency response plans shall be adapted to cover the additional risks associated with the carriage of dangerous goods.

5.6 Aerial Work

5.6.0 General

The Civil Aviation (Aircraft Registration and Marking) Order 2022 defines Aerial Work as: -

"an aircraft operation in which an aircraft is used for the purpose of providing specialised services including but not limited to mapping, surveying, filming or imagery, observation, surveillance, patrol, inspection, glider towing, parachute jumping, external load carrying, banner towing, dispensing or dropping."

Note: "filming and imagery" excludes:

- external aircraft images used for the purposes of inflight entertainment; and
- imaging systems used to provide enhanced vision capability to flight crew.

An approval to conduct aerial work is required, except for aerial filming or imagery where remuneration or valuable consideration is not provided for the service, and the filming or imagery equipment is hand held.

The operator of any aircraft registered in the Isle of Man that requires an aerial work approval, shall comply with the requirements of a Large and Turbojet Aircraft, refer to Part 1 Chapter 11, regardless of the aircraft's MTM/engines/seating configuration

5.6.0.1 Types of Aerial Work Permitted

The IOMAR may approve an operator for any of the following types of aerial work: -

- mapping;
- surveying;
- filming or imagery;
- observation;
- surveillance;
- patrol; and
- inspection.

5.6.1 Standard Operating Procedures

The SOPs shall be part of the Company Operations Manual, or in a separate manual, and will be reviewed as part of the Aerial Work approval process.

5.6.1.1 Operational Risk Assessment

Prior to the production of the operator's SOPs, a risk assessment which assesses the complexity of the aerial work activity shall be completed to determine the hazards and associated risks inherent in the operation.

Based on the risk assessment, the operation shall establish SOPs to mitigate the risks to as low as reasonably practicable.

5.6.1.2 SOP Development

SOPs should be developed taking into account the results of the risk assessment process (refer to Part 2 Chapter 5.6.1.1).

The following guidance has been provided to assist operators in the production of SOPs.

SOPs should be based on a systematic risk assessment to ensure that the risks associated with the task are acceptable.

The risk assessment should describe the activity in detail, identify the relevant hazards, analyse the causes and consequences of accidental events and establish methods to treat the associated risk.

5.6.1.3 SOP Template

The guidance below has been provided to assist in the development of SOPs.

The SOPs must take into account:

1) The Nature and Complexity of the Activity;

   a) The Nature of the Activity and Exposure

      The nature of the flight and the risk exposure (e.g. low height) should be described.

   b) The Complexity of the Activity

      Detail should be provided on how demanding the activity is with regard to the required piloting skills, the crew composition, the necessary level of experience, the ground support, safety and individual protective equipment that should be provided for persons involved.

   c) The Operational Environment and Geographical Area

      The operational environment and geographical area over which the operation takes place should be described:

      i) congested hostile environment: aircraft performance standard, compliance with rules of the air, mitigation of third party risk;

      ii) mountain areas: altitude, performance, the use/non-use of oxygen with mitigating procedures;

      iii) sea areas: sea state and temperature, risk of ditching, availability of search and rescue, survivability, carriage of safety equipment;

      iv) desert areas: carriage of safety equipment, reporting procedures, search and rescue information; and

      v) other areas.

   d) The Application of Risk Assessment and Evaluation

      The method of application of 1 a), b) & c) above to the particular operation so as to minimise risk should be described.

      The description should reference the risk assessment and the evaluation on which the procedure is based. The SOPs should:

      i) contain elements relevant to the operational risk management performed during flight;

      ii) contain limitations, where required, such as weather, altitudes, speeds, power margins, masses, landing site size; and

iii) list functions required to monitor the operation. Special monitoring requirements in addition to the normal functions should be described in the SOPs.

2) Aircraft and Equipment:

a) The Aircraft

The category of aircraft to be used for the activity should be indicated (e.g. helicopter/aeroplane, single/multi-engined, classic tail rotor/Fenestron/no tail rotor (NOTAR) equipped). In particular, for helicopters, the necessary level of performance certification (Category A/B) should be specified.

b) Equipment

All equipment required for the activity should be listed. This includes installed equipment certified in accordance with the Type Certificate (e.g. for the Diamond DA 42 MPP)or an STC.

A large number of activities require, in addition to the standard radio communication equipment, additional air-to-ground communication equipment.

This should be listed and the operational procedure should be defined.

3) Crew Members:

a) The crew composition, including the following, should be specified:

i) minimum flight crew (according to the appropriate manual); and

ii) any additional flight crew.

b) In addition, for flight crew members, the following should be specified:

i) selection criteria (initial qualification, flight experience, experience of the activity);

ii) initial training (volume and content of the training); and

iii) recent experience requirement and/or recurrent training (volume and content of the training).

c) If the operator specifies a crew composition of more than one pilot, the following should apply:

i) the SOPs should ensure that the pilot flying and pilot monitoring functions are possible from either pilot's seat throughout the flight; and

ii) the operator should adapt the SOPs to the specified crew composition.

The criteria listed in (3)(b)(i) to (3)(b)(iii) should take into account the operational environment and the complexity of the activity and should be detailed in the training programmes.

4) Task Specialists (if applicable), refer to Part 2 Chapter 5.6.2

a) Whenever a task specialist is required, his/her function on board should be clearly defined. In addition, the following should be specified:

i) selection criteria (initial background, experience of the activity);

ii) initial training (volume and content of the training); and

iii) recent experience requirement and/or recurrent training (volume and content of the training).

The criteria listed in (4)(a) should take into account the specialisation of the task specialist and should be detailed in the training programmes.

b) There is a large number of activities for which task specialists are required. This chapter should detail the following for such personnel:

   i) specialisation;

   ii) previous experience; and

   iii) training or briefing.

   Briefing or specific training for task specialists referred to in (4)(b) should be detailed in the training programmes.

5) Performance

   This chapter should detail the specific performance requirements to be applied, in order to ensure an adequate power margin.

6) Normal Procedures

   a) Operating Procedures

   The operating procedures to be applied by the flight crew, including the coordination with task specialists.

   b) Ground Procedures

   The procedures to be applied by the task specialists should be described, e.g. loading/unloading, cargo hook operation.

7) Emergency Procedures

   a) Operating procedures

   The emergency procedures to be applied by the flight crew, the coordination with the task specialist and coordination between the flight crew and task specialists should be described.

   b) Ground procedures

   The emergency procedures to be applied by the task specialists (e.g. in the case of a forced landing) should be specified.

