Gama Aviation

Operations Manual

Part C

Route/Role/Area and Aerodrome/Operating Site Instructions and Information

(EASA)

Issue 5
Revision 1
June 2019

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UK Civil Aviation Authority

OPERATIONS MANUAL - NOTICE OF PROPOSED AMENDMENT (NPA)
Applicable to Air Operator Certificate (AOC) Holders

Civil Aviation Authority

Operator Name:…Gama Aviation (UK) Limited……

AOC No: 1068………

NPA Number:…………………………………………………………

OM Part/ Section	**Amdt/ Rev No.**	**Reason for Amendment**	**Effective Date**	**Approval Ref.**(Note 5)
Part C	Issue 5-Rev.1	This revision includes: • NTA 003/19/G – Amendment to OMC	June 2019	
Section 10	-	RVSM amendments *(paras 10.4.2.1, 10.4.2.4, 10.4.2.5)* *(NTA 003/19/G)*		
Section 11	-	Paragraphs rewritten. *(paras 11.1.2, 11.2.1, 11.2.2)*		

AOC Declaration:(Note 1)

I hereby submit this Operations Manual NPA for approval. I confirm that I am satisfied this submission has been satisfactorily prepared and that I have checked the contents for accuracy.

Name: ...Geoffrey Brain..............…………… Date: ......4-6-2019..................................

Signature: GeoffBrain………………………….. Position: ……DFO……………………...

Notes:

1) This form should be signed by the person responsible for maintaining the Operations Manual content that this NPA is applicable to.

2) This form is available as a Microsoft Word document to enable it to be filled in electronically and submitted by e-mail.

3) The Operator Name and AOC Number at the top of the table must be completed.

4) Additional rows in the table can be inserted as required, in order to fully summarise the amendment.

5) The 'Approval Ref.' column is to indicate that text has been added/altered in the Operations Manual that directly affects Approvals as listed on the current AOC 'Operations Approval' document or the 'Operations Approval Checklist', which is available on the CAA website. When this is applicable, the Regulatory reference (e.g. SPA.RVSM.100) should be included.

6) Amended or new text must be clearly indicated as such in the Operations Manual.

7) Further guidance on what is required for aeroplane and helicopter AOC holders can be found in Chapter 2 of **CAP 789**, Requirements and Guidance Material for Operators. For balloon AOC holders, further guidance can be found in **CAP 611**.

8) This form should be submitted by email to the following addresses:

   - For aeroplane and helicopter AOC holders: **NPA@caa.co.uk**
   - For balloon AOC holders: **ga@caa.co.uk**

   The assigned Lead Inspector should also be included in email correspondence.

9) Alternatively, this form may be submitted by post to:

   - NPA Co-ordinator (FOD)
     Shared Services Centre
     Aviation House, GE
     Gatwick Airport South
     West Sussex
     RH6 0YR

     for aeroplane and helicopter AOC holders.

   - General Aviation Unit
     Aviation House, 2E
     Gatwick Airport South
     West Sussex
     RH6 0YR

     for balloon AOC holders.

This page is for CAA use only. AOC No:

CAA Comment, Acceptance and/or Approval (delete as appropriate).

Applicability: Paragraphs 1 2 3 (circle one or more as applicable).

Paragraph 1 – Not Affecting an Operations Approval

The proposed amendment affects material that **does not** affect the continued validity of the AOC holders Operations Approval.

The amendment is accepted for incorporation into the Operations Manual effective from *(date)* …………………………, but may be subject to future comment.

Paragraph 2 – Affecting an Existing Operations Approval

The proposed amendment affects material relating to an **existing Approval**, as listed on the cover page and/or the AOC holders Operations Approval.

The amendment is approved for incorporation into the Operations Manual effective from *(date)* ………………………… and the Operations Approval has been re-issued / remains effective *(delete as appropriate.)*

Paragraph 3 – Application for a New Operations Approval

The proposed amendment affects material relating to an application for a **new Approval**, as listed on the cover page and/or the master Operations Approval Document.

The amendment is approved for incorporation into the Operations Manual effective from *(date)* ………………………… and the Operations Approval has been issued / re-issued / remains effective *(delete as appropriate.)*

Name: P Stroud Date: 07/06/2019

Signature: P D Stroud Position: Flight Operations Inspector

Preface

This manual forms part of the Operations Manual of Gama Aviation (UK) Limited.

The Management responsibilities and supporting procedures referred to in this Manual are approved and must be adhered to.

It is accepted that Gama Aviation (UK) Limited *(known as the "Operator")* do not override the need to comply with International Air Navigation requirements, EASA Requirements in so far as they are endorsed by the Civil Aviation Authority *(known as the "Competent Authority").*

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Introduction

Operations Manual Part C is intended to detail all the routes, departure and approach procedures, and individual airport minima to be used by company aircraft. Due to the nature of Gama Aviation's operations, the company subscribes to Jeppesen Sanderson Inc. to provide this information in accordance with the requirements of EASA-OPS and the OM A, Chapter 8. This information is provided to flight crew as paper enroute charts and departure/ approach plates on the iPad EFB system and on some smaller aircraft paper approach plates.

Areas of Operation – *Please refer to Part A, Paras 1.1.2 and 1.1.3*

Map of Area of Operation – *Please refer to Part A, Appendix 1*

In order to ensure complete coverage of the area the company has a worldwide subscription to Jeppesen charts as detailed in table 1 below. In addition there is also a subscription to the United Kingdom Information Publication (AIP).

Provider	Service	Coverage	Customer no.
Jeppesen Gmbh Frankfurterstrasse 233 63263 Neu-Isenburg Germany Tel: +49 6102 5070	Jeppesen Airway Manual: JeppView terminal charts and text paper enroute and area charts Revision service	• World - basic • World - military supplement	1349056-746403
UK AIS NATS Ltd Ist Floor, North Wing, Heathrow House, Bath Road. Hounslow TW5 9AT Tel: +44(0)208 750 3773	AIP Online www.ais.org.uk AIP ENR AIC NOTAM	United Kingdom	gamaops

REVISION HISTORY

This part of the Operations Manual provides a detailed history of the revisions to the manual. It also specifies the effective revision state of each of the manual's constituent parts. This page is to be kept in the front of the Operations Manual.

1. General

This revision includes:

NTA 003/19/G – Amendment to OMC

1.1 Part C editorial changes and inclusions:

Header	-	Updated to reflect current revision status
LOEP	-	Updated to reflect current revision status
TOC	-	Paragraph numbering corrections
Section 10	-	RVSM amendments *(paras 10.4.2.1, 10.4.2.4, 10.4.2.5) (NTA 003/19/G)*
Section 11	-	Paragraphs rewritten. *(paras 11.1.2, 11.2.1, 11.2.2)*

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List of Effective Pages

Sections	Revision	Date
Header	**1**	**June 2019**
Preface	Original	April 2017
Rev Hist	**1**	**June 2019**
LOEP	**1**	**June 2019**
TOC	**1**	**June 2019**
0	Original	April 2017
1	Original	April 2017
2	Original	April 2017
3	Original	April 2017
4	Original	April 2017
5	Original	April 2017
6	Original	April 2017
7	Original	April 2017
8	Original	April 2017
9	Original	April 2017
10	**1**	**June 2019**
11	**1**	**June 2019**
12	Original	April 2017
13	Original	April 2017

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Table of Contents

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0.0 ADMINISTRATION AND CONTROL OF ROUTE / AREA MANUAL

0.1 INTRODUCTION

0.1.1 This route Manual forms Part C of Gama Aviation's Operations Manual and consists of:

a) this volume, the Route Information Manual (RIM);

b) the Jeppesen Manuals of maps and charts.

0.1.2 Amendments to the commercially produced publications will be sent to the company's head office. The operations staff will ensure that the amendments are forwarded to the relevant aircraft in a timely manner.

0.1.3 Amendments should always be actioned as soon as practical. At the very least, the crew should check that their particular flight is not affected by any amendments.

Amendments to this RIM will form part of the normal cycle of Gama's Operations Manual amendments.

0.1.4 This volume will only contain the briefs for Category B and C aerodromes that are regularly visited by Gama aircraft. For aerodromes, not normally visited, a brief will be prepared for the flight crew prior to departure and will be attached to this volume.

Briefs for Category B or C aerodromes will be attached to the flight documents when visits are made to ensure that crew members have access to the aerodrome brief. These briefs should be signed by the crew members as they self-brief; these briefs will be kept with the post flight paperwork as a record of briefing.

The requirements for visits to Category C aerodromes are as shown in *Section 11*.

Generally extra training has to be provided to flight crews prior to the first CAT operations into or out of any Category C aerodrome.

All Category B aerodrome visits require the Commander to sign the brief and ensure that the signed brief is returned to Operation with the rest of the flight paperwork in the usual way.

0.1.5 All Company flights will be operated in accordance with the requirements of *OM A, Section 8, Chapter 8.1.1.* This will ensure that all flights comply with the requirements of *EASA and ICAO - Flight Procedures / Flight Procedures (DOC8168) – General Principles*.

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1.0 Section 1 - MINIMUM FLIGHT LEVELS / ALTITUDES

a) Selection of Minimum Flight Levels

Refer to:

1) Jeppesen Airway Manuals – *Held on EFB*
   i) Volume One Introduction Chart Glossary
   ii) Airways Charts
   iii) Terminal
   iv) En-route
2) Operations Manual *Part A Section 8 para 8.1.1*

b) Selection of Minimum Altitudes

Refer to:

1) Jeppesen Airway Manuals – *Held on EFB*
   i) Volume One Introduction Chart Glossary
   ii) Airways Charts
   iii) Terminal
   iv) En-route
   v) Jeppesen PLOG
2) Operations Manual *Part A Section 8 para 8.1.1*
3) Topographical Charts
4) Specific Company Airfield Route and Aerodrome Briefs

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2.0 OPERATING MINIMA FOR DEPARTURE, DESTINATION AND ALTERNATE AERODROMES

2.1 ONE ENGINE INOPERATIVE EN-ROUTE NET FLIGHT PATH

Performance Class A *(Multi Engine Aeroplanes)* shall in addition to meeting the minimum flight altitude requirements of O*M-C, Section 1,* must be capable of meeting the following performance requirements:

In the event of a loss of one engine at the most critical point along the take-off path, and in the meteorological conditions expected for the flight:

(i) The gradient of the net flight path must be positive at least 1000 feet above all terrain and obstructions along the route within 5nm on either side of the intended track, and

(ii) The net flight path must permit the aeroplane to continue flight from the cruising altitude, clearing vertically by at least 2000 feet all terrain and obstacles along the route within 5nm on either side of the intended track, to an aerodrome where a landing can be made. The effect of the operation of ice protection systems on the net flight path must be taken into account.

2.2 PERFORMANCE CLASS B AEROPLANES

In addition to the requirements of *OM-C, Section 1,* aeroplanes operated to performance class B standards must be capable of meeting the following performance requirements:

(i) In order to allow visual course guidance navigation, the weather conditions prevailing at the time of operation, including ceiling and visibility, should be such that the obstacle and / or ground reference points can be seen and identified.

(ii) APG *(Aircraft Performance Group)* software is used by the Company to calculate aircraft performance with regard to obstacle avoidance. The pre-flight paperwork provided by operations will include details of the NTOFP information downloaded from the APG website.

NOTE: For further details, see the following section on APG Performance data in this manual.

2.3 DESTINATION AERODROMES

An aerodrome shall only be selected as a destination aerodrome when the following conditions are met:

(i) The appropriate weather reports and / or forecasts, or any combination thereof, indicate that the weather at the aerodrome will be at or above the applicable landing minima for one hour before and one hour after the Estimated Time of Arrival (ETA); and

(ii) RVR / Visibility in accordance with the requirements of the Jeppesen Flight Guides *(when annotated as 'STANDARD').*

(iii) For a non-precision or circling approach the ceiling must be at or above MDH.

(iv) The aerodrome is adequate for the type(s) of aeroplane and operation(s) concerned.

2.4 TAKE-OFF ALTERNATE AERODROME

An aerodrome shall only be considered as a take-off alternate when the following conditions are met:

(i) The appropriate weather reports and / or forecasts, or any combination thereof, indicate that the weather at the aerodrome will be at or above the applicable landing minima for one hour before and one hour after the Estimated Time of Arrival (ETA), and

(ii) If only non-precision and / or circling approaches are available the circling must be taken into account; and

(iii) Any one-engine inoperative limitation must be taken into account i.e. approach climb gradient; and

(iv) The aerodrome is adequate for the type(s) of aeroplane and operation(s) concerned.

2.5 DESTINATION ALTERNATE, EN-ROUTE ALTERNATE AND ISOLATED AERODROMES – IFR PLANNING MINIMA

For selection as a Destination Alternate, En-route Alternate or Isolated Aerodromes, meteorological reports and / or forecasts must indicate that the weather at the aerodrome will be at or above the planning minima specified in the table below, for 1 hour before to one hour after the expected time of arrival.

Non-precision minima (NPA) in the table below mean the highest minima that apply in the prevailing wind and serviceability conditions. Localiser only approaches, if published, are considered to be non-precision approaches.

The table below does not include planning minima requirements for APV, LTS CAT I and OTS CAT II operations, however the following minima should be used:

(i) For APV operations – NPA or CAT I minima, depending on the DH / MDH;

(ii) For LTS CAT I operations – CAT I minima; and

(iii) For OTS CAT II operations – CAT II minima.

TYPE OF APPROACH	PLANNING MINIMA
CAT II and CAT III	CAT I RVR
CAT I	NPA RVR / Visibility Ceiling shall be above the MDH
NPA	NPA RVR / Visibility + 1000
CIRCLING	Circling

NOTE: LOC only approaches are considered Non-Precision (NPA)

3.0 COMMUNICATION FACILITIES AND NAVIGATION AIDS

3.1 ATC FACILITIES

Refer to:

a) Jeppesen Airways Manuals – *Held on EFB*
   - (i) Volume One – Radio Aids
   - (ii) Terminal Aerodrome Charts
   - (iii) Charts (En-route and Navigational)

3.2 NAVIGATION AIDS

a) Jeppesen Airways Manuals – *Held on EFB*
   - (i) Volume One – Radio Aids
   - (ii) Terminal Aerodrome Charts
   - (iii) Charts (En-route and Navigational)

3.3 RADIO TELEPHONY (R/T) PROCEDURES

The Commander is responsible for all radio communication from the aircraft, although under standard procedures for a particular aircraft type, another crew member may operate the equipment.