8) Ground Equipment

   This chapter should detail the nature, number and location of ground equipment required for the activity, such as:

   a) refuelling facilities, dispenser and storage;

   b) firefighting equipment;

   c) size of the operating site (landing surface, loading/unloading area); and

   d) ground markings

9) Records

   It should be determined which records specific to the flight(s) are to be kept, such as task details, aircraft registration, pilot-in-command, flight times, weather and any remarks, including a record of occurrences affecting flight safety or the safety of persons or property on the ground.

5.6.1.4 Permissions

If the type of Aerial Work being considered is unable to comply with the Civil Aviation (Rules of the Air) Order (refer to the consolidated Rule of the Air published in CP15) (e.g. low level operations) a Permission can be applied for provided the operator can demonstrate an equivalent level of safety can be achieved.

5.6.2 Task Specialists

5.6.2.1 Responsibilities

The task specialist shall be responsible for the proper execution of his/her duties.

Task specialists' duties shall be specified in the SOPs (refer to Part 2 Chapter 5.6.1).

During critical phases of the flight or whenever deemed necessary by the pilot-in-command in the interest of safety, the task specialist shall be restrained at his/her assigned station, unless otherwise specified in the SOP.

The task specialist shall ensure that he/she is restrained when carrying out specialised tasks with external doors opened or removed.

The task specialist shall report to the pilot-in-command: -

1) any fault, failure, malfunction or defect, which he/she believes may affect the airworthiness or safe operation of the aircraft, including emergency systems; and,
2) any incident that was endangering, or could endanger, the safety of the operation.

5.6.2.2 Safety Briefing

The operator shall ensure that, prior to take-off task specialists are given a briefing on operational procedures associated with the specialised task before each flight or series of flights.

5.6.3 Initial Application Process

Operators wishing to apply for approval to conduct aerial work are encouraged to discuss their requirements with the Flight Operations team prior to submitting the Form 41 Aerial Work application form.

Approval to conduct aerial work will be added to the aircraft specific Operations Specification certificate (Ops Spec) and will be granted for up to 3 years, or the expiry of the current Ops Spec.

5.6.3.1 Required Documentation

The following documents must be submitted along with the application: -

- Company Operations Manual (COM) – refer to Part 1 Chapter 13.1;
- Standard Operating Procedures (SOPs) – refer to Part 2 Chapter 5.6.1; and
- Maintenance Control Manual (MCM) – refer to Part 1 Chapter 13.5.

5.6.3.2 Minimum Equipment List

In addition to the Form 41 application form, the operator must have an approved MEL.

Refer to Part 2 Chapter 5.2 for more details on how to apply for an MEL.

Where the manufacturer has not produced an MMEL, the Kinds of Operational Equipment List (or similar) can be used as the basis for producing an MEL.

5.6.3.3 Aircraft With a Certificate of Registration (CofR) Issued Prior to 1st August 2022

If the Certificate of Registration was issued prior to 1st August 2022, a new CofR must be issued, therefore a Form 92 must also accompany the application.

5.6.3.4 Onsite Inspection

Depending on the complexity of the operation, an on-site inspection, which may include observing one or more demonstration flights, maybe required prior to initial approval.

Any costs associated with an on-site inspection will be included in the cost of the approval.

5.6.4 Ongoing Oversight

Ongoing oversight will be conducted using a risk based approach, which may include periodic on-site inspections.

5.6.5 Renewal Application Process

Form 4a shall be used to renew an aerial work approval.

Form 4a lists the additional documentation which must be submitted to the IOMAR to support the renewal of an aerial work approval.

Depending on the complexity of the operation, an on-site inspection maybe required prior to renewing the approval. Any costs associated with an on-site inspection will be included in the cost of the approval. Operators are therefore encouraged to apply to apply to renew the Aerial Work up to 2 months prior to the expiry date of the Operations Specification certificate (Ops Spec).

5.6.6 Changes to Aerial Work Approval

Changes to the SOPs must be submitted to the IOMAR for approval, using Form 41.

Changes to the SOPs **which are purely administrative**, do not require approval from the IOMAR.

CHAPTER 6: ALL WEATHER OPERATIONS (AWOPS)

Before conducting All Weather Operations (AWOPS), Operators of M-registered aircraft must obtain an AWOPS Operational Approval from the IOMAR.

Please refer to RP 39 for more details.

PART 3 – OPERATOR GUIDANCE

This part contains guidance on various subjects relating to Flight Operations of M- Registered aircraft.

CHAPTER 1: EXTENDED RANGE (ER) OPERATIONS

1.0 General

This guidance has been produced for operators of M- Registered aeroplanes with two or more turbine engines who conduct 'ER Operations'.

This bespoke guidance material has been produced specifically for non-commercial operations using ETOPS principles.

By following this guidance, operators will benefit from: -

- Identification and control of hazards in your operation;
- Raised awareness amongst operational staff;
- Potential reduction of incidents in the operation; and
- Potential cost savings by taking a proactive instead of a reactive approach.

1.1 Background

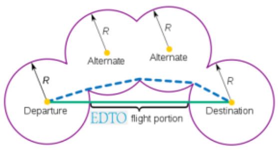
ER Operations, as described in a Master Minimum Equipment List (MMEL), usually refers to Extended-range Twin-engine Operational Performance Standards (ETOPS).

Rule changes during the 1980s recognised the increasing reliability of turbojet engines and helped to establish type design and operational practices for commercial operators to conduce safe and reliable ETOPS. Approval to conduct ETOPS is only required for commercial operators wishing to operate beyond the threshold time set by the State of the Operator.

As the technology and reliability of twin-engine airplanes continued to improve, such operations became compatible with those long-range operations typically associated with three and four-engine aeroplanes.

Ensuring availability of en-route alternate aerodromes, adequate firefighting coverage at these aerodromes, and fuel planning to account for depressurization are sound operational practices for all aeroplanes, including three and four-engine aeroplanes. Likewise, all aeroplane time critical systems should account for the maximum allowable diversion and worst-case scenarios. To address these issues, a reasonable approach was to demand that many of the ETOPS requirements, which were based on sound safety principles and were successfully proven over many years of operations, should be applied to all operations, which had potential extended diversion times to adequate alternate aerodromes. As such ICAO changed the terminology from ETOPS to Extended Distance Time Operations (EDTO), to include extended range operations for all aeroplanes.