Contact is to be maintained with the Air Traffic Control Centre (ATCC) or Flight Information Centre (FTC) prescribed by the Air Traffic Services controlling the area in which the aircraft is operated, and clearance must be obtained from one station before changing to another.

RT frequencies must only be used for the purposes for which they are promulgated; in particular, ground movement frequencies should not be used while airborne. In exceptional circumstances however, or where communication is difficult, any suitable means of contact may be used.

A continuous RT listening watch must be maintained throughout all flights, even those outside Controlled Airspace, unless:

a) Permission has been given by the appropriate ATC station to discontinue radio watch, or
b) SELCAL is in use.
c) Use of defective radio equipment might endanger the safety of the aircraft.

The ICAO Standard Phonetic Alphabet and phraseology must be used for all R/T communications. The use of idiomatic or colloquial expressions should be avoided where foreign controllers have a limited knowledge of English and may well only understand standard phraseology and procedures.

3.4 INTERNATIONAL VHF EMERGENCY FREQUENCY (121.5 MHZ)

Use of this frequency must be restricted in order to provide a clear channel between aircraft and a ground station, or between aircraft and / or ground search and rescue services, in an emergency. Other than in emergency, it may only be used for air / ground communication:

a) When airborne equipment failure prevents the use of normal channels;

b) With certain European military stations which provide VDF bearing or fixer services and / or military control services to civil aircraft on 121.5 MHz only; or

c) When used to assist ATC to contact another aircraft which has lost Radio Contact.

3.5 MET INFORMATION - GROUND TO AIR

Full use should be made of met broadcast frequencies to obtain weather information during flight. Requests for information from air / ground communications stations must be limited to information that cannot be obtained from other broadcasts.

3.6 MET INFORMATION - AIR TO GROUND (AIREP)

Position reports to ATC should if requested to do so be followed by an AIREP message according to the following rules:

a) Europe: not required

b) Outside Europe: on established airways, report at points marked “M” on Radio Navigation Charts.

c) On the North Atlantic Track System: if asked to “give weather reports”, report for the reporting point and the mid-point between it and the previous reporting point. Mid-point observations should be held for transmission with the report at the next reporting point.

d) On North Atlantic routes which are not on the NAT system, report at each Oceanic Reporting point.

In order to minimise workload on short sectors, AIREPS need not be made if flight duration is less than two hours, or if the aircraft is within one hour of landing.

AIREPS should contain: Position, Flight Level, Temperature, Wind Direction and Velocity, and if applicable, Significant Weather as required, in an “AIREP special”.

In addition to the above, flight crew may make additional reports if they feel that the information will be of value to the Meteorological Office. e.g. crossing a Jet Stream or if the Navigation Flight Plan winds are incorrect. These additional reports should be filed by way of an AIREP but should not be transmitted to ATC but reported on an AIREP form and handed to an authority on arrival.

NOTE: ICAO Specifications (Meteorology) require that Commanders report immediately to the ATCC with whom they are in communication, weather conditions encountered in flight that are likely to affect the safety of other aircraft; e.g. severe turbulence, moderate or severe icing, severe hail or thunderstorms.

Regional Supplementary Procedures specify that in-flight meteorological reports should be prepared over certain areas where Met reporting stations are sparse. These reports should be handed in to the Met Office at the next stop, when possible by a flight crew member in person in case amplification is required.

3.7 R/T CALL SIGNS

The ATC flight plan should contain the call sign to be used in communications with ATC. If using a Company designator and a flight number the R/T call signs must always be given in full.

3.7.1 CALL SIGN CONFUSION

Care must be taken that to ensure call signs are not confused. If the Commander becomes aware that there is a risk of his call sign becoming confused with that of another aircraft, he may request permission from ATC to change to an alternative R/T call Sign such as the aircraft registration.

3.8 ICAO REGULATIONS

The following categories of messages are permitted according to ICAO regulations:

3.8.1 FLIGHT SAFETY MESSAGES:

Defined as routine movement and control messages, originated by an airline or aircraft and of immediate concern to an aircraft in flight.
Such messages could:-

(i) Refer to diversion instructions or any urgent information of any type

(ii) Offer Met advice of immediate concern;

(iii) Include other messages concerning aircraft in flight or about to depart.

3.8.2 FLIGHT REGULATORY MESSAGES

Defined as those messages regarding the operation or maintenance of facilities essential for the safety or regularity of operation.
They include:

(i) Messages concerning servicing of aircraft;

(ii) Instructions to agents concerning changes in requirements for passengers and crew caused by deviations from schedule;

(iii) Messages concerning non-scheduled landings, aircraft parts and materials urgently required and changes in operating schedules.

3.9 MODE S AND FLIGHT ID

All Gama Aviation aircraft are fitted with enhanced Mode S transponders, which, amongst other information, transmit the flight ID entered by way of the transponder control page. To avoid transmitting wrong information it is important to check during pre-flight that the correct call sign is used. This is identified in Box 7 of the ICAO Flight Plan.

3.10 SSR TRANSPONDERS

3.10.1 Normal Procedures

Published procedures using standard PIT phraseology must always be followed.

Transponders should be switched on, with Altitude Report on, at all times in flight and in all types of airspace, unless ATC specifically order otherwise.

If no code is allocated, squawk A 2000.

3.10.2 Transponder Failure

In the event of a complete Transponder failure, ATC will endeavour to allow the flight to continue in accordance with the flight plan. In certain traffic situations however, particularly when the failure is detected soon after take-off, this may not be possible and the aircraft may be required to land at the departure aerodrome; or to land at another aerodrome acceptable to the Commander and to ATC.

3.11 TCAS

The TCAS Control Unit should be set to Auto and the Mode Selector set to the TCAS mode. The range should be set appropriately.

Further guidance on the use of TCAS can be found at *OM-A, Section 8.3.6*.

3.12 RADIO COMMUNICATION FAILURE

If TWO WAY communication is lost, the transponder must be set to Mode A Code 7600.

Upon seeing this response, a controller will check the extent of the failure by instructing the aircraft to operate IDENT or to change codes. If the aircraft receiver is functioning, further control of the aircraft may continue using code changes or IDENT to acknowledge clearances.

In the event of a hijack, transponder Mode A Code 7500 should be selected.

3.13 EMERGENCY

If the transponder is already operating on a specified code, this code must be maintained in an emergency unless directed by ATC. In any other circumstance
Code A 7700 should be selected.

3.14 CONSPICUITY CODE - U.K

When operating in U.K. airspace at and above FL100, and not in contact with an ATS unit, Transponder Conspicuity Code A 7000 mode C shall be selected unless a “special purpose code” (e.g. radio failure) is more appropriate. Below FL 100, A7000 should be selected.

NOTE: Some aerodromes in the UK operate a local conspicuity code for aircraft operating in the vicinity of their zones:

Oxford – 4517,
Cranfield – 0260

A full list can be found in the UK AIP, Section ENR 1.6.

3.15 ATC COMMUNICATIONS (CANADA)

Position reports should be sent to the controlling ATC Centre.

If contact is lost with the centre the alternative method of communication is through the nearest radio beacon station on VHF, normally 126.7 MHz addressed “For ATC.

However reference should be made to the communications section on the appropriate en-route chart for confirmation of frequencies used by these stations.

3.16 ATC COMMUNICATIONS (USA)

Position reports should be sent direct to the controlling ATC Centre.

If contact is lost with the Centre, the alternative methods of communication are:

a) Via a Flight Service Station (FSS) as follows:

   (i) Aircraft transmits on 122.1 MHz and listens in on the en-route VOR frequency;

   (ii) Two-way communication on 122.6 or 123.6 MHz *(also 122.2 and 122.3 MHz at some locations, and 126.7 in Alaska).*

   NOTE: As the above frequencies are liable to change, and in any case all channels are not held at all FSS stations, pilots are recommended to refer to the ‘Communications’ section on the High and Low level charts.

   (iii) via Company VHF ARINC channels;

   (iv) via HF in those cases where the ATC Centre is served by HF.

3.17 RECORDING OF THE FREQUENCIES

Monitoring of the ATC frequency is essential. On transfer to another centre and/or frequency, both the frequency should be entered on the PLOG. This is a useful way of establishing what the previous frequency was, should there be no response from the next centre changeover and the preselect malfunctions. It also confirms the frequency that was in use should any post flight ATC queries need to be resolved.

3.18 HF R/T NETWORK

As an alternative to, and when out of range of VHF air traffic communication systems, there is a worldwide HF R/T network consisting of banded areas which encompass Air/Ground stations using a common network family. Transmissions are single side band suppressed carrier wave. SELCAL is available with Air/Ground stations and when appropriate this is indicated in the frequency listings in the Jeppesen manuals.

3.19 COMMERCIAL COMMUNICATIONS

There are a number of commercial companies in Europe and North America offering worldwide coverage in communications. Certain of their frequencies are restricted to matters relating to Aircraft Operational Control *(ICAO Annex 10 refers),* but others can be used for public correspondence, including phone patch.

Current contact and follow-up frequencies are shown below but should be checked for recency in the appropriate Jeppesen Manual.

STOCKHOLM RADIO						
3494 KHz	5541 KHz	8930 KHZ	11345 KHz	13342 KHz	17916 KHz	23210 KHz

3.20 ARINC STATIONS THROUGHOUT THE USA

ARINC has a number of stations giving near complete VHF coverage of the USA. Aircraft may maintain a SELCAL watch on ARINC Company frequencies while in US airspace, but no unnecessary calls for assistance or weather information should be made, because of the costs involved.

For further information on the ARINC network, see Jeppesen Airways Manuals.

3.20.1 Procedures:

a) Select the ARINC VHF frequency as shown in the Jeppesen Manuals, or use the area frequency if no contact. It is unnecessary to obtain a SELCAL check.

b) Thereafter the aircraft should continue SELCAL watch changing frequency as necessary.

c) If Company Operations had a message for the aircraft, the nearest station agency would forward a message to ARINC Control Station who would SELCAL the aircraft.

ARINC also maintains HF SSB Company Operation Stations in San Francisco, New York, Houston and Honolulu allowing worldwide operational control, with SELCAL and phone patch facilities on all frequencies. Frequencies are listed in the Jeppesen Airways Manuals.

3.21 SPECIAL USE FREQUENCIES

3.21.1 IATA In-Flight Broadcast Procedure

This procedure is mandatory and applies to all FIRs within the Africa region with the exception of Bloemfontein, Canaries, Cape Town, Casablanca, Dakar Oceanic, Durban, Harare, Johannesburg, Port Elizabeth, Sal Oceanic and Windhoek.

Cairo FIR is also excluded from the IATA In-Flight Broadcast Area and the use of the procedure is not officially recognised. If, however, crews choose to use the procedure in the Cairo FIR it should be remembered that there is no requirement for other traffic to maintain a listening watch. The standard IATA procedure is as follows:

a) Crews will maintain a listening watch on 126.9 MHz from 10 mins before entering the defined area until leaving the area.

b) In addition to normal ATS reporting procedures for the route being flown, flight crews will broadcast position data as follows:

(i) 10 mins before entering the area, or as soon as appropriate after taking-off in the area;

(ii) 10 mins prior to reporting points;

(iii) 10 mins prior to crossing or joining an ATS route;

(iv) at 20 min intervals between distant reporting points;

(v) 2-5 mins where possible, before a change in flight level;

(vi) at the time of a change in flight level;

(vii) at any other time considered necessary by the crew.

NOTE: This system of position reports is designed to assist Pilots in areas where ground communication is poor, or non-existent, and crews are required to make decisions which should help avoidance of collision.

Listen very carefully to the position and levels of other aircraft. They may be on your airway, at your level ahead of you going in the opposite direction.

3.21.2 IATA Worldwide Air-to-Air Frequency

The worldwide air-to-air frequency is 123.45 KHz.

3.21.3 African Communications

Many routes are in Africa are in Advisory Airspace, and hence only an Advisory Service is provided and not a Control Service will be offered. This means that separation will only be provided from known traffic.

As communications are notoriously bad through Africa *(with the exception of South Africa)*, both between ATC Units and R/T between ATC and aircraft, flight plans may not have been received and aircraft may not have been able to contact ATC.

This also applies to a lesser extent in controlled airspace. As Radar coverage is negligible except South Africa and the Nairobi Terminal Area, there is likely to be unknown traffic. Hence:

- Keep a good look-out and listening watch. Even with aircraft operating at the correct cruising levels conflicts have occurred between traffic converging almost head on, as semi-circular rules are generally used and traffic is mainly N-S.
- Do not accept non-standard clearances *(i.e, levels).* As most of the routes are N-S and semi-circular rules are used, a small change of track may necessitate a level change. However, note that some N-S airways/advisory routes use the mean direction to determine the appropriate FL - see Charts.

- Direct routings may be offered. However, some countries prohibit foreign registered aircraft from operating outside controlled or advisory airspace. They have been known to intercept aircraft not flying the centre line of an airway.
- Use the IATA In-Flight Broadcast Procedure as appropriate. But do not assume that all aircraft will use the facility. If it is apparent that there is a conflict with another aircraft, inform ATC as soon as possible and insist that they resolve the situation. Apparent conflict situations should be recorded on the Plog.
- When approaching an FIR boundary, attempt to contact the onward ATC Unit well in advance, as coordination will probably not have been carried out.
- Consider flying a small track offset *(remaining within the required navigational accuracy required),* normally 1nm or 2nm's right of track.

Local restrictions on traffic change with the political situation, and crews should read the latest AIS Briefing.

NOTE: ICAO have allocated 128.95 MHz for crews to exchange operational information with each other over Africa and the Indian Ocean.

3.21.4 North Atlantic Air-to-Air Communications Frequency

In the NAT region, when out of range of VHF ground stations on the same or adjacent frequencies, 123.45 MHz may be used for air-to-air operational communications including the relaying of position reports.

Please - no general chit chat.