Extended Deviation Time Operations / Extended Range Operations



The IOMAR does not issue an EDTO approvals, therefore has not established a threshold time in legislation. However in order to provide this guidance material, the IOMAR has taken the decision to establish a Threshold Time in policy for ER Operations.

1.1.1 IOM ER Operations Threshold Time

The threshold time for M- Registered aeroplanes is 120 minutes from an en-route adequate alternate aerodrome at the OEI cruise speed under ISA conditions in still air from any point along the proposed route of flight.

1.1.2 IOMAR Requirements for ER Operations

Operators who wishes to operate flights in excess of the 120 minutes Threshold Time shall follow the IOMAR ER Operations guidance which includes conducting a risk assessment in conjunction with their SMS, taking into consideration the guidance in this document and any contained in OEM documentation.

Note: If the ER Operations definition in the MMEL refers to flights conducted over a route that contains a point further than a 'specific flying time', at the approved one-engine inoperative cruise speed, under ISA conditions in still air from an adequate alternate aerodrome, the MEL shall be no less restrictive than the applicable MMEL.

1.2 Definitions

Adequate Aerodrome

Is an aerodrome which the operator considers to be satisfactory, taking account of the applicable performance requirements and runway characteristics; at the expected time of use, the aerodrome will be available and equipped with necessary ancillary services such as ATC, lighting, communications, weather reporting, navigational aids and emergency services.

Adequate ER Operations En-Route Alternate Aerodrome

Is an aerodrome that meets the landing performance requirements of the aeroplane i.e. runway length, ATC, lighting, communications, weather reporting, navigation aids, aerodrome facilities and at least one instrument approach. Adequate Aerodromes are selected at the time of planning ER Operations routes. An adequate aerodrome, which additionally, at the expected time of use, has an ATS facility and at least one instrument approach procedure.

Approved One-Engine-Inoperative Cruise Speed

For ER Operations, the approved one-engine-inoperative cruise speed for the intended area of operation shall be a speed, within the certified limits of the aeroplane, selected by the operator.

Contingency Fuel

Factors that can influence fuel required on a particular flight in an unpredictable way include deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions and deviations from planned routings and/or cruising levels/altitudes.

Critical Fuel Scenario

Fuel required assuming a normal flight and 3 different scenarios: Engine fail, depressurisation and engine failure with depressurisation. The one that requires more fuel will be selected as the critical fuel scenario.

Critical Phases of Flight

Means the take-off run, the take-off flight path, the final approach, the missed approach, the landing, including the landing roll, and any other phases of flight as determined by the pilot-in-command or commander.

Critical Point (CP)

Is the point on the route which is critical with regard to the ER Operations fuel requirements if a diversion has to be initiated.

Dispatch

Is when the aeroplane first moves under its own power for the purpose of taking off. ER Operations planning minima applies until dispatch.

En-Route Adequate (ERA) Aerodrome

Is an aerodrome along the route, which could be required at the planning stage.

Equal Time Point (ETP)

Is a point on the aeroplane track in relation to two suitable aerodromes, from which it is the same time for an aeroplane to fly to either. These two aerodromes could be the departure and destination aerodromes, or any two division aerodromes situated suitably in relation to the aeroplane's track. The ETP position can be determined using computerized flight plan that features such capability, mathematically or graphically on a navigation or plotting chart.

Equivalent Position

Is a position that can be established by means of a DME distance, a suitably located NDB or VOR, SRE or PAR fix or any other suitable fix between three and five miles from threshold that independently establishes the position of the aeroplane.

EDTO

Is any operation by an aeroplane with two or more turbine engines operated *commercially* by an operator holding an EDTO approval where the diversion time to an en-route adequate alternate aerodrome is greater than the *threshold time* established by the Regulatory Authority. In the case of M- Registered aeroplanes, (which are only permitted to be operated non-commercially), the threshold time would be established by the operator, normally 120 minutes.

ER Operations Area

Is an area containing airspace within which an aeroplane remains in excess of the specified flying time in still air (in standard conditions) at the approved one-engine-inoperative cruise speed from an adequate ER Operations route alternate aerodrome.

ER Operations Entry Point (EEP)

Is the first point on the route of an ER Operations flight, determined using a one-engine inoperative cruise speed under standard conditions in still air, that is more than the specified flying time from an adequate alternate aerodrome for aeroplanes with two engines.

ER Operations Exit Point (EXP)

Is the last point in the route that exceeds the ER Operations threshold.

ER Operation

Is an operation by an M- Registered aeroplane with two or more turbine engines where the diversion time to an en-route adequate alternate aerodrome is greater than the threshold time as established by the operator, normally 120 minutes, or by the MMEL(s) which the MEL is based upon (whichever is the most limiting).

Isolated Aerodrome

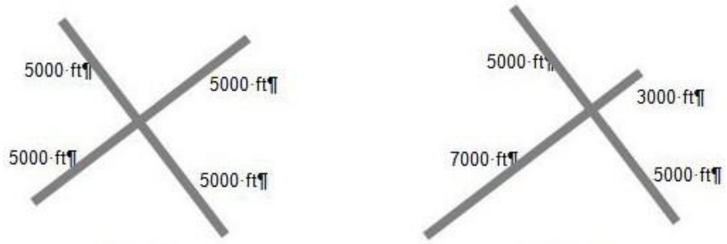
Is a destination aerodrome for which there is no destination adequate alternate aerodrome suitable for a given aeroplane type.

Where the aerodrome of intended landing is an isolated aerodrome; for a turbine-engined aeroplane, the amount of fuel required to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel;

Separate Runways

Are runways at the same aerodrome that are separate landing surfaces. These runways can overlay or cross in such a way that if one of the runways is blocked, it will not prevent the planned type of operations on the other runway, (unless the aeroplane was disabled at the intersection, then both runways would be out of action). Each runway shall have a separate approach procedure based on a separate navigation aid.

Single Runway With More Than One Non-Precision Approach Procedure



1 Runway 2 Runways

Where more than one Non Precision approach procedure exists for a given runway, the most restrictive minima (highest MDA and highest RVR/VIS) of all the Non Precision approach procedures for that runway have been used in the calculations. Therefore, if the forecast conditions are equal to or better than the ER Operations En-Route Alternate Planning Minima quoted in the following pages, then that aerodrome and runway qualify as an ER Operations En-Route Alternate. If the forecast conditions are worse than the ER Operations En Route Alternate Planning Minima, the aerodrome and runway can still qualify as an ER Operations En-Route Alternate if the minima are re-calculated using the minima for a less restrictive Non Precision approach.

Suitable Aerodrome

Is an adequate aerodrome which at the anticipated time of use (one hour before earliest ETA to one hour after latest ETA) has weather reports or forecasts which indicate the weather conditions to be at or above the approved minima.

Threshold Time

For M- Registered aeroplanes the threshold time is 120 minutes from an en-route adequate alternate aerodrome at the OEI cruise speed under ISA conditions in still air from any point along the proposed route of flight.

1.3 Operational Considerations

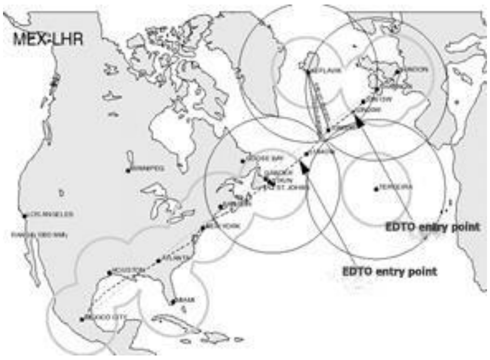
1.3.1 Operational Risk Assessment (ORA)

As a minimum the ORA should take into account: -

- the area of ER Operations;
- the impact on the MEL;
- reliability programme; and

- training.

1.3.2 ER Area of Operations

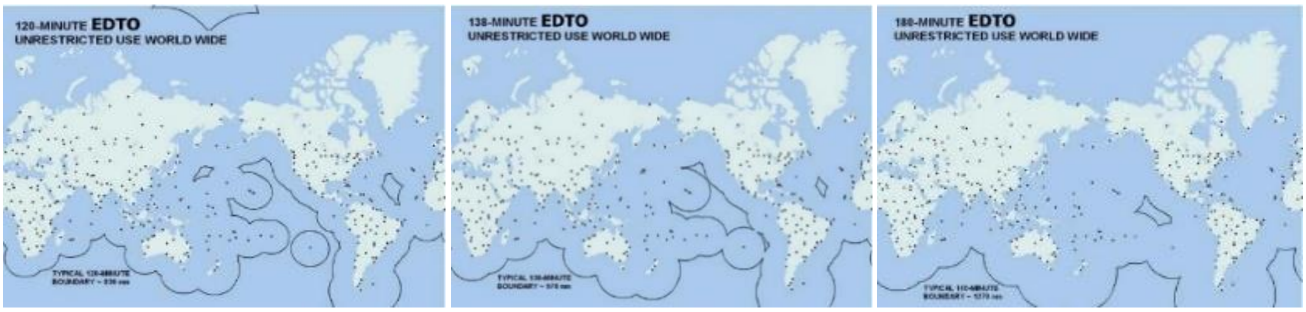


The operational risk assessments should be considered for a well-defined area. The size of this area depends on:

- The maximum diversion time,
- The selected one-engine-out diversion speed schedule, and
- The number and location of the selected adequate diversion aerodromes.

The area of operations is determined in still air and ISA conditions, considering the relevant aeroplane performance with one engine inoperative, the remaining engine being at Maximum Continuous Thrust or less. Therefore, the area of operation is determined once, and does not need to be re-assessed for each flight (considering the en-route weather forecast or the aeroplane performance depending on the take-off weight) unless one or more adequate diversion aerodromes happen to be unsuitable.

The effect of the various Threshold Times can be seen on the following maps



1.3.3 ER Operations Impact on the Minimum Equipment List (MEL)

The MMEL will often use the term ER Operations to highlight certain equipment would otherwise be considered as essential for EDTO operations. As such, the MEL should identify where additional equipment is required for ER Operations.

1.4 Extended Range Operations Reliability Programme

The reliability program of an aeroplane intended to operate beyond the threshold time should be designed with early identification and prevention of failures or malfunctions of ER Operations significant systems as the primary goal. Therefore, the reliability program should include assessment of ER Operations Significant Systems performance during scheduled inspection/testing, to detect system failure trends in order to implement appropriate corrective action such as scheduled task adjustment.

The reliability program should be event-orientated and incorporate:

a) Reporting procedures in accordance with Occurrence reporting;
b) Operator's assessment of propulsion systems reliability;
c) APU in-flight start program;
d) Oil consumption program.
e) Engine condition monitoring program;
f) Verification program.

The primary purpose of the reliability program is to ensure continued airworthiness. This program is an integral part of the Aeroplane Maintenance Program (AMP). It establishes a method of monitoring aeroplane systems and component failure rates by statistical analysis, together with the necessary reporting and action procedures.

The program is based on reliability management, using condition monitoring as a primary measure of the effectiveness of the maintenance processes prescribed in the approved Aeroplane Maintenance Program and shall:

a) Control the reliability of systems and components, by closely monitoring them to establish realistic maintenance tasks and intervals, and to measure systems and component failures;
b) Improve the reliability of the systems and components by taking action as and when thought necessary, such as initiating modification action, part overhaul, or other inspection procedures;
c) Concentrate on items with low reliability, with a view to ultimately improving aeroplane reliability as a whole;
d) Establish statistical evidence of systems and component reliability, which shall assist in negotiations with manufacturers, repair organizations, workshops and base maintenance organizations, helping to further improve reliability.

The following additional parameters shall be reported in the ER Operations reliability program:

a) In-flight shutdowns.
b) Aeroplane diversions or turn backs.
c) Un-commanded power changes or surges, cases of inability to control the engine or obtain desired power.
d) Problems with systems critical to ER Operations (EDTO).
e) Any problems with critical systems, e.g. FANS 1/A+, GPS & RNP capability (refer to the approved MEL).
f) Phase of flight at which discrepancy arose.

1.5 Extended Range Operations Flight Crew Training

Initial and recurrent ER Operations (EDTO) training should cover:

a) Diversion Procedures and Diversion "decision making" Initial and recurrent training to prepare flight crews to evaluate potential significant system failures. The goal of this training should be to establish crew competency in dealing with the most probable contingencies. The discussion should include the factors that may require medical, passenger related or non-technical diversions.

b) Navigation and communication systems, including appropriate flight management devices in degraded modes.

c) Fuel Management with degraded systems.

d) Initial and recurrent training which emphasizes abnormal and emergency procedures to be followed in the event of foreseeable failures for each area of operation, including:

   1) Procedures for single and multiple failures in flight affecting ER Operations sector entry and diversion decisions. If standby sources of electrical power significantly degrade the cockpit instrumentation to the pilots, then training for approaches with the standby generator as the sole power source should be conducted during initial and recurrent training.