3.22 GPS STATUS

The United States Coastguard provides a taped GPS status report continuously available by telephone on the following number: *001 - (703) 313 5907*

Additional information may be requested on: *001 - (703) 313 5900*

3.23 HANDLING AGENT COMMUNICATIONS

Most agents used by the Company have the use of a communications frequency allocated to them. Frequencies available and notes on their use will be given in the Commanders Brief. These frequencies are to be used whenever available, to pass to Ground Agents any pertinent or information requirements, movement messages and serviceability details. Establishing radio contact with the destination handling agent is required as a matter of routine prior to top of descent.

In the event of changes to Flight Plans including diversions and alteration in ETA of 15 minutes or more, a message should be sent at the earliest opportunity to the Company; or to the handling agent at the destination.

Where applicable all aircraft should maintain SELCAL watch with the Company Flight Watch service.

Handling agents VHF frequencies are given on the flight brief.

Met information may be obtained from handling agents to supplement broadcast information, but information obtained in this way is to be treated as unofficial.

Handling agent frequencies are monitored by National State Authorities and reported to the International Frequency Registration Board to determine any infringement of R/T regulations which could result in action against the Company.

In addition, outside sources such as Press Agencies and other airlines may be monitoring the channel. Whilst this should not inhibit the proper use of the frequency, it must be borne in mind when unusual occurrences are reported.

3.24 DATALINK COMMUNICATIONS

3.24.1 ACARS - *(Aircraft Communications Addressing & Reporting System)*

ACARS is a digital datalink system for transmission of short, relatively simple messages between aircraft and ground stations via radio or satellite. Messages may be sent automatically or manually.

3.24.2 Data Download & FMS Interface

Through an interface of the Flight Data Acquisition and Management System and the ACARS Management Unit, it is possible to download, in real time aircraft, engine and operational performance conditions to the company, and for the company to send weather, winds, clearances etc. from the ground to the flight crew.

These processes can be performed automatically by the Management Unit and associated avionics systems, with no action performed by the flight crew. Alternatively, a person or system may create and send a message via ACARS to, or from, the ground / aircraft.

ACARS messages are transmitted using one of three subnetworks:

a) VHF subnetwork. Using a standard ACARS VHF transmission format, an aircraft can communicate with ground systems in real-time almost anywhere in the world, provided there are Remote Ground Stations transceivers.

   However, VHF communication is only applicable over landmasses which have a VHF relay ground network installed.

b) SATCOM sub-network which provides worldwide coverage except at some very high latitudes.

c) HF datalink covers the Polar regions, where SATCOM coverage is unreliable.

3.24.3 Method of Transmission

a) Downlink

A pilot may want to inform Flight Operations that departure has been delayed by Air Traffic Control (ATC). The pilot would first bring up a Communications Management Unit (CMU) on the Multifunction Control Display Unit (MCDU) screen that allows him to enter the expected time of the delay and the reason for the delay. After entering the information on the MCDU, the pilot would then press a “SEND” key on the

MCDU. The CMU would detect the SEND key being pushed, and would then generate a digital message containing the delay information. This message may include such information as aircraft registration number, the origination and destination airport codes, the current ETA before the delay and the current expected delay time. The CMU would then send the message to one of the existing radios, i.e., HF, SATCOM or VHF, with the selection of the radio based on special logic contained within the CMU.

For a message to be sent over the VHF network, the radio would transmit the VHF signals containing the delay message. This message is then received by a VHF Remote Ground Station (RGS), which forwards the message to the Datalink Service Provider's (DSP) main computer system. The message is then processed by the company.

The transmission time from when the flight crew presses the "SEND" key to send the message, to the time that it is processed within the Company computer system does vary, but is usually between 6 to 15 seconds. The messages that are sent to the ground from the CMU are referred to as "downlink" message.

b) Uplink
For a message to be transmitted to the aircraft (referred to as an "uplink" message), the process is nearly a mirror image of how a downlink is sent from the aircraft. For example, in response to an ACARS downlink message requesting weather information, a weather report is constructed by the Company. The message contains the aircraft registration number in the header of the message, with the body of the message containing the actual weather information. This message is sent to the DSP's main computer system.

The DSP transmits the message over their ground network to a VHF remote ground station in the vicinity of the aircraft. The remote ground station broadcasts the message over the VHF. The on-board VHF radio receives the VHF signal and passes the message to the CMU (with the internal modem transforming the signal into a digital message). The CMU validates the aircraft registration number, and processes the message, which can be viewed on the MCDU.

3.24.4 CPDLC *(Controller Pilot Data Link Communication)*

A new strategy is needed to cope with increased demands on Air Traffic Control, and data link based communications offers a possible strategy by increasing the effective capacity of the communications channel.

a) Use of CPDLC
Controller Pilot Data Link Communication (CPDLC) is a means of communication between controller and pilot, using data link for ATC communication. At the highest level, the concept is simple, with the emphasis on the continued involvement of the human at either end and the flexibility of use.

The CPDLC application provides air-ground data communication for the ATC service. This includes a set of clearance/information/request message elements which correspond to voice phraseology employed by Air Traffic Control procedures. The controller is provided with the capability to issue level assignments, crossing constraints, lateral deviations, route changes and clearances, speed assignments, radio frequency assignments, and various requests for information. The pilot is provided with the capability to respond to messages, to request clearances and information, to report information, and to declare / rescind an emergency. The pilot is, in addition, provided with the capability to request conditional clearances (downstream) and information from a downstream Air Traffic Service Unit (ATSU).

A “free text” capability is also provided to exchange information not conforming to defined formats. An auxiliary capability is provided to allow a ground system to use data link to forward a CPDLC message to another ground system.

The sequence of messages between the controller at an ATSU and a pilot relating to a particular transaction (for example request and receipt of a clearance) is termed a “dialogue”. There can be several sequences of messages in the dialogue, each of which is closed by means of appropriate messages, usually of acknowledgement or acceptance. Closure of the dialogue does not necessarily terminate the link, since there can be several dialogues between controller and pilot while an aircraft transits the ATSU airspace.

All exchanges of CPDLC messages between pilot and controller can be viewed as dialogues; some basic rules apply:

1. All dialogues must be closed wherever possible.
2. A dialogue opened by CPDLC must be closed by CPDLC unless connectivity is lost.
3. A dialogue opened by voice must be closed by voice, not CPDLC.

The CPDLC application has three primary functions:

1 the exchange of controller / pilot messages with the current data authority,

2 the transfer of data authority involving current and next data authority, and

3 downstream clearance delivery with a downstream data authority.

Flights planning to use CPDLC shall include in Item 18 of the flight plan the indicator CODE/ followed by the 24-bit aircraft address expressed in the form of alphanumerical code of six hexadecimal characters

e.g. CODE/F00001.

b) Initialisation

Before being able to communicate with an ATC centre through CPDLC, the FMC must have a valid position. Since CPDLC is used for oceanic / remote communications and position reporting, and is an adjunct to HF radio, a clearance is obtained through ACARS with voice communication as an alternative. As the aircraft approaches, for example, the oceanic entry point the specific information must be entered on the ATC LOGON / STATUS page *(accessed by pressing the ATC mode key on the MCDU).* This information includes the initial ATC centre to be used (LOGON TO), Flight Number (FLT NO) and Tail Number. On completion of these entries SEND will be displayed under LOGON. Select this SEND prompt to initiate the logon sequence between the FMC and the selected ATC Centre, at which point SEND changes to SENDING, and if the logon is successful, it will revert to ACCEPTED, as shown in the diagram. Oceanic clearance must be received prior to LOGON and if not forthcoming through ACARS then voice calls must be made.

On initial contact the flight crew shall:

1) Not include a position report;
2) Use the data link term "CPDLC" after the aircraft call-sign;
3) Give the name of the next OCA or FIR to be entered;
4) Request SELCAL check.

An **example** of a voice call is:

Call – *Shanwick Radio, Gama 123 C-P-D-L-C*

Reply – *Gama 123, Shanwick Radio C-P-D-L-C, go ahead*

Call – *Shanwick Radio, Gama 123 C-P-D-L-C. Next Gander, request SELCAL check ABCD*

Reply – Gama 123, *Shanwick Radio C-P-D-L-C, Voice reports not required in EGGX, Primary 1234, Secondary 3456, next contact Gander 1256, standby SELCAL check ABCD.*

Call – *Shanwick Radio, Gama 123, SELCAL received, out.*

Where CPDLC is not said phonetically, and immediately follows the call-sign.

Once the initial logon sequence is complete, the initial ATC Centre and the FMC will ensure transfer to subsequent ATC Centres.

3.24.5 Equipment

Each *Part B* will contain information relative to the type of equipment that is installed on each aircraft and how it should be operated. Although most avionics systems use a similar logic for operation, some systems require further information to be used correctly and this information is provided.

Training will also be provided for crew members when required to use this equipment.

3.24.6 Automated Dependent Surveillance (ADS)

Automatic Dependent Surveillance (ADS) is a surveillance technique by which an aircraft transmits, via data link, a series of parameters extracted from the on-board navigation and positioning systems.

The ADS technique provides:

a) Identification of the aircraft;

b) The position of the aircraft in four dimensions *(the three spacial dimensions plus the time measurement);*

c) Additional information, such as the flight plan.

The ADS has two functional defining characteristics: it is automatic; that is, it does not require pilot intervention to send the aircraft data to the control tower, and it is dependent because the required information is generated by the aircraft itself; that is, it depends on the on-board systems.

The ADS technique requires a navigation system and a data link in the aircraft and on the ground, a station that receives the ADS information for use by the surveillance data handling systems. This new system is essential to complement surveillance in oceanic regions or in those in which there is little or no radar coverage. It also improves surveillance in areas currently covered by radar *(thanks to air-to-air surveillance or the collection of additional on-board data, such as flight plans).*

3.24.7 ADS-B and ADS-C

ADS has been broken down into two techniques that are based on the same principles:

ADS-B (Broadcast) and ADS-C (Contract).

a) The following are characteristics of ADS-B broadcasting;

1) That the data collected by ADS-B are sent, via data links, and broadcast periodically by the aircraft.

2) That the primary characteristics is to facilitate air-to-ground data transmission, as well as air-to-air.

3) That air-to-air data transmission to provide an on-screen representation of nearby traffic in the aircraft CDTI *(Cockpit Display of Traffic Information)* is collated.

4) That there are the three techniques used to implement ADS-B: Mode 4 VDL; S-Mode Extended Squitter and UAT.

b) ADS-C involves transmitting certain data between the aircraft and a ground station. The primary characteristics are:

1) That data is transmitted only when a contract has been established with a particular ground station, several independent contracts may be maintained with several different ground stations.
2) That the ground station determines the frequency of the transmissions and their parameters.
3) That there are four types of contracts: periodical, on-demand, by-event and emergency.
4) That there are two basic technologies used by ADS-C: FANS-1/A, based on the ACARS data link, and the ADS-C ATN system.

4.0 RUNWAY DATA AND AERODROME FACILITIES

4.0.1 Runway lengths and available distances are detailed on the Airport pages (x0-9x) of the Jeppesen approach plates. They are also, along with other details such as Rescue Firefighting Categories, in the Airport Directory.

This data can be found in the FliteDeck app on the EFB at MANUALS / appropriate region / AIRPORT DIRECTORY / AIRPORT DATA.

For non EFB equipped aircraft see Jeppesen Vol 1*(appropriate to region).*

This information should be used in conjunction with the APG performance analysis software to take into account obstacles in the take-off flight path.

Refer also to *OM-B, Section 4* for details of the APG Performance Software.

4.1 RUNWAY DATA

Refer to:

a) Jeppesen Airway Manuals.
   (i) Volume One Airport Directory.
   (ii) Terminal Aerodrome Charts.

4.2 AERODROME FACILITIES

Refer to:

a) Jeppesen Airway Manuals.
   (i) Volume One Airport Directory.
   (ii) Terminal Aerodrome Charts.

4.3 APPROACH PROCEDURES

Refer to:

a) Jeppesen Airway Manuals.
   (i) Terminal Aerodrome Charts.
   (ii) Airways Charts.

4.4 MISSED APPROACH PROCEDURES

Refer to:

a) Jeppesen Airway Manuals.
   (i) Terminal Aerodrome Charts.
   (ii) Airways Charts.

4.5 DEPARTURE PROCEDURES

Refer to:
a) Jeppesen Airway Manuals
   (i) Terminal Aerodrome Charts
   (ii) Airways Charts

4.6 NOISE ABATEMENT PROCEDURES

Refer to:
a) Jeppesen Airway Manuals
   (i) Terminal Aerodrome Charts
   (ii) Airways Charts
b) Specific Company Procedures and Briefs,
c) Operations Manual Part B.

4.7 OPERATING MINIMA GENERAL

General information on the subject of Weather Minima / Performance will be found in the Company OM A.

The following instructions amplify these requirements for all Company Operations.

The Company's specific minima for aerodromes and alternates used will be found in the Jeppesen Airways Manuals maintained on each aircraft,

The relevant minima shall be employed strictly as recorded and no discretion can be delegated to individual Commanders to apply lower minima.

Taking-off or landing in conditions worse than those specified is not permitted.

A Commander may however, exercise his judgement whether to take-off or land even though the reported conditions are better than the prescribed minima if in his opinion this is necessary to ensure the safety of the flight.

4.8 JEPPESEN DETAILS CURRENT INSTRUMENT PROCEDURES AND REQUIREMENTS

Jeppesen details current Instrument Procedures and requirements. Approach Plates indicating OCA / H values display these requirements, which figures cater for the various aircraft categories.

For non-precision approaches, a Pressure Error Correction of 50' or less is catered for in the minima displayed on the charts.

4.9 DEFINITIONS AND RULES OF THE AIR

Definitions can be found at the front of *OM-A in Section 0, Para 0.1 (d)*.

The Rules to be followed can be found in the UK CAA publication CAP393, Air Navigation: The Order and Regulations. The paragraph numbering and format of this document is not the standard used throughout the company Operations Manual.