   2) Operational restrictions associated with these system failures including any applicable MEL considerations.

e) Flight planning, charts, ETP, CP calculations, OFP – Jepps Brief – Plotting chart – Weather – NOTAMs Sigmet chart.

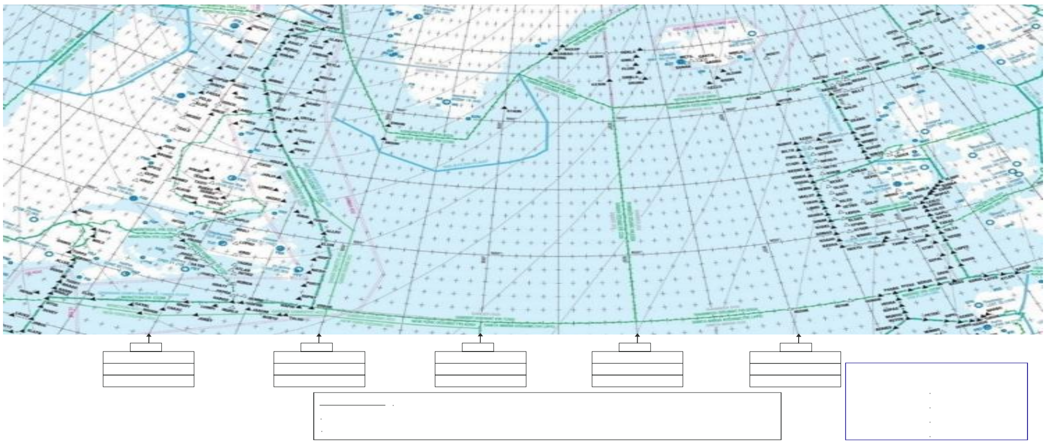
   1) Procedures for single and multiple failures in flight affecting ER Operations sector entry and diversion decisions. If standby sources of electrical power significantly degrade the cockpit instrumentation to the pilots, then training for approaches with the standby generator as the sole power source should be conducted during initial and recurrent training.

   2) Operational restrictions associated with these system failures including any applicable MEL considerations.

1.6 Extended Range Operational Planning

1.6.1 ER Ops Orientation Charts

When ER Operations, flights are planned predominately on airways (i.e. N Canada, Far East) it is recommended that route orientation charts be used. The charts would be used for orientation purposes with respect to planned en-route alternates.



1.6.2 ER Ops En-Route Alternates

Prior to conducting ER Operations, an operator shall ensure that an adequate ER Operations en-route alternate is available, within either the operator's diversion time based on the use of the their SMS, or a diversion time based on the MEL generated serviceability status of the airplane, whichever is shorter.

An adequate aerodrome is one which additionally, at the expected time of use, has an ATS facility, at least one instrument approach procedure and a published Rescue and Fire Fighting Services (RFFS) category equivalent to ICAO category 4, available at 30 minutes' notice.

An operator should only select an aerodrome as an ER Operations en-route adequate alternate aerodrome when the appropriate weather reports or forecasts, or any combination thereof, indicate that, between one hour before earliest ETA to one hour after latest ETA calculated by adding the additional limits.

Approach Facility	**Adequate Alternate Aerodrome Ceiling**	**Weather Minima Visibility/RVR**
Precision approach procedure.	Authorized DH/DA plus an increment of 200 feet.	Authorized visibility plus an increment of 800 metres (or ½ statute mile).
Non-precision approach or circling approach.	Authorized MDH/MDA plus an increment of 400 feet.	Authorized visibility plus an increment of 1500 metres (or 1 statute mile).

The above criteria for precision approaches are to be applied to all ILS approaches.

When determining the usability of an Instrument Approach (IAP), forecast wind plus any gusts should be within operating limits, and within the operators maximum crosswind limitations taking into account the runway condition (dry, wet or contaminated) plus any reduced visibility limits. Conditional forecast elements need not be considered, except that a PROB 40 or TEMPO condition below the lowest applicable operating minima should be taken into account, refer to Part 3 Chapter 1.6.3.

1.6.3 Application of Aerodrome Forecast (TAF & Trend) to Pre-Flight Planning

APPLICATION OF AERODROME FORECASTS (TAF & TREND) TO PRE-FLIGHT PLANNING (ICAO Annex 3 refers)

1. APPLICATION OF INITIAL PART OF TAF (For aerodrome planning minima see EU-OPS 1.297)

a) **Applicable time period:** From the start of the TAF validity period up to the time of applicability of the first subsequent 'FM...*' or 'BECMG' or, if no 'FM' or BECMG' is given, up to the end of the validity period of the TAF.

b) **Application of forecast:** The prevailing weather conditions forecast in the initial part of the TAF should be fully applied with the exception of the **mean wind** and **gusts (and crosswind)** which should be applied in accordance with the policy in the column 'BECMG AT and FM' in the table below. This may however be overruled temporarily by a 'TEMPO' or 'PROB**' if applicable acc. to the table below.