4.9.1 The Secretary of State for Transport, in exercise of his powers under article 95(1) of the Air Navigation Order 2005(a), makes the following Regulations:

1. These Regulations may be cited as the Rules of the Air Regulations 2007 and shall come into force on 30th March 2007.
2. The Rules of the Air set out in Schedule 1 shall have effect and may be cited as the Rules of the Air 2007.
3. The Regulations specified in Schedule 2 are revoked.

Refer to rules of the air regulations in the air navigation order section two (cap 393).

The following rules are included here for clarity.

4.9.2 RULE 18 – FLIGHT IN CLASS A AIRSPACE

(1) Subject to paragraphs (2) and (3), the commander of an aircraft flying in Visual Meteorological Conditions in Class A airspace shall comply with rules 35, 36 and 37 as if the flight were an IFR flight.

(2) For the purposes of paragraph (1) rule 36 (2) shall not apply.

(3) Paragraph (1) shall not apply to the commander of a glider which is flying in Class A airspace which is notified for the purpose of this paragraph if the glider is flown in accordance with such conditions as may also be notified for that purpose.

4.9.3 RULE 20 – CHOICE OF VFR OR IFR

(1) Subject to paragraph (2 below) an aircraft shall always be flown in accordance with the Visual Flight Rules or the Instrument Flight Rules.

(2) In the United Kingdom an aircraft flying at night shall –

a) Be flown in accordance with the Instrument Flight Rules outside a control zone;

b) Be flown in accordance with the Instrument Flight Rules in a control zone unless it is flying on a special VFR flight.

4.9.4 RULE 35 - FLIGHT PLAN AND AIR TRAFFIC CONTROL CLEARANCE

(1) Before an aircraft either takes off from a point within any controlled airspace or otherwise flies within any controlled airspace the commander of the aircraft shall —

a) Send or transmit a flight plan complying with paragraph (2) to the appropriate air traffic control unit; and

b) obtain an air traffic control clearance based on that flight plan.

(2) The flight plan shall —

a) Contain such particulars of the intended flight as may be necessary to enable the air traffic control unit to issue an air traffic control clearance and for search and rescue purposes; and

b) for a flight within United Kingdom reduced vertical separation minimum airspace, also state whether or not the aircraft is equipped with height keeping systems as required by articles 57 and 58 of the Order.

(3) Unless he has requested the appropriate air traffic control unit to cancel his flight plan, the commander of the aircraft shall forthwith inform that unit when the aircraft lands within or leaves the controlled airspace.

4.9.5 RULE 36 - COMPLIANCE WITH AIR TRAFFIC CONTROL CLEARANCE AND NOTIFIED PROCEDURES

(1) Subject to paragraph (2), the commander of the aircraft shall fly in conformity with—

a) The air traffic control clearance issued for the flight, as amended by any further instructions given by an air traffic control unit; and, unless he is otherwise authorised by the appropriate air traffic control unit,

b) the instrument departure procedures notified in relation to the aerodrome of departure; and

c) the holding and instrument approach procedures notified in relation to the aerodrome of destination.

(2) The commander of the aircraft shall not be required to comply with paragraph (1) if—

a) He is able to fly in uninterrupted Visual Meteorological Conditions for so long as he remains in controlled airspace; and

b) he has informed the appropriate air traffic control unit of his intention to continue the flight in compliance with Visual Flight Rules and has requested that unit to cancel his flight plan.

(3) If any deviation is made from the provisions of paragraph (2) for the purpose of avoiding immediate danger the commander of the aircraft shall inform the appropriate air traffic control unit of the deviation as soon as possible.

4.9.6 RULE 37 - POSITION REPORTS

The commander of an aircraft in IFR flight who flies in or is intending to enter controlled airspace shall report to the appropriate air traffic control unit the time, position and level of the aircraft at such reporting points or at such intervals of time as may be notified for this purpose or as may be directed by the air traffic control unit.

4.10 VISUAL CONTACT APPROACH

This is allowed to expedite IFR traffic at an aerodrome when ATC may authorise a Commander to discontinue an instrument approach procedure provided the Commander reports that he has the aerodrome in sight and that:-

Either:

a) The reported cloud ceiling is NOT BELOW the initial approach altitude; or

b) the Commander reports at any time after commencing the intermediate procedure that the visibility will permit a visual contact approach and landing and a reasonable assurance exists that this can be accomplished.

A visual contact approach may be employed only when it is apparent both from the air and from the ground that all factors favour cutting short the instrument approach pattern and relying instead on visual guidance for positioning the aircraft for landing.

Descent will be contained within the Circuit and / or approach pattern, and may not be continued below 1000' above the highest obstacle within a 10nm radius of the aerodrome at night until the PAPIS / VASIS or the ILS Glide Path indicate that it is safe to do so.

4.11 PROCEDURE FOR FLIGHT INTO AERODROMES WITHOUT LET-DOWN AIDS

The approach and landing at destination will take place entirely in VMC and in accordance with the following:-

a) The weather forecast for the destination aerodrome must give reliable assurance that the minimum weather conditions prescribed in *sub-para c)* will be available at ETA; and

b) on arrival over the destination aerodrome, descent below the en-route safety altitude may not be commenced until the aircraft's position has been positively identified by visual reference; and

c) the descent must be made clear of all cloud, in sight of the surface and with a flight visibility of at least 5 Kilometres *(9 Kilometres when above 3000' AMSL)*; and

d) an alternate aerodrome must be nominated for the flight having a serviceable let down aid which the aircraft is capable of using and for which there is an authorised procedure; or

When following flight under IFR to a selected aerodrome at which an instrument let-down can be carried out, onward flight to the destination aerodrome will be made in VMC and in accordance with the following requirements:-

a) The 'selected' aerodrome must be located within 25nm of the destination aerodrome and have a serviceable let-down aid and authorised procedure; and

b) permission to use facilities at the 'selected' aerodrome must be obtained from the controlling authority during the flight or prior to departure if necessary and any conditions stipulated in this connection must be observed; and

c) the weather forecast for the 'selected' and destination aerodromes must give reliable assurance that the onward flight in VMC can be made with a forward visibility of at least 5 Kilometres (*9 Kilometres when above 3000' AMSL)* and with a Cloud Ceiling of at least 1000 AGL throughout the route to be flown. If at any point on the onward flight the actual weather conditions are found to be below this specification, the aircraft must divert; and

d) the 'selected' aerodrome may be nominated as the alternate aerodrome if landing there is feasible and permitted.

NOTE: The landing minima for either procedure must be recorded on the Navigation Log.

The MDA must be calculated on the same basis as the circling altitude.

The RVR will be 800m or the lowest RVR for a non-precision instrument approach at the airfield if HIGHER,

Minimum In-Flight Visibility will be 2000m.

NOTE: Regardless of the location of the aid itself, an aerodrome may be considered as equipped with a let-down aid if an authorised instrument approach procedure is published for landing at that particular aerodrome using the aid in question.

4.12 TAKE-OFF ALTERNATE

When weather conditions at the aerodrome of departure are below those required for landing, a suitable alternate aerodrome at which favourable landing conditions are reported or forecast, should be available as follows:-

Twin Engine Turbine: 60 MINUTES

Also, terrain and flight profile *(considering icing conditions etc.)* between the departure and the departure alternate must be achievable when aircraft performance considerations are taken into account.

If no suitable diversionary aerodrome is available, the flight must be postponed until the minimum weather conditions for landing prevail at the aerodrome of departure.

4.13 TAKE-OFF CONDITIONS

A flight may not be commenced unless the information available to the Commander at the aerodrome of departure indicates that:-

a) At the estimated time of arrival at the aerodrome of destination and at the selected alternate, or at two alternate aerodromes, if selected, the forecast weather conditions will not be worse than the minima prescribed for the aid and procedure intended to be used for landing; and
b) At the time of take-off the reported Cloud Ceiling and the reported or assessed RVR at the aerodrome of departure are not worse than the prescribed minima for take-off and the aerodrome has not been declared QGO by the competent authority; and
c) If required by the Flight Manual, icing conditions can be avoided en-route.

4.14 APPROACH AND LANDING CONDITIONS

In order to carry out an instrument approach procedure at any aerodrome a copy of the officially published Approach Chart giving details of the authorised approach procedure must be held on the aircraft. An exception is however permitted in the case of a Radar Approach procedure where it is known that no Approach Chart is published.

The following conditions for making any approach to land must be observed:-

a) When approaching an aerodrome and about to carry out a visual or an instrument approach procedure, a Commander may not descend below his en-route safety altitude until he has positively identified his position. He may then descend to the safety altitude applicable to the approach procedure he is intending to use or to the lowest holding altitude required by Air Traffic Control, provided this is not below the prescribed safety altitude for the sector in which holding take place.

b) When making a descent to an aerodrome on an instrument approach, the approach may not be continued past the Outer Marker or equivalent position, if the relevant Runway Visual Range at the aerodrome, or if this is not available, the factored met visibility notified to a Commander by the Aerodrome Authority at the time, is less than the RVR prescribed for the approach aid and runway being used.

   An approach ban also exists when the aerodrome has been declared QGO by the Competent Authority.

c) Where the Cloud Ceiling is reported as lower than the prescribed Decision Altitude, a Commander may decide to descend to Decision Altitude in order to assess the situation for himself.

d) Descent below Decision Altitude is permitted only when conditions allow the remainder of the approach to landing to be completed entirely by visual reference to the ground.

e) If due to weather conditions a Commander has been obliged to go-around from two successive approaches, he may not then make a further attempt to land at that aerodrome except in emergency, or unless he has received a report of a significant improvement in landing conditions from the controlling authority.

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5.0 APPROACH, MISSED APPROACH AND DEPARTURE PROCEDURES

5.1 APPROACH

An approach may be started irrespective of the RVR, but it may not be continued below 1000ft above the aerodrome height unless the reported controlling RVR (*or converted met visibility is equal to or better than the specified minimum).*

If below 1000ft above the aerodrome position, the approach may be continued to the landing irrespective of reported RVR/Visibility provided that the required visual reference has been established at the DH/MDH, and is maintained.

The touch-down zone RVR is always controlling. If reported and relevant, the mid-point and stop end RVR are also controlling. The minimum RVR value for the mid-point is 125m or the RVR required for the touch-down zone if less, and 75m for the stop-end. For airplanes equipped with roll-out guidance or control system, the minimum RVR value for the mid-point is 75m.

NOTE: 'Relevant' in this context, means that part of the runway used during the high speed phase of the landing down to a speed of approximately 60 knots.

5.1.1 Visual Approach

Circling (visual manoeuvring) is the term used to describe the visual phase of an instrument approach required to position an aeroplane for landing on a runway which is not suitably located for a straight-in approach.

It may also be called an Indirect Approach.

Minimum Descent Height (MDH). The MDH for circling shall be the higher of:

- The published circling OCH for the Aeroplane Category; or
- The minimum circling height derived from Table 9 below; or
- The DH/MDH of the preceding instrument approach procedure.

5.1.2 Minimum Descent Altitude (MDA)

The MDA for circling shall be calculated by adding the published aerodrome elevation to the MDH as determined above.

5.1.3 Visibility

The minimum visibility for circling shall be the higher of:

- The circling visibility for the aeroplane category, if published; or
- The minimum visibility derived from Table A below; or
- The RVR/CMV derived from *Tables 5 and 6* shown in *OM-A, Section 8, Para 8.1.3.7* for the preceding instrument approach procedure.
- The minimum RVR for a visual approach shall be 800 metres.

5.1.4 Visibility & MDH for Visual Manoeuvring – Table A

Aircraft Category	A	B	C	D
MDH (ft)	400	500	600	700
Minimum Meteorological Visibility (m)	1500	1600	2400	3600

5.1.5 Approach and Landing Noise Abatement Procedures

The procedures are as follows:

- Inbound flight path should not require more than 20° bank angle to follow noise abatement track;
- Observe all airspeed limitations and ATC instructions;
- Initial inbound altitude for noise abatement areas will be a descending path from 2,500 ft AAL or higher. Maintain minimum airspeed (1.3 Vs + 20 KIAS) with gear retracted and minimum approach flap setting;
- At the final approach fix (FAF) or not more than 4 miles from runway threshold, extend the landing gear. Final landing flap configuration should be delayed at pilot's discretion to enhance noise abatement.
- During landing, use minimum reverse thrust.

Crewmembers should be aware that unnecessary use of reverse thrust when landing can also be a source of noise. Therefore, except when eliminating residual thrust *(i.e. Company Beechcraft King Air 200s),* the use of minimum reverse thrust necessary for safety is recommended, consistent with safety for runway conditions and available length.

5.2 MISSED APPROACH

The missed approach, after an approach has been flown using the CDFA technique, shall be executed when reaching the decision altitude or the MAPt, whichever occurs first. The lateral part of the missed approach procedure must be flown via the MAPt unless otherwise stated on the approach plate.

The missed approach procedure to be carried out is the one applicable to the instrument approach runway unless another procedure is prescribed.

Once the aeroplane has left the instrument procedure and commenced circling, an initial climbing turn towards the runway and overhead the aerodrome will be made, where the aeroplane will then establish in a climb on the missed approach track of the instrument approach runway.

Because of the variability of circling procedures other patterns may be needed at different stages in order to keep the aeroplane in a safe area and to establish the missed approach track.

Aircraft specific missed approach procedures are found in the applicable *OM-B, section 2.*

5.3 DEPARTURE PROCEDURES

Departures shall be conducted in accordance with the information published in the Jeppesen Airways Manuals, section Terminal Charts, and in accordance with any published local procedures.

In order to reduce the effect on the local population around departure airports, where possible all departures shall be made in accordance with the principles of 'Noise Abatement procedures.

5.3.1 Take-Off

Sufficient engine thrust to achieve 1,000 fpm.

5.3.2 Departure Procedures for Distant Noise Abatement Objectives

The procedures are as follows:

- Climb at maximum practical rate at V2 + 20 KIAS indicated airspeed to 1,500 ft above airfield level (AAL) with take-off flap setting;
- At 1,500 feet AAL, accelerate to final segment speed *(VFS or equivalent)* and retract flaps. Reduce to a quiet climb power setting *(i.e. MCT or equivalent)* whilst maintaining at least 1,000 fpm maximum climb rate and airspeed not to exceed 190 kts until reaching 3,000 ft AAL. Above 3,000 ft re-instate climb power gradually and resume normal climb schedule;
- Observe all airspeed limitations and ATC instructions.

NOTE: Aircraft performance will differ with type and take-off conditions; therefore, pilots are to comply with the AFM if procedures require specific techniques.

5.3.3 Departure Procedures for Close in Noise Abatement Objectives

The procedures are as follows:

- Climb at maximum practical rate at V2 + 20 KIAS indicated airspeed to 800 ft above airfield level (AAL) with take-off flap setting;
- At 800 feet AAL, reduce to a quiet climb power setting *(i.e. MCT or equivalent)* whilst maintaining at least 1,000 fpm maximum climb rate and V2 + 20 KIAS until reaching 1,500 ft AAL. At 1,500 feet AAL, accelerate to final segment speed *(VFS or equivalent)* and retract flaps. Maintain at least 1,000 fpm maximum climb rate and airspeed not to exceed 190 kts until reaching 3,000 ft AAL.
- Above 3,000 ft re-instate climb power gradually and resume normal climb schedule;
- Observe all airspeed limitations and ATC instructions.

NOTE: Aircraft performance will differ with type and take-off conditions; The Commander must determine whether take-off thrust should be reduced prior to, during, or after flap retraction. Pilots are to comply with the AFM if procedures require specific techniques.

6.0 COMMUNICATION – FAILURE PROCEDURES

6.1 RADIO COMMUNICATION

All the Company aircraft are equipped with at least two VHF radios.

Radio 1 on the left side is the master radio and will be used at all time to maintain communications with ATC units.

Radio 2 on the right side is used for obtaining ATIS and communicating with handling agents etc. Radio 2 must always be returned to 121.5 mHz and monitored when not in use.

If a third radio is carried, then this may be used for monitoring 121.5 mHz however on some aircraft this may already be in use as a data upload frequency.

6.2 COMMUNICATIONS FAILURE PROCEDURES

Pilots should always be familiar with the communication failure procedures for the route of flight.

ICAO procedures are found in the Jeppesen FliteDeck app at *Manuals / General / Emergency / Emergency Data – International / ICAO / Communications Failure.*
For non EFB equipped aircraft this can be found in the Jeppesen Volume 1.

There are specific instructions for specific regions, countries and airports are in the EMERGENCY section of the appropriate region manual.

If Two Way communication is lost, the transponder must be set to Mode A Code 7600.

Upon seeing this response, a controller will check the extent of the failure by instructing the aircraft to operate IDENT or to change code. If the aircraft receiver is functioning, further control of the aircraft may continue using code changes or IDENT to acknowledge clearances.

In the event of hijack, transponder Mode A Code 7500 should be selected.

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7.0 SEARCH AND RESCUE FACILITIES

Aircraft specific information can be found in each applicable Part B.

7.1 INTRODUCTION

The subject of survival is vast and cannot be covered thoroughly in a few pages in this manual. The aim of this section, therefore, is to give broad guidelines, which may be of help when survival becomes a problem. It should be remembered that the following are the greatest assets to people in this situation.

a) **The Will to Survive.**
This natural urge may seem both obvious and abundant, however, in a bad situation it can be neither. It is vitally important to keep up the morale of crew and passengers.

b) **Common Sense.**
There are no hard and fast rules for survival so the use of common sense and keeping a cool head are essential, especially for the person in charge. *(I.e. the Commander, if he is still able).*

c) **Knowledge.**
Do not forget that besides the crew, the passengers may have experience in useful areas such as medicine, survival techniques, animal capture, edible plants, etc.

7.2 PRIORITY LIST

This list pertains to any survival situation and should be memorised by all crews.

PROTECTION

LOCATION

WATER

FOOD

a) **Protection**
   (i) Environments where survival is a problem are described as “hostile”, since the body is unable to cope without some form of protection from them.
   (ii) The protection required is usually from heat loss or gain, but would also be from other factors such as wind, fire or animals for example. Also included in this section would be protection from loss of blood and infection through wounds - i.e. First Aid.

b) **Location**
   (i) The aircraft is fitted with an ELT. This sends a signal which greatly helps in the location of survivors from downed aircraft. It is commonly thought that the locator beacon fitted to the 'Black Box' will also act as a locator transmitter. This is only partly true as if the transmitter is underwater only ships with a special detector head can receive the signal from a 'Black Box'.

The ELT is usually triggered in the event of a crash landing; however, as a reassurance that a transmission has been made, the unit can also be manually operated by moving the rocker switch in the cockpit from 'ARM' to 'ON' forcing the unit to transmit.

(ii) To assist aircraft in the detection of downed aircraft survivors, the able bodied survivors should try and make the crash site as conspicuous as possible to over flying aircraft. This may involve the removal of equipment and furnishings from the aircraft wreckage, some of which might be brightly coloured. (The notes relating to Jungle survival should also be read). It might be necessary for the survivors to try and increase the visibility of the site by removing from the vicinity some indigenous materials which would obstruct the view of rescuers.

c) **Water**

(i) Water is a basic requirement for maintaining life. The amount of water required for survival depends upon the local conditions and the local environment. Each of the following sections has a guide to the requirements for water, but it must be pointed out that water is far more important to survival than food.

d) **Food**

(i) Although last on this list, food is obviously still a very important factor for survival. Some very broad guidelines are:

- If water is not available, it is advisable to eat very little as the process of assimilation in the body uses water.
- Carbohydrates are assimilated more quickly than proteins and give greater energy and use less water.
- Examples of carbohydrates are: sugar, potatoes and grain *(bread).*
- Proteins: meat, fish and poultry.
- Nuts contain both.
- Fruit and vegetables are generally neutral and may not contain so much energy as other foodstuffs, but have a relatively large amount of water, vitamins and other essential elements.

7.3 SEA SURVIVAL

Whether the ditching occurs on a bright blue windless day in the Mediterranean or at night in a force 9 gale in the Atlantic, there are few easy options.

a) **Protection**

(i) When immersed in cold water, the body loses heat rapidly. For example at a sea temperature of +5º Centigrade, the time to unconsciousness may be 5 minutes and death due to hypothermia in 15 – 30 minutes. This is quite apart from the dangers of water ingestion and exhaustion caused by rough seas.

(ii) It is therefore essential to board the life rafts, if available, as soon as practicable and to keep people as dry as possible. Once everybody is in the life raft(s), the static line may be severed and the life raft should be paddled to join up with others if possible.

(iii) When clear of the aircraft, the floor should be inflated and the life raft inspected for leaks. First Aid should be given to the injured and seasickness pills distributed. Chronic seasickness can reduce the will to survive drastically and water loss from the body from vomiting can become critical.

(iv) All equipment should be secured as best as possible and the drogue streamed.

(v) Make sure people keep their lifejackets on.

b) **Location**

(i) Depending on the life raft type, the following may be available: emergency locator beacon, flares, heliograph and torches.

(ii) A continuous watch should be maintained for aircraft or vessels.

(iii) It is best to try and keep life rafts near the aircraft or wreckage, since these will usually be found by search and rescue teams first.

c) **Water**

(i) The only drinking water available will be from the life raft equipment pack, anything salvaged from the aircraft, rainwater *(the life raft may be fitted with special pockets for collecting it)* or ice *(iced water has reduced salt levels)*.

(ii) Prevent water losses by minimising perspiration and seasickness.

d) **Food**

(i) Apart from any food salvaged from the aircraft, the only source of food will be from fishing *(there may well be angling equipment in the life raft equipment pack).*

e) **Hazards**

(i) Be mindful of body temperature at all times. Prevent people from lying in the sun and keep the head covered on sunny days as the glare from the water can cause sunburn or sunstroke.

(ii) Sharks are unlikely to be a problem unless there is blood in the water. If they do come at the life raft, try beating the surface of the water or hitting them on the head with the paddle.

7.4 DESERT SURVIVAL

Deserts vary enormously, but have two things in common – they are hot *(during the day, at least)* and water is scarce. Depending on the type of desert and the time of year, they can also be very cold at night.

a) **Protection**

(i) Unless there is good reason otherwise, stay in or near the aircraft / wreckage. The rescue teams always look for the aircraft first. At any rate, put everybody in the shade if possible and administer First Aid as required.

(ii) Try and erect a more durable shelter using parts from the aircraft perhaps, such as carpets, cushions, curtains, life rafts and suitcases.

b) **Location**

(i) The main location aid is the emergency locator beacon, but do not forget the aircraft radios if they are usable.

(ii) At night, light one fire and have two others in a triangle ready as this is an international distress signal. In the day, keep the fire going and burn oil or rubber to cause smoke when necessary.

(iii) Make the aircraft as visible as possible from the air.

c) **Water**

(i) There should be water in the emergency packs and maybe some in the aircraft, including soft drinks.

(ii) Do not be tempted to leave the neighbourhood of the aircraft to look for water unless absolutely necessary.

(iii) Make the aircraft as visible as possible from the air.

(iv) Reduce body water loss to a minimum by changing one's rhythms to be active at night and passive by day.

(v) Ration water from the outset and stick to it until actually rescued rather than when spotted.

d) **Food**

(i) Apart from that in the aircraft, food is obviously scarce. The animals that are present will be more active at night and a torch can be useful to temporarily stun them.

(ii) It must be remembered that food intake is limited by the amount of water available.

e) **Hazards**

(i) Snakes

Usually, snakes will not be seen, unless taken by surprise or trodden on for example, when they may well bite. Treat all bites as poisonous. Tourniquets are now considered to be too potentially damaging and it is better to tie a crepe bandage firmly along the whole length of the affected limb to restrict the blood supply, but not to cut it off. Try and clean the wound with soap and water.

(ii) Sunburn

Watch everybody for signs of sunburn, as it is avoidable and can easily reduce one's chances of survival.

7.5 WINTER SURVIVAL

The principles of winter survival apply to any region where low temperature, high winds or a covering of snow prevail.

a) **Protection**

(i) If the aircraft is not suitable, find some temporary shelter and administer First Aid. Once this is done, a more permanent shelter should be constructed using, for example the aircraft fuselage or wings and trees, blankets, life rafts, seats, etc.

(ii) In deep snow, a simple igloo is very effective built out of blocks of snow. Always construct the entrance to any shelter downwind.

b) **Location**

(i) The emergency locator beacon should be used as the primary location aid with any of the other items in the emergency pack as a back-up and again, do not forget the possible use of the aircraft radios.

(ii) As in the desert survival section, one should light one fire and have two others ready in a triangle as a distress signal. During the day, smoke can be produced from burning tyres, rubber or green wood and leaves.

(iii) Stay near the aircraft and make sure it remains visible from the air by keeping snow etc. brushed off.

c) **Water**

(i) Where there is snow and ice, the amount of drinking water available is limited only by the ability to melt it. However, snow and ice should not be eaten as this can reduce body temperature and cause soreness to the mouth. Ice produces more water than snow.

(ii) Do not forget there may be water available in the aircraft.

d) **Food**

(i) This is largely a matter of using the aircraft supplies and then trying to trap animals such as rabbits. There may well be berries around but if in doubt as to their toxicity, take a small amount first and wait for reactions before serving to others.

e) **Hazards**

(i) Exposure and frostbite are the worst enemies. The former is the continual drainage of heat from the body and is combated by building a good shelter and wearing as much clothing as necessary supplemented by blankets if available. People huddled together in a confined space will help to keep the general temperatures up.

(ii) If exposure is suspected, the patient should be warmed as soon as possible using clothing *(many thin layers are more effective than one or two thick ones)*, blankets, etc. and hot drinks, *(not alcohol).* If feasible, undress the patient and put into a sleeping bag, or wrapped in blankets, between two other naked people.

Building the body core temperature up to normal can be a long process and even when achieved, the patient will require plenty of rest and food.

(iii) Frostbite is the freezing of living tissue and usually occurs at the extremities of the body such as the nose, toes and fingers. This can occur surprisingly quickly at very low temperatures and therefore it is extremely important to make sure that everything is covered properly before leaving the shelter and nothing is uncovered until back in the shelter. Touching cold surfaces with bare flesh can tear the skin off. Heating frostbitten areas should be carried out slowly *(e.g. by using body heat)* and will be very painful. In serious cases, the tissue may be permanently damaged.

(iv) Snow blindness is caused by the very intense light levels entering the eyes when sunlight is reflected off snow. It can be extremely painful and resting the eyes in complete darkness *(use a blindfold, not tightly bound)* is the only care.

7.6 JUNGLE SURVIVAL

There is not a standard form of jungle. The terrain can range from large trees up to 200' in height growing closely together with relatively little undergrowth *(primary jungle)* to trees of various heights with dense undergrowth *(secondary jungle).* All jungles are by definition in warm climates and will have plenty of shade and shelter and are thus hospitable in character.

Most jungles are inhabited and with very few exceptions, the natives are friendly. Their villages often tend to be near major rivers which are known as the "roads of the jungle".

a) **Protection**

(i) Since landing in a jungle is so difficult without extensive damage to the aircraft and occupants, the first priority is to collect everybody together and administer First Aid away from the aircraft until it is certain that it is safe to return. Do return when safe, and make a more permanent shelter – torrential rain is a frequent phenomenon. Again the dinghies may be useful.

b) **Location**

(i) This can be a great problem because the canopy of foliage can obscure most signs of the aircraft and ground signals and can reduce the efficiency of the radio beacon.

(ii) It is therefore advisable to try and find a clearing where any bright articles such as lifejackets can be left. Also, look for some high ground or climbable trees from which to operate the radio/radio beacon.

(iii) If neither of these is feasible, as a last result it may be necessary to consider moving to a better site. Because this may be extremely arduous, it is better to attempt sooner rather than later, and make it obvious to rescuers in which direction you have gone.

c) **Water**

(i) Water should not be a problem as there is usually plenty around, but if purifying tablets are available, use them or, if not, boil the water.

d) **Food**

(i) Anything left in the aircraft will probably be the major source of food since animals, which may be present in abundance, are difficult to catch, let alone eat. Fishing may well be more successful.

(ii) As regards eating plants, here are three very general guidelines.