2. APPLICATION OF FORECAST FOLLOWING CHANGE INDICATORS IN TAF AND TREND

TAF or TREND for AERODROME PLANNED AS:	FM (alone) and BECMG AT: Deterioration and Improvement	BECMG (alone), BECMG FM, BECMG TL, BECMG FM...* TL, in case of: Deterioration	BECMG (alone), BECMG FM, BECMG TL, BECMG FM...* TL, in case of: Improvement	TEMPO (alone), TEMPO FM, TEMPO TL, TEMPO FM ... TL, PROB30/40 (alone): Deterioration – Transient/Showery Conditions in connection with short-lived weather phenomena, e.g. thunderstorms, showers	TEMPO (alone), TEMPO FM, TEMPO TL, TEMPO FM ... TL, PROB30/40 (alone): Deterioration – Persistent Conditions in connection with e.g. haze, mist, fog, dust/sandstorm, continuous precipitation	TEMPO (alone), TEMPO FM, TEMPO TL, TEMPO FM ... TL, PROB30/40 (alone): Improvement In any case	PROB TEMPO: Deterioration and Improvement
DESTINATION at ETA ±1 HR **TAKE-OFF ALTERNATE** at ETA ± 1 HR **DEST. ALTERNATE** at ETA ± 1 HR **ENROUTE ALTERNATE** at ETA ± 1 HR (See OPS AMC 1.255)	Applicable from the **start of the change**. **Mean wind**: Should be within required limits; **Gusts**: May be disregarded.	Applicable from the **time of start** of the change. **Mean wind**: Should be within required limits; **Gusts**: May be disregarded.	Applicable from the **time of end** of the change. **Mean wind**: Should be within required limits; **Gusts**: May be disregarded.	Not applicable **Mean wind and gusts** exceeding required limits may be **disregarded.**	Applicable **Mean wind**: Should be within required limits; **Gusts**: May be disregarded	Should be disregarded.	Deterioration may be disregarded; Improvement should be disregarded including mean wind and gusts.
ETOPS ENRT ALTN at earliest/latest ETA ± 1 HR	Applicable from the **time of start** of change; **Mean wind**: Should be within required limits; **Gusts** exceeding crosswind limits should be fully applied.	Applicable from the **time of start** of change; **Mean wind**: Should be within required limits; **Gusts** exceeding crosswind limits should be fully applied.	Applicable from the **time of end** of the change; **Mean wind**: Should be within required limits; **Gusts** exceeding crosswind limits should be fully applied;.	**Applicable if below applicable landing minima** **Mean wind:** Should be within required limits; **Gusts** exceeding crosswind limits should be fully applied.	**Applicable if below applicable landing minima** **Mean wind:** Should be within required limits; **Gusts** exceeding crosswind limits should be fully applied.		

Note 1: "Required limits" are those contained in the Operations Manual.

Note 2: If promulgated aerodrome forecasts do not comply with the requirements of ICAO Annex 3, operators should ensure that guidance in the application of these reports is provided.

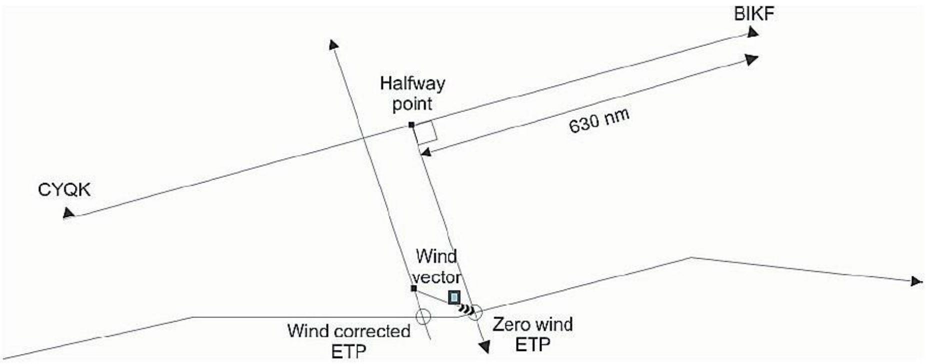
* The space following 'FM' should always include a time group e.g. 'FM 1030'.

1.6.4 Construction of Manual Equal Time Points (ETPS)

It will not normally be necessary for flight crews to construct ETPs. However, the need could arise if a new ERA has to be chosen (e.g. weather deterioration) and if the issue of a revised CFP is not practical (or if it occurs en-route). Two methods can be used, depending on the orientation of the ERAs to the ER Operations segment. The first is for ERAs which are generally abeam, and the second for "Gateway" ERAs which are approximately at either end of the segment. Once a new ETP has been constructed, a new Critical Fuel should be calculated.

1.6.5 Constructing an "Abeam" ETP

In this example, BIKF (Keflavik) and CYQX (Gander) have been used.



1) Draw a straight line connecting the ERAs.
2) Bisect this line, and from the halfway point draw a perpendicular line to the track line. This intersect is the zero wind ETP.
3) Measure the distance from the zero wind ETP to the onward ERA.

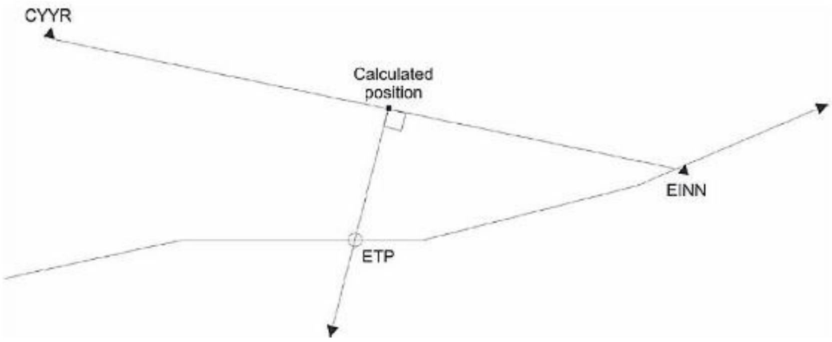
4) Divide the distance from (3) by 420 to calculate the zero wind flying time at the single engine cruise speed (assume 1:30 hrs for this example).
5) From the 20,000 ft wind chart select an average wind for the flight from the zero wind ETP to the onward ERA (for this example, it is 300/40).
6) The aeroplane will be subject to 40 kts of wind for 1 hr 30 mins – equivalent to 60 nm.
7) Plot the total wind vector (i.e. 300 degrees, 60 nm) from the zero wind ETP. Take care that the vector is in the correct sense (upwind).
8) From the end of the total wind vector, draw another line parallel to the first perpendicular. The point where this second line intersects the track is the wind corrected ETP.
9) Calculate Critical Fuel required using the headwind component on the Critical Fuel Table.

1.6.6 Constructing a "Gateway" ETP

In this example, CYYR (Goose Bay) and EINN (Shannon) have been used.

1) Calculate the wind corrected ETP on the straight line joining the ERAs using the formula:

$$X = \frac{D \times H}{840}$$



Where:

X = Distance to ETP in nautical miles.

D = Great Circle Distance between ERAs in nautical miles.

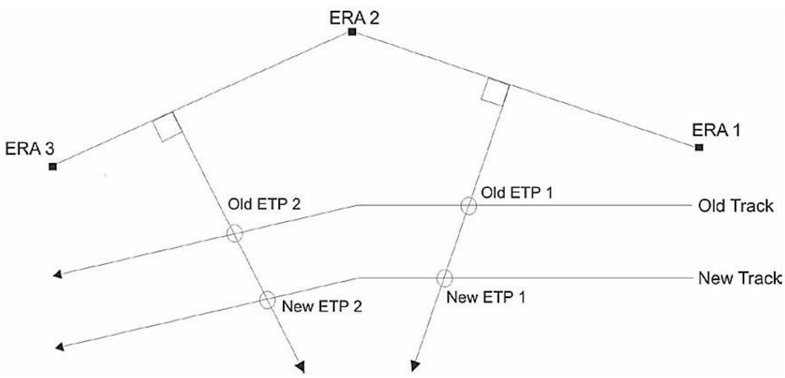
H = Single engine groundspeed home.

2) Plot the point and draw a perpendicular to intersect track. This intersect is the ETP.
3) Calculate Critical Fuel required using the headwind component on the Critical Fuel Table.

From that point the CP is usually, but not always (depending on the configuration of the area of operations), the last ETP within the ER Operations segment. Note that the last ETP is not necessarily the ETP between the last two adequate alternate aerodromes.

1.6.7 Constructing New ETPs Following an In-flight Re-route

A re-route in flight will render the previously plotted ETPs invalid. The method shown below allows for the simple reconstruction of ETPs for a new route, assuming that the ERAs in use have not changed.0



1) Draw a straight line joining ERAs.
2) Draw a perpendicular line which passes through the ETP on the original route, and also the new route.
3) The point where the perpendicular intersects the new route is the new ETP.

1.7 ER Ops Aide Memoire

In order to assist flight crew preparation, the operator should produce an ER Ops Aide Memoire. An example of an ER Aide Memoire is provided below.

AIRCRAFT REG: **DATE:**	**ETD:** **DESTINATION:**
'ER OPERATIONS' STATUS	
MEL/CDL	✓
TIME LIMITED SYSTEMS (if applicable)	✓
NOTAMS	
Departure Airport	✓
Destination Airport	✓
En-route Alternates	
En-route	
WEATHER FOLDER	
TAF METARS SIGMETS: Departure Airport Destination Airport En-route Alternate	
WINDS AND TEMP CHARTS Cruise FL Diversion FL	
TEMSI charts	
ICING FORCAST	

Check Aircraft Configuration

- Check ER Operations Status of the aircraft MEL/CDL)
- Check Time Limited Systems (if applicable)

Nominate ER Ops Alternate

Consider ER Ops Fuel Requirements

Prepare Flight Folder

CHAPTER 2: OPERATIONS OVER OR CLOSE TO CONFLICT ZONES

The safety and security of an aircraft operation to or through a particular geographical area or location is entirely the responsibility of the Aircraft Operator; the IOMAR does not specifically prohibit or allow such operations.

Under the Convention on International Civil Aviation, individual States maintain sovereign authority over their airspace. This authority carries with it the responsibility to issue risk advisories regarding any threats to the safety of civilian aircraft operating in their airspace.

States also have authority to close their own airspace where certain safety threats could warrant action is taken.

Any decision to undertake an operation over or close to a conflict zone, should be very carefully considered given the risk and potentially adverse consequences involved.

Therefore, it is strongly recommend that the operator complete a thorough safety and security assessment, taking into account global airspace risks communicated by States and/or third parties, including NOTAMs and AICs and any other official publication, in determining whether to undertake the operation. Furthermore, the operator is strongly recommended to discusses the planned operation with the aircraft insurers and obtain their consent.

ICAO Conflict Zone Information Repository and other sites that can assist operators, are available on the IOMAR website.

CHAPTER 3: OPERATIONS OUTSIDE CONTROLLED AIRSPACE (CAS)

3.0 General

Class G airspace is 'uncontrolled' airspace and an air traffic control (ATC) service is not provided. The nature of private aviation can lead to flights being conducted outside CAS, therefore not receiving the protection provided by ATC. Whilst a flight information service (FIS) may be available, this might be provided without the benefit of radar surveillance and with limited ability to provide collision avoidance advice to the pilot.

Operators should be aware of the increased mid-air collision risks from such flights, in particular before opting to take a marginal 'short cut' through Class G airspace when operating an IFR flight that could be protected by an established route that is protected by CAS.

In order to ensure that the additional risks associated with flight outside CAS are adequately considered and appropriate measures put in place, the IOMAR strongly recommends operators conduct a risk assessment before the flight is conducted. For established routinely used routes this could be maintained and updated at periods and reviewed as part of the pre-flight planning process. For ad-hoc flights the process below should support the conduct of a flight specific risk assessment at the flight planning stages.

3.1 The Safety Risk Assessment Process for Flights Outside CAS

The safety risk assessment process involves identifying the hazards associated with the activity (in this case specific flights outside CAS), considering the seriousness of the consequences of the hazard occurring (the severity), evaluating the likelihood or probability of it happening, deciding whether the consequent risk is acceptable and within the organisation's safety performance criteria (acceptability), and finally taking action to reduce the safety risk to an acceptable level (mitigation).

3.2 Hazard Identification

A hazard is any situation or condition that has the potential to cause adverse consequences. The table below lists some of the hazards that should be considered when conducting a safety risk assessment for flights outside CAS.

Hazard	Guidance
Glider Activity	Known area of glider activity (ridges, launch sites etc. nearby).
General Aviation (GA) Activity	Known high levels of GA activity, e.g. near to flight schools, clubs, popular routeings or where airshows or displays are prevalent.
Airspace Funnelling	Areas of airspace where high concentrations of Class G traffic could congregate due to factors in the environment such as terrain, danger areas, adjacent controlled airspace.
Autonomous fast jet manoeuvres or ad-hoc formations	Military fast jets on manoeuvres including various sized formations having some aircraft not transponding. Non-notified activity not predictable.
Other military activity	Notified predictable military activity such as air-to-air re-fuelling, major exercises or airshows.
Very Light Jets (VLJs)/Air Taxi	Routes adjacent to areas of known business activity, e.g. event venues, racetracks with aviation facilities.
Low-level activity	Random Visual Flight Rules (VFR) manoeuvres at low levels (e.g. pipeline inspection, police, survey work, military training).
Lack of air traffic service (ATS) availability	Potential for ATS to be unavailable or withdrawn without prior notice due to insufficient ATS provider personnel, communications or surveillance resource, including ATS equipment failures.
Multi-agency ATS provision	Regions of airspace where ATS Outside CAS could be provided by a variety of providers at the same time (e.g. Airborne Warning and Control System, military Air Traffic Control (ATC), civil ATC etc.) - leading to possible confusion, ambiguity or lack of co-ordination between services.
Helicopters	Flight-planned helicopter operations mixing with fixed-wing including Instrument Flight Rules (IFR), e.g. servicing offshore facilities etc.
Commercial airline activity	Other commercial operators operating through the same airspace.
Balloons/Airships	Powered or non-powered lighter than air traffic.
Parachuting activity	Areas of known activity/drop zones or clubs nearby.