1. Avoid brightly coloured plants
2. Do not eat anything with a milky sap
3. Avoid all jungle fungi

e) **Hazards**

(i) Poisonous snakes see para 7.4 e) i). Although there may be non-poisonous snakes which kill by suffocation *(e.g. the pythons),* these can usually be deterred as long as people are not allowed to be on their own.

(ii) Insects can cause problems ranging from food contamination to sickness. In these conditions, hygiene is vital and if adhered to, should reduce the chances of contamination from insects. Insect bites can be deterred by covering as much of the body as possible and sitting in/near smoke. Look carefully before sitting down anywhere.

(iii) Leeches and ticks are more unsightly than dangerous, although they can also be agents of infection. Try not to pull them off *(as the head tends to stay in the wound)* but apply heat, salt or Vaseline to their bodies and they should drop off.

7.7 SEARCH AND RESCUE

7.7.1 Introduction

See also AIP Section SAR.

By international agreement, most of the world's land and sea areas have air sea rescue coverage – this cover usually being provided by military forces. The area of responsibility for coverage normally corresponds to the FIR boundaries, but can be extended by mutual and international agreement.

Control of search and rescue operations falls on the Rescue Co-ordination Centres (RCCs). These RCCs are linked to air traffic control (ATC), but are not necessarily at the same location.

RCCs have at their disposal all military and civil aircraft, naval and merchant naval vessels, army, policy, fire ambulance and coast guard forces, mountain rescue teams and satellite distress alerting systems which can be used as they think fit. An RCC can also call on the services of a neighbouring RCC if necessary.

7.7.1.1 **Distress frequencies:** 121.50 MHz, 243.00 MHz, and 2182 kHz.

Pilots should be aware of any survival equipment requirements which different states may require. For example, the UK requirements for carriage of ELTs, fuel reserves and survival equipment etc. for crossing the Atlantic is less stringent than those of Canada and Iceland.

When flying over difficult terrain, flight plans should always be filed.

7.7.2 Ground to Air Signals

The following are guidelines for the use of signals.

a) The symbols should be at least 2.5m long and should be made as conspicuous as possibly providing the maximum colour contrast between the symbols and their background.

b) They may be formed from any materials such as wood, fabric, stones, trampled snow, etc.

7.7.3 Air to Ground Signals

The following signals by aircraft mean the ground signals have been understood:

a) During daylight – rocking aircraft wings.

b) During darkness – flashing on and off twice the aircraft landing lights or navigation lights.

7.7.4 Emergency Equipment Stowage Locations

See each aircraft specific *Part B, section 10.*

8.0 AERONAUTICAL MAPS AND CHARTS

8.1 INTRODUCTION

It is not the purpose of this Part C to cover information widely available in controlled commercially available publications already held by Gama Aviation.

8.2 GENERAL RESPONSIBILITY

It is the responsibility of all staff to ensure they are familiar with the contents of this section when accepting bookings, planning or operating.

8.3 SOURCES OF INFORMATION

The sources of controlled commercial available information held by Gama Aviation, its location and staff responsible for amendments.

DOCUMENT	LOCATION	STAFF RESPONSIBLE FOR AMENDING DOCUMENT
Air Pilot	On Line	N/A
Cat B Airfield Brief	Q-Pulse Library	Chief Pilot
Information / Safety Notices	Director of Flight Operations	Director of Flight Operations
Jeppesen-Jeppview	Operations Computers	Ground Operations Manager
Aircraft Jeppview	Aircraft FMS Database	Database Administrator
IPad Jeppview	Aircraft Ipad x 2	Database Administrator

8.4 RESPONSIBILITIES

The Ground Operations Manager will be responsible for ensuring both the Operations and Aircraft Flight Guides are kept up to date. If time does not permit the aircraft copy to be amended before departure of the next flight he is to ensure the amendment is included in the Commander's Brief and annotated accordingly.

8.5 HANDLING AGENTS

All information relating to handling agents will be included in the Commanders Brief.

8.6 VHF CHART

If any parts of the flight are to be conducted under VFR then an up to date aeronautical VFR chart of at least 1:500,000 scale must be carried covering the whole VFR portion of the flight.

A check of the validity of this chart will be made as part of the Aircraft Equipment Check – Check D, Item 17 *(GAL179)*

8.7 APPROACH AND DEPARTURE PLATES

Approach and departure plates are normally available for all airports visited by Company aircraft. These charts may be held on the approved EFB or if not available will be provided by operations, prior to flight.

EFB manual section 4 refers to the procedure to be followed should the EFB be unavailable.

8.8 EN-ROUTE CHARTS

En-route paper charts for the route to be flown must always be available and carried on the aircraft. When established in the cruise the applicable chart should be immediately available for reference

Aircraft that make use of EFB charts for approach and departure will normally also be provided with a full set of Hi and Low charts for the region of operation. In addition, a set of area charts will also be provided. Some areas such as Heathrow or Manchester are provided with their own fold out chart to assist crews operating into these busy areas.

9.0 AERONAUTICAL INFORMATION AND METEOROLOGICAL SERVICES

Aeronautical Information is provided by each country in the relevant Aeronautical Information Publication (AIP). However, it is not practical to have copies of all AIP's available for flight planning and in-flight reference. Jeppesen collate all the information into a usable format which is presented in the Easy Brief system for preflight planning and this can be saved to the EFB for in flight use.

For non EFB equipped aircraft this information can be printed prior to departure for in flight use.

NOTE: Important information is also provided at the front of J*eppesen Vol 1.*

For each flight a check should be made of all relevant NOTAM's issued for a particular flight.

General information on decoding weather reports is found on the Flite Deck system in MANUALS / GENERAL / METEOROLOGY.

For non EFB equipped aircraft this can be found in *Jeppesen Volume 1.*

Further information can also be found at *OM-A, Section 8, Para 8.1.6.*

9.1 EN-ROUTE VOLMET REPORTS

Regular checks should be made of en-route airports weather conditions. VOLMET frequencies are found on the applicable HI en-route charts.

Jeppesen Vol 1 includes a meteorological section containing a list of the VOLMET stations and the airports covered in the same sequence as broadcast.

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10.0 EN-ROUTE COMMUNICATION / NAVIGATION PROCEDURES

See also *section 3* of this manual for further information.

10.1 LEGAL REQUIREMENTS

ICAO Annex 6 states that an aircraft shall be provided with navigation equipment which will enable it to proceed:

a) In accordance with the flight plan; and

b) In accordance with the requirements of air traffic services.

Furthermore, the aircraft shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the aircraft to navigate in accordance with the airspace requirements. In other words, systems must be duplicated.

10.1.1 LONG RANGE NAVIGATION

A Long Range Navigation System (LRNS) is one that is essentially for use over remote or oceanic areas. Each LRNS must be capable of providing to the flight crew a continuous indication of the aircraft position relative to the desired track such that each pilot seated at that person's duty station can determine that position. Typically, a LRNS may be a Flight Management System (FMS) with sensor inputs from an Inertia System and / or a Global Navigation Satellite System.

Inertial systems may be Inertial Reference Systems (IRS) which in their normal navigation mode provide attitude, heading, acceleration, vertical speed, ground speed, track, present position and wind data to various systems which require this inertial information including an independent flight management system for aircraft guidance, or may be Inertial Navigation Systems (INS) which are self-contained and have integral computers which resolve the various navigation equations but are not as flexible as IRS.

Satellite Systems may be the Russian Global Orbiting Navigation Satellite System (GLASNOS) or the United States Global Positioning System (GPS). The latter is the only accepted system at present. ESA the European Space Agency is also in the process of placing its own Satellite based Navigation System into orbit

A LRNS is one Flight Management System (FMS) with inputs from either one Inertial Reference System (IRS) or one Global Navigation Satellite System (GPS) sensor.

10.1.2 NAVIGATION EQUIPMENT REQUIREMENTS

Two serviceable LRNS are required at the time of departure for any flight planned to proceed through unrestricted North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace or designated Area Navigation routes / areas requiring RNP-10 compliance.

One serviceable LRNS is required at the time of departure for any flight planned to proceed through restricted North Atlantic Minimum Navigation Performance

Specification (MNPS) Airspace *(other than UK — Iceland via G3 and Gil)* or designated Area Navigation routes / areas requiring RNP-4 compliance.
Other routes / areas requiring RNP-5 compliance are covered in *Section 10.1.3* of this manual and routes / areas not requiring any RNAV compliance are covered by the requirements of ICAO Annex 6.

10.1.2.1 Scale of Equipment Required

NAV AREAS	ROUTE REMARKS	NAV EQUIPMENT REQUIRED
Artic	All routes	2 x Inertial LRNS
Antarctic	All routes	2 x Inertial LRNS
Sahara	On 60 nm airways	SRA
	Other routes	1 x LRNS & SRA
South America	All routes	1 x LRNS & SRA
Pacific Ocean	All routes	2 x LRNS Check RNP-10 requirements
Australia	RNAV routes	2 x LRNS & SRA
	(RNP-10 & RNP-4)	1 x LRNS & SRA
Indian Ocean	All routes	2 x LRNS
North Atlantic	All routes outside MNPSA	2 x LRNS
South Atlantic	All routes outside MNPSA	2 x LRNS
Northern Canada	Outside NDA	2 x Internal LRNS Check requirements of Canadian MNPS
	Within NDA	
Northern Asia	All routes	1 x LRNS & SRA
Southern Asia	All routes	2 x LRNS & SRA
NAT and CAN MNPS / RNPC	Unrestricted	2 x LRNS
	Restricted	1 x LRNS
Iceland – Europe	SRA	See UK AIP ENR 22

KEY
LRNS - Long Range Navigation System (1 FMS & 1 IRS or 1 GPS)
SRA - Short Range Aids (VOR, DME, ADF)

10.1.2.2 Area Navigation (RNAV) Routes

At least one serviceable FMS that can be automatically updated is required for flight along controlled, advisory or uncontrolled ATS Routes designated as being Basic RNAV routes:

a) Having route designators L, M or N for basic area navigation routes forming part of the regional networks of ATS routes, or:

b) Having route designators T, Y or Z for basic area navigation routes which do not form part of the regional network of ATC routes.

10.1.3 NAVIGATION EQUIPMENT

10.1.3.1 Insertion of Ramp Position

The latitude and longitude will be entered into the FMS to the tenth of a minute *(if not known, use a zero);* ensure that the decimal point is in the correct position.

Later in the cockpit preparation checks, each crew member should check the entered ramp position against the Jeppesen Airfield Plate IRS co-ordinates, or the co-ordinates on the airfield stand where applicable. The entered ramp position is then recorded on the Master Document.

10.1.3.2 Initial Waypoint Loading

The entry of waypoint data into the navigation systems must be a coordinated 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. It is not sufficient for one flight crew member to observe another flight crew member inserting the data.

The ramp position of the aircraft and at least two additional waypoints, but ideally, all the waypoints relevant to the flight, should be loaded while the aircraft is at the ramp. However, it is most important to ensure that the first en-route waypoint is inserted accurately, rather than to endeavor to load the maximum number of waypoints.

During flight, at least two current waypoints beyond the leg being navigated should be maintained in the CDU. Both flight crew should be responsible for loading, recalling and checking the accuracy of the inserted waypoints, one loading and the other recalling and checking them independently. Remote loading of the units permits one pilot to crosscheck additionally that the data inserted by the other is accurate. In neither case should this process be permitted to engage the attention of both pilots simultaneously during flight.

10.1.4 ATC CLEARANCES

When obtaining ATC clearances, headsets must be worn and, where possible, clearances should be monitored by both crew members. The pilot requesting the clearance will record it on the Master Document, or the crossing chart, while the second crew member monitors clearance and read-back.

All clearances must be read back in full, unless a special procedure is in force. If there is any confusion, request clarification. If given a re-route with minor changes, then amend the Master Document, allocate new waypoint names and numbers. Should a major re-routing be given, then a clearpart of the Master Document should be used to avoid any mistakes.

When the LRNS sets are to be re-loaded, ensure that the Autopilot system engaged is controlling the aircraft on the current ATC track. Then one crew member should re-load the

LRNS's and after this is complete the other crew member should check the distances and tracks.

NOTE: Do not change the co-ordinates of the waypoint(s) if the LRNS is using it to steer the autopilot.

10.1.5 ROUTE FLYING

10.1.5.1 Routes Other than RNAV Routes

When flying on controlled, advisory or uncontrolled ATS routes where the centerline is delineated by a radio beacon (VOR or ADF) and the FMS is not in use, the beacon assigned to the airway is to be tuned and identified, then the centreline radial is to be selected and the HIS switch set to V/L. Monitor the beam bar for any deviation if flying a VOR radial. Route designators for these routes are:

a) A, B, G or R, for routes which form part of the regional networks of ATS routes and are not area navigation routes.

b) H, J, V or W, for routes which do not form part of the regional networks of ATS routes and are not area navigation routes.

When flying routes that are not designated RNAV routes, and the FMS is being used to navigate the airway centreline when crossing each waypoint check the overhead of the radio beacon and then the next radio beacon, the distance to go to the next waypoint and finally, that the correct track is taken up by the aircraft.

10.1.5.2 Routes that are Designated RNAV Routes

When flying on controlled, advisory or uncontrolled ATS routes where the centreline is not delineated by a radio beacon, but here the centreline is to be maintained using RNAV equipment, then the FMS will be the prime source of directional control. The autopilot should be coupled to the FMS. Route designators for these routes are:

a) L, M, N or P for area navigation routes, which form part of the regional networks of ATS routes.

b) Q, T, Y or Z for area navigation routes, which do not form part of the regional networks of ATS routes.

Area Navigation (RNAV) ATS Routes, Required Navigation Performance Capability (RN PC) and Minimum Navigation Performance Specification (MN PS) Airspace.

Detailed North Atlantic Procedures are contained in *Section 10.5 of this Part C* of the Operations Manual.

When LRNS is the sole form of navigation, the utmost vigilance is required to avoid serious navigation violations.

On receipt of MNPS/RNPC/RNAV clearance, the cleared track must be checked or plotted on the appropriate chart and the turning points labeled with the waypoint names or numbers, as previously described.

The LRNS serviceability requirements in Nay Mode will be found in the equipment requirement list. The navigation serviceability rules to transit the MNPS/RNPC airspace will be found in North Atlantic Procedures.

Each LRNS will be checked for accuracy when transiting the last land based fix prior to the LRNS Sector, and system performance will be continually monitored. Updating must be monitored, especially on RNAV ATS routes.

Whilst in MNPS/RNPC/RNAV airspace, the following procedure at waypoints will be adopted:

a) Check the actual position of each LRNS against the Master Document or, in the case of a track change, then 'the change of routing' area on the Master Document.
b) Record the time of the Handling Pilot's LRNS crossing the waypoint.
c) Check the next waypoint co-ordinates, track to, distance to, and ETA. *(See LRNS procedures.)*
d) Check the aircraft has turned onto the new track by checking the FMS. Special procedures apply to North Atlantic HLA Airspace *(see NAT HLA section 10.5 of this manual).*

10.1.5.3 Deliberate Deviation from Track

Deliberate temporary deviations from track are sometimes necessary, usually to avoid severe weather; under normal circumstances, prior approval from ATC should be obtained. After such deviations the crew must ensure that the autopilot is re-coupled to the navigation system and when possible the original route regained.

10.1.5.4 Standard Weather Deviation

Meteorological conditions can cause turbulence, which can be detrimental to accurate height keeping. If an aircraft reports greater than moderate turbulence and is within 5 minutes of another aircraft at 1000 feet vertical spacing, ATC should endeavor to establish 2000 feet separation by climbing / descending either aircraft.

Pilots should notify ATC as soon as possible and request flight level change if necessary then take the following action:

a) Watch for possible conflicting traffic and make maximum use of exterior lights;
b) Broadcast call sign, position, flight level, nature and severity of turbulence and intentions on 121.5 MHz (123.45 MHz may be used as a back-up); and
c) If the aircraft cannot maintain flight level, execute established contingency procedures.

10.1.5.5 Actions to be Taken if a Revised Air Traffic Clearance Cannot be Obtained

Pilots shall 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 centre line unless otherwise directed by ATC),* when it is absolutely necessary in the interests of safety to do so.

a) When possible, deviate away from an organized track or route system;

b) 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).*

c) Watch for conflicting traffic both visually and by reference to ACAS (if equipped);

d) Turn on all aircraft exterior lights (commensurate with appropriate operating limitations);

e) For deviations of less than 10 nm, aircraft should remain at the last assigned level;

f) For deviations of greater than 10 nm, when the aircraft is approximately 10nm from track, initiate a level change based on the following criteria:

ROUTE CENTRELINE TRACK	DEVIATIONS > 10 NM	LEVEL CHANGE
EAST	LEFT	DESCEND 300 ft
000° - 179° magnetic	RIGHT	CLIMB 300 ft
WEST	LEFT	CLIMB 300 ft
180° - 359° magnetic	RIGHT	DESCEND 300 ft

g) 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;

h) When returning to track, be at its assigned flight level, when the aircraft is within approximately 10 nm of centreline.

10.1.5.6 Obtaining Priority from ATC when Weather Deviation is Required

A rapid response may be obtained on initial contact by stating "WEATHER DEVIATION REQUIRED" to indicate that priority is desired, if necessary making the message an urgency call. *(Do not forget to cancel the urgency call when the deviation has been completed).*

10.1.5.7 Inadvertent Deviation from Track

If an aircraft has inadvertently deviated from the route in the ATC clearance it shall take action to regain such route within 100nm from the position at which the deviation was detected. The controlling ATC should be informed as soon as possible and the aircraft intentions broadcast on 121.5 MHz.

Except that if, when within the NAT system, the aircraft position is discovered to be in excess of 50 nautical miles from the assigned track then the aircraft should maintain the current displacement from the track, maintain flight level and contact ATC. The aircraft's position should be broadcast on 121.5 MHz.

10.1.5.8 Avoiding Confusion between Magnetic and True

Details of the precaution to be taken in areas of compass unreliability and on flights within MNPS airspace are covered, where appropriate, in other sections.

10.1.5.9 Procedures in the Event of System Degradation

Procedures in the event of system degradation are covered in *Sections 10.4 and 10.5* of this manual.

10.1.5.10 Caribbean Area

Flights transiting Antigua, Barbados, Grenada, Caracas, Kingston, Montego Bay, Port of Spain, St. Lucia may find symptoms of EMI are observed during arrival and whilst parked in transit.

Aircraft systems, as well as the navigation systems, have been known to be affected by electromagnetic interference. Indications of the presence of EMI include erratic operation of the anti-skid, air conditioning packs, pressurisation outflow valves, air valves, window heat and the public address/cabin interphones.

Whilst taxiing or when on the ramp, any abnormal indications of system cycling instead of having valves like pressurisation outflow valves remaining open or at the required setting, will be construed as evidence of EMI and the navigation systems must then be fully checked.

10.1.6 MACH NUMBER TECHNIQUE

See - Section 10.5 - (NAT HLA) of this manual.

10.1.7 NAVIGATION PROCEDURES

10.1.7.1 Pre Flight Procedures

a) The Commander or First Officer will insert the departure ramp position in the FMS equipment by using the FMS ramp position if programmed into the FMS database, the “LAST POS” position if still applicable, or the ramp position shown on the aerodrome chart;

b) As a part of their checks, the Commander and First Officer will check the GPS ramp position.

c) Commander or First Officer will load the FMS. The loaded FMS data will be checked in accordance with Company procedures, and then transferred to the other FMS system *(where fitted)* where they will be re-checked.

NOTE: All Jeppesen navigation guides and charts must be checked for validity and must be current prior to flight. Navigation data supplied on disk may be allowed to be not more than 5 days post the validity dates.

d) Before departure;
   (i) The FMS initial route waypoints are checked to at least past the top of climb.

10.1.7.2 In Flight Procedures

The ATC clearance for flight through scheduled navigation area, should normally be copied by the NHP and where possible monitored by the HP. The HP also monitors the domestic ATC frequency and the aircraft flight path.

a) FMS Procedures – flight within scheduled navigation areas;

(i) First Officer loads **AND** checks the FMS route, against the waypoints on the PLOG. In the case of a North Atlantic re-routing, when the FMS data cannot be verified by the PLOG, he will cross check the FMS tracks and distances against the tracks and distances data in this manual and the Commander will independently repeat the check;

(ii) NHP completes the flight progress chart, annotating each waypoint within the scheduled navigation area with its position by recording its latitude and longitude;

(iii) The Commander, prior to entering a scheduled navigation area, must cross check the waypoint positions on the FMS and the leg distances and record and annotate the waypoints on the PLOG whilst the First Officer monitors the domestic ATC frequency and the aircraft flight plan.

(iv) Therefore, before entering a scheduled navigation area, both crew members will have independently checked each waypoint and its distance in their appropriate FMS and ringed and ticked the waypoint.

(v) The NHP should keep the FMS updated with waypoints; and each crew member is responsible for keeping the other informed of any changes or additions to FMS loading;

(vi) FMS changes to ROUTE or VNAV data must be cross checked by the other crew member before executing.

10.1.7.3 FMS Accuracy Checks, Prior to Scheduled Area Entry

Prior to entering a scheduled navigation area, confirm the accuracy of the FMS by:

a) Entering the Nav, Pos Sensors pages and checking the STATUS GPS 1 and GPS 2;

b) VOR radials and/or DME

c) Flight over VOR/NDB stations *(gives poor definition however);*

d) Passing close to a VOR/NDB to obtain a running fix;

e) Weather radar;

f) Visual fix;

g) ATC radar surveillance.

NOTE: In the case of b, d, e, f or g, the FMS cross-check should be accurate within 3 nm

10.1.7.4 Verification of Aircraft Position Prior to Scheduled Area Entry

Every effort should be made to verify the aircraft's position at MNPS Entry and Exit points.

10.1.7.5 Use of Flight Progress Chart When in Scheduled Area

On entering a scheduled navigation area for which a flight progress chart is provided, the performance of the FMS and each IRS set must be monitored by ensuring that the sets are supplying independent XTK information to the PF and PNF. The flight progress chart will be used when passing out a range of the last radio navigation beacon and position information plotted at regular intervals.

10.1.7.6 Waypoint Checks

Approaching each waypoint in a Scheduled Navigation Area, waypoint checks will be carried out in accordance with the following procedure:

10.1.7.6.1 FMS Equipment

a) On the FMS, check the latitude/longitude;

b) Select FPL. Check distance and time to next waypoint. The time overhead a current waypoint is defined as the time when the distance displayed equals the distance to the next waypoint;

c) Check the position on the two LRNS *(where available)* and that these present positions correspond to the ATC clearance;

d) Select FPL page and observe waypoint cycling, note waypoint identifier, ATA and altitude of the last waypoint crossing;

e) When steady on new course (wings level): check True/Magnetic Track on HIS against the PLOG initial True/Magnetic Track.

10.1.7.6.2 Initiated Transfer FMS Procedures

Either pilot may keep the FMS updated with waypoints. Both pilots are responsible for keeping the other informed of any such changes or additions. However, before any change is entered into the system on a permanent basis the other pilot must cross-check the information for accuracy.

10.1.8 IN-FLIGHT MALFUNCTIONS

10.1.8.1 General

Comply with the action codes and instructions contained in the Aircraft Manuals, which will be found in the aircraft library.

Navigate the aircraft by reference to a serviceable FMS/GPS.

If one FMS is unserviceable, monitor the aircraft position frequently by reference to the remaining serviceable equipment. Do this by:

a) Comparing Distance To Go with the navigating FMS;

b) Checking XTK Error against the navigating FMS.

When neither system is suspect and it is impossible to assess which system is the more accurate.

c) If XTK Error is 20 nm or more: Fly the aircraft using FMS offset or HDG mode to maintain half the XTK difference;

d) If DTG readings disagree by 25 nm or more: Adjust the ETAs to the mean of the displayed distances.

10.1.8.2 On Airways

a) Ensure that the route does not enter a scheduled navigation area;

b) Continue to monitor the flight progress by reference to ground aids. There is no limitation on the number of FMS sets required to be serviceable in NAV MODE, unless in an ANO Schedule 7 area;

c) Navigate the aircraft by reference to a remaining serviceable FMS.

NOTE: If FMS navigation systems are un-serviceable in NAV MODE, immediately:

(i) Advise ATC of the situation if appropriate;
(ii) Steer by reference to magnetic compasses;
(iii) Steer the PLOG magnetic tracks adjusted for estimated drift;
(iv) Contact other aircraft for wind information;
(v) Continue to fix the aircraft's position by all available means e.g. ATC SSR, VOR/DME, NDB, visually, by weather radar or other aircraft.

10.1.8.3 In a Scheduled Navigation Area: In-flight Contingencies

10.1.8.3.1 Introduction

The following procedures are intended for guidance only. Although all possible contingencies cannot be covered; they provide for such cases as inability to maintain assigned level due to weather, aircraft performance or pressurisation failure, loss of, or reduction in, navigation capability or en-route diversion across the traffic flow.

They are applicable primarily when rapid descent, turn back, or both are required. The pilot's judgment shall determine the sequence of actions taken, having regard to the specific circumstances.

10.1.8.3.2 General Procedures

If an aircraft is unable to continue flight in accordance with its air traffic control clearance, a revised clearance shall, whenever possible, be obtained prior to initiating any action, using the radiotelephony distress or urgent signal as appropriate. This shall also apply to aircraft that are unable to maintain an accuracy of navigation on which the safety of the separation minima applied depends.

If prior clearance cannot be obtained, an air traffic control clearance shall be obtained at the earliest possible time and, in the meantime, the aircraft shall broadcast its position *(including the ATS Route designator or the Track Code as appropriate)* and intentions on 121.5 MHz at frequent intervals until air traffic control clearance is received.

10.1.8.4 Special Procedures

10.1.8.4.1 Initial Action

If unable to comply with the above provisions, the aircraft should leave its assigned route or track by turning 90 Deg to the right or left whenever this is possible. The direction of the turn should be determined by the position of the aircraft relative to any organized route or track system *(e.g., whether the aircraft is outside, at the edge of, or within the system),* the levels allocated to adjacent routes or tracks, and if appropriate, terrainclearance.

10.1.8.4.2 Subsequent Action

An aircraft able to maintain its assigned level should:

a) If above FL 410, climb or descend 1000ft;

b) If below FL 410, climb or descend 500ft;

c) If at FL 410, climb 1000ft or descend 500 ft.

While acquiring and maintaining in either direction a track laterally separated by half the track distance spacing.

An aircraft not able to maintain its assigned level should start its descent while turning to acquire in either direction a track laterally separated as above from its assigned route or track. For subsequent level flight a level should be selected which differs from those normally used by 1000ft if above FL 410 or by 500ft if below FL 410.

10.1.8.4.3 En-Route Diversion Across the Traffic Flow

The basic concept of this guidance is that, when operationally feasible, before diverting across tracks or routes with heavy traffic, the aircraft should offset from the assigned track or route by half the track spacing distance and expedite a descent to an altitude below, or climb to an altitude above, those where the vast majority of aircraft operate before proceeding towards the alternate aerodrome.

Flight below FL 285, or above FL 410, should meet this objective.

10.1.8.4.4 Loss of Navigation Capability

Partial, or Complete Loss of, Navigation Capability by Aircraft Having State Approval for Unrestricted Operations in Oceanic / Remote Airspace.

10.1.8.4.5 One Out Of Two Systems Fails Before Take-Off

The Commander should consider:

a) Delaying departure if timely repair is possible; or

b) Planning on the special routes which are recommended for use by aircraft suffering partial loss of navigation capability, subject to the following conditions:
   (i) Sufficient navigation capability remains to meet the Long Range Navigation requirements and the aircraft is fitted with serviceable standard short-range navaids (VOR/DME, ADF);

(ii) A revised flight plan is filed with the appropriate ATS unit;
(iii) An appropriate ATC clearance is obtained; or

c) Obtaining a clearance above or below Special Rules airspace.

10.1.8.4.6 **One Out Of Two Systems Fails Before the Oceanic / Remote Boundary is Reached**

The Commander will have to consider:

(i) Landing at a suitable aerodrome before the boundary or returning to the aerodrome of departure; or
(ii) Diverting by the special routes, subject to the same conditions; or
(iii) Obtaining a re-clearance above or below Special Rules Airspace.