NOTE: The above list is not necessarily exhaustive and operators shall make their own assessments of the hazards on the specific routes they fly.

In considering the hazards associated with a particular route, operators can use the information above, but should ensure that they regularly review the list and update it based upon data from accident, incident and flight data monitoring data and (where available) voluntary incident reporting, confidential reporting schemes, safety surveys, operational safety audits and safety assessments.

The hazards along a route will change depending upon the segment of the route being flown. For example, the hazards in the proximity of an aerodrome will not necessarily be those encountered during the cruise. To aid clarity in hazard identification, and to provide focus when considering what mitigation can be put in place (refer to Part 3 Chapter 3.7 Mitigating Actions), operators should firstly define the route they are considering and then divide the route into segments. Operators should consider any significant differences that there might be at various points along the route and whether particular alternative routes (depending on runway orientation or approach/departure) are sufficiently different to warrant separate consideration. Any differences between route sectors at different times of the day, week or year should also be considered and noted. The route segments considered shall include the aerodrome of departure and/or arrival if situated outside CAS.

This definition and division of the route is an important step in the risk assessment process. A good definition of the route is required to ensure that all appropriate hazards are given due consideration.

3.3 The Safety Risk Assessment

Risk is an assessment of the likelihood and the severity of adverse consequences resulting from a hazard.

To help an operator decide on the likelihood of a hazard causing harm, and to assist with possible mitigation of any perceived safety risk, where possible relevant stakeholders should be consulted. The identification of the stakeholders will be helped by the process of defining the route segments.

The results of the safety risk assessment should be recorded.

3.4 Likelihood

When assessing likelihood or probability the following factors should be taken into account:

- The degree of exposure to the hazard.
- Any historic incident or safety event data relating to the hazard. This can be derived from data from industry, regulators, other operators, Air Navigation Service
- Providers, internal reports etc.
- The expert judgement of relevant stakeholders.

3.5 Severity

The severity of any adverse consequences resulting from a particular hazard should be considered. Operators should identify the most credible likely outcome, for example mid-air collision, AIRPROX, late avoiding action, etc.

3.6 Tolerability

At this stage of the process the safety risks should be classified in a range from acceptable to unacceptable.

3.7 Mitigating Actions

Appropriate mitigations for each identified hazard should then be considered, recorded and implemented.

Mitigations shall be adopted in order to reduce the safety risks to an acceptable level, but additional mitigation wherever reasonably practicable should also be considered where this might reduce an already acceptable safety risk even further. Thus, the mitigation process should reduce the safety risk to be as low as reasonably practicable.

Examples of potential mitigations:-

- re-route;
- adjusted day/time of flight;
- amended ATS communication plan;
- enhanced briefing to include awareness of particular hazards;
- TCAS;
- Enhanced conspicuity (e.g. use of landing lights);
- Reduced speed;
- VMC flight only
- Etc.

CHAPTER 4: RAMP INSPECTIONS ON M- REGISTERED AIRCRAFT

4.0 General

SAFA (Safety Assessment of Foreign Aircraft) Ramp Inspections can be conducted in any state. Whilst most inspections are conducted on commercial aircraft, increasingly non-commercial operators are being subjected to ramp checks.

The most common programme is the European Union Ramp Inspection Programme (EU RIP).

The EU RIP includes all EASA member states, plus other participating states such as the UAE, Canada & Australia.

The IOMAR has trained EU RIP Inspectors who are tasked with supporting our operators following a ramp inspection.

4.1 SAFA Ramp Procedures

A SAFA Ramp Inspection can be performed on arrival or prior to departure and will comprise a number of items from a standard checklist depending on the time available.

A SAFA Ramp Inspection should be conducted against ICAO Annex 6 Part II.

Any findings resulting from the ramp check, are classified according to their severity. More serious findings could include restrictions on the flight operation, corrective actions before flight, detention of the aircraft by the inspecting authority or revocation of the operator's entry permit.

4.2 Proof of Inspection (POI)

The PIC will be provided with a Proof of Inspection report which will usually highlight the areas that have been inspected and any findings.

The PIC will typically be asked to sign the POI. The signature is required to confirm an inspection has been conducted, it is not to accept the findings.

The POI shall always be sent to the operator.

4.3 Findings Follow-Up

All SAFA findings shall be processed through the operator's safety management system (if applicable). Operators shall aim to identify actions to prevent the recurrence of non-compliances rather than purely corrective action which, in some cases, could have been taken before the return flight.

4.4 Disputed Findings

Operators wishing to challenge findings shall contact the inspecting national authority directly – only the inspecting authority can amend a finding. Contact details can be found on the Proof of Inspection and Inspection Report given to the pilot-in-command.

The Flight Operations Team (flightoperations@gov.im) should be copied into such communications.

CHAPTER 5: CARRIAGE OF HUMAN REMAINS

5.0 General

Human remains may be carried on board M- Registered aircraft provided they are not classed as infectious remains in accordance with the ICAO Technical Instructions.

Human remains should be accompanied by a *laissez-passer* for human remains, issued by the appropriate public authority of the State of origin.

5.1 Procedures for the Carriage of Caskets

Human remains in caskets, shall be packed in a hermetically sealed inner containment which may be constructed of a flexible material or may be a rigid coffin of lead or zinc.

The inner containment shall be packed inside a wooden or metal coffin. The wooden or metal casket may be protected from damage by an outer packing and covered by canvas or tarpaulin so that the nature of its contents is not apparent

Caskets shall be carried and appropriately secured against movement in the aircraft hold.

The PIC shall supervise the loading and securing of the casket.

5.2 Procedures for the Carriage of Cremated Remains

Cremated remains must be shipped in funeral urns which are efficiently cushioned by suitable packaging, against breakage.

Cremated remains may be carried in the aircraft cabin or hold as required and appropriately secured against movement of the aircraft.