10.1.8.4.7 **One Out Of Two Systems Fails After the Oceanic / Remote Boundary is Crossed**

Once the aircraft has entered Special Rules Airspace, the Commander should normally continue to operate the aircraft in accordance with the clearance already received, appreciating that the reliability of his total navigation system has been significantly reduced.

He should, however:

a) Assess the prevailing circumstances *(e.g. remaining portion of the flight in Special Rules Airspace, etc.)*; and

b) Prepare a proposal to ATC with respect to the prevailing circumstances *(e.g. request clearance above or below Special Rules Airspace, turn back, obtain clearance to the special routes, etc.)*; and

c) Advise and consult with ATC as to the most suitable action; and

d) Obtain appropriate clearance prior to any deviation from original clearance.

When the flight continues in accordance with its original clearance *(especially if the distance ahead within Special Rules Airspace is considerable)*, the Commander should begin a special monitoring program:

e) To take special care in the operation of his remaining system, taking account of the fact that his routine method of error checking is no longer available;

f) To check the main and standby compass systems against the information that is available;

g) To check the performance record of the remaining equipment and if doubt arises regarding the performance and/or reliability he should consider:
   (i) attempting visual sighting of other aircraft, or their contrails, which may provide a track indication;
   (ii) calling the appropriate Oceanic Area Control Centre to obtain information on aircraft adjacent to his estimated position and /or calling on VHF to establish contact with such aircraft (preferably same track/level) obtaining from them information which could be useful *(drift, heading, wind details)*.

10.1.8.4.8 **All Systems Fail After Entering Oceanic / Remote Airspace**

(*Or the 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.)*

10.1.8.4.9 **The Commander should:**

a) Notify ATC, requesting a revised clearance;

b) Make best use of procedures specified above, relating to attempting visual sightings and establishing contact on VHF with adjacent aircraft for useful information;

c) Keep a special lookout for possible conflicting aircraft, and make maximum possible use of exterior lights;

d) If no instructions are received from ATC within a reasonable period, consider:
(i) Climbing or descending 500 feet if below FL 410;
(ii) Climbing or descending 1000 feet if above FL 410;
(iii) Climbing 1000 feet or descending 500 feet if at FL 410; and
(iv) Advising ATC as soon as possible.

10.1.8.4.10 **On A Polar Route**

a) TWO serviceable inertial systems in NAV MODE are always required on the polar routes prior to entering the COMPASS UNRELIABLE area; *(Refer to this manual for further information.)*

b) Refer to Note below following FMS/IRS failure prior to passing the “Decision Point” when entering the area of compass unreliability;

c) If after passing the Decision Point, only one FMS system remains serviceable in NAV MODE:
(i) Steer the aircraft by reference to the remaining serviceable FMS/IRS;
(ii) Advise ATC of the situation;
(iii) Prepare for total failure of navigation systems.

NOTE: If after passing the Decision Point, no inertial systems are serviceable in NAV MODE, immediately:
(i) Advise ATC of the situation;
(ii) Contact other aircraft for wind information;
(iii) Fix the aircraft’s position as soon as possible by any available means e.g. ATC / Military radar, visually, by weather radar or other aircraft;
(iv) Steer by means of the Reversionary Procedure detailed in the Polar Section.

10.1.8.5 Manual Position Updating of the FMS In Flight

NOTE: In-flight updating of the FMS is **not** recommended except in exceptional circumstances where large errors are experienced over positive fixes or as directed in these instructions. On those occasions when it is found necessary to update the FMS in flight, the details should be contained in a report to the Maintenance Manager.

Manual updating may be necessary if the two LRNS read cross-track differences of 10 nm or more. If this is the case:

a) Check any malfunction orders;

b) Check and compare FMS / GPS data e.g. TK, GIS, drift, etc.; for evident errors;

c) If no steering malfunction exists on any unit continue steering on the systems already selected;

d) If a malfunction has occurred, select the systems without relevant malfunction for steering.

10.1.8.6 Cross Track Disagreements

With only one serviceable IRS set in NAV MODE and if XTK readings on the GPS sets disagree by 20 nm or more, use the following procedure.

a) ‘When neither systems is suspect and it is impossible to assess which system is the more accurate, fly the aircraft to maintain HALF the XTK difference and record this as a Sector Defect in the Maintenance Log;

Distance readings on the two sets disagree by 25 nm or more:

a) Check the malfunction codes;

b) If no relevant malfunction exists on either set, Adjust the ETAs to confirm with the mean of the displayed times;

c) If a relevant malfunction does occur, select the set without malfunction for calculating ETAs.

10.1.8.7 Flight Progress Chart

For flight through a scheduled navigation area in which completion of a flight progress chart is required, NHP will:

a) Write the latitude and the longitude for each position;

b) Draw in the aircraft track across the scheduled navigation area;

c) Annotate the coded waypoints as displayed by FMS;

d) Check the FMS legs against the PLOG.

In the event of a re-route or when the ATC clearance is at variance with the anticipated route:

a) Reload the FMS with the new route;

b) Amend the latitudes and longitudes written on the chart;

c) Draw the new route;

d) Annotate the new waypoints on the chart as well as on the PLOG.

10.2 P-RNAV AIRSPACE

The aircraft must be RNP-5 compliant as required by the ECAC States for flight in European Airspace above FL95.

Prior to entering BRNAV airspace navigation systems must be operating within tolerance, and maintaining navigation accuracy on the cleared route should take priority.

The FMS database must be in date at all times.

Traditional navigation equipment (e.g. VOR/DME/ADF) should still be used both to monitor tracking accuracy and to facilitate reversion in the event of a loss of GPS navigation capability.

ATC should be alerted immediately should tracking reliability become suspect and reversion to non-RNAV navigation be necessary.

Guidance and procedures (normal and abnormal) with regard to system degradation are contained elsewhere in this manual.

10.2.1 PRECISION AREA NAVIGATION (P-RNAV) IN ECAC TERMINAL AIRSPACE INTRODUCTION

As a further development of the concept of area navigation within the European region, Precision Area Navigation (P-RNAV) is to be implemented in terminal airspace as an interim step to obtain increased operating capacity together with environmental benefits arising from route flexibility. In accordance with the EUROCONTROL Navigation Strategy, the carriage of RNAV equipment capable of precision navigation will be optional; those aircraft that are not P-RNAV compliant or do not wish to complete a P-RNAV Approach/Departure will be able to undertake conventional STARs / SIDs. P-RNAV is expected to be progressively replaced by RNP-RNAV operations.

Terminal Area Procedures exclude the Final and Missed Approach segments; P-RNAV procedures and apply to operations including Departures, Arrivals and Approaches up to the point of the Final Approach Waypoint (FAWP). For the immediate future, holding patterns are expected to be flown using conventional procedures.

10.2.1.1 Purpose

This guidance material is a synopsis of regulations.

When followed in its entirety, it does establish an acceptable means that can be used to obtain the necessary operational approval of a P-RNAV system for its use in designated European airspace.

10.2.1.2 Concept of P-RNAV

This guidance material includes both airworthiness and operational approval criteria related to P-RNAV systems intended to be used under Instrument Flight Rules, including Instrument Meteorological Conditions, in designated European airspace.

It addresses general certification considerations including functional requirements, accuracy, integrity, continuity of function, and system limitations together with operational considerations.

Precision RNAV (P-RNAV) has a navigation performance equal or better than a track keeping accuracy of ± 1.85km I ± nm for 95% of the flight time of an aircraft using Precision RNAV equipment. It ensures the navigational performance and functionality required for RNAV Terminal Area Procedures.

Whilst no ECAC-wide mandate for the carriage of P-RNAV is foreseen the Regulatory Authority requires P-RNAV certification for operation in notified Terminal Airspace. To this end, at the latest by November 2004, aircraft operating on RNAV Terminal Area Procedures in major ECAC Terminal Airspace will be subject to the following requirements;

a) For RNAV procedures that include route segments below the appropriate Minimum Flight Altitude (e.g. Minimum Sector Altitude (MSA); Minimum Radar Vectoring Altitude (MRVA)), P RNAV Approval will be required from the State of Registration;

b) For RNAV procedures that do not include route segments below the appropriate Minimum Flight Altitude (e.g. Minimum Sector Altitude (MSA); Minimum Radar Vectoring Altitude (MRVA)), and designed in accordance with en-route design principles, B RNAV approval may suffice. Otherwise, except where explicitly stated that the carriage of P-RNAV certified equipment is not required, the only acceptable alternative for such RNAV procedures is P-RNAV;

10.2.1.2.1 **Failure Conditions and Probability Terms**

a) Hazardous: Failure Conditions which would reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be.
   (i) A large reduction in safety margins or functional capabilities;
   (ii) Physical distress or excessive workload such that the flight crew cannot be relied upon to perform their tasks accurately or completely; or
   (iii) Serious or fatal injury to a relatively small number of the occupants other than the flight crew;

b) Probable Failure Conditions are those anticipated to occur one or more times during the entire operational life of each aeroplane;

c) Remote Failure Conditions are those unlikely to occur to each aeroplane during its total life, but which may occur several times when considering the total operational life of a number of aeroplane of the type;

d) Extremely Remote Failure Conditions are those not anticipated to occur to each aeroplane during its total life but which may occur a few times when considering the total operational life of all aeroplane of the type;

e) Extremely Improbable Failure Conditions are those so unlikely that they are not anticipated to occur during the entire operational life of all aeroplane of one type.

10.2.1.2.2 **System Description**

Lateral Navigation

For lateral navigation, the RNAV equipment enables the aircraft to be navigated in accordance with the appropriate routing instructions along a path defined by waypoints held in an on-board navigational database.

For the purposes operations are based upon the use of RNAV equipment that automatically determines aircraft position in the horizontal plane using inputs from the following types of positioning sensor (in no specific order of priority):

a) Distance measuring equipment giving measurements from two or more ground stations (DME/DME);

b) Very high frequency Omni-directional Radio range with a located DME (VOR/DME) where it is identified as meeting the requirements of the procedure;

c) Global Navigation Satellite Systems (GNSS);

d) Inertial Navigational System (INS) or Inertial Reference System (IRS), with automatic updating from suitable radio based navigational equipment.

NOTES: TACAN beacons may be included in the on-board navigation database and used to supplement DME provided they meet ICAO Annex 10 Standards and are listed in the AIP.

Accuracy

During operations on routes or in areas notified exclusively for P-RNAV equipped aircraft, the lateral track keeping accuracy of the on-board P-RNAV system shall be equal to or better than ± l nm for 95% of the flight time.

Integrity

With respect to the airborne system, the probability of displaying hazardously misleading navigational or positional information simultaneously to both pilots is remote.

Continuity of Function

With respect to the airborne systems, it shall be shown that:

a) The probability of loss of all navigation information is remote;

b) The probability of non-restorable loss of all navigation and communication functions is extremely improbable.

10.2.1.2.3 Requirements and recommended functions consist of RNAV functions to be performed, the display of information relevant to the path being flown and annunciation of warnings and failures.

These functions are distributed within the aircraft navigation and display system that is dedicated to primary information. Other information to be displayed is centered on the pilot's RNAV interface unit. There is no one defined equipment configuration that meets the TGL 10 P-RNAV requirements. For example the RNAV function and database requirements may be consolidated as part of an integrated navigation system as is the case where an FMS is installed and a Multi Control Display Unit is used as the pilot RNAV interface. Other configurations may have a separate conventional navigation system with an additional RNAV computer and display unit.

The system design and equipment to obtain compliance may be achieved by a number of different configurations of equipment.

Display of Essential Information in the Pilots' Primary Field of View

a) Lateral deviation & TO/FROM the waypoint;

b) Failure flag (failure of P-RNAV system);
c) Indication of active sensors being used.

Pilot Information that must be Displayed on a Navigation Display Unit Near to the Pilots' Primary Field of View

a) Validity of database;
b) Course to be flown;
c) Computed path of aircraft;
d) Identification of TO/FROM waypoints;
e) Speed/Time to waypoints;
f) Maneuver anticipation;
g) Navigation sensor in use.

Pilot Capabilities on Pilot / RNAV Interface Equipment

a) Automatic select and tune navigational aid;
b) Deselect individual navigational aids;
c) Select procedure to be flown.

10.2.1.2.4 **Equipment Requirements RNP-1**

See the MEL or Equipment Lists identifying the minimum system functions acceptable for P-RNAV operations.

Required Functions

RNAV COMPUTER CAPABLE OF	DISPLAY OF
Auto Tune VOR / DME	Lateral deviation
Automatic selection / de-selection of NAV source	TO / FROM
Auto reversion to alternate R-NAV sensor	Failure Flag
Reasonableness check of Nav Aid	Active Nav sensor
Direct TO function	Validity date of database
Auto Tune VOR / DME	Lateral deviation
Automatic selection / de-selection of NAV source	TO / FROM
Auto reversion to alternate R-NAV sensor	Failure Flag
Executing Database procedures	

Recommended Functions

DISPLAY OFF	CAPABILITY TO
Navigation Mode	Fly parallel paths
	Offset left or right 1 to 20 nm
	Fly vertical profiles
	Runway precision update

CAPABILITY TO EXECUTE LEG TRANSITION AND MAINTAIN TRACKS CONSISTENT WITH FOLLOWING ARINC 424 PATH TERMINATORS	DISPLAY OF
Holding Pattern to Manual Termination	Offset deviation and distance to go
Holding Pattern to an Altitude	Indicate prior end of offset
Holding Pattern to a Fix (HF)	
Constant Radius Path to a Fix (RF)	

10.2.1.2.5 **Use of Inertial Data *(Not applicable to Gama Operations)***

In the event of unavailability or loss of radio sensor derived automatic position updating, it may be permissible to use data from an inertial system as the only means of positioning for a short period of time. This time factor will have been established by the Operator and, when approved by the Regulatory Authority, will be included in the P-RNAV Approval Document.

10.2.2 ACCEPTABLE MEANS OF COMPLIANCE

10.2.2.1 Airworthiness

a) New and Modified Installations. Operators should consult the Airworthiness Division of the relevant Regulatory Authority for guidance on this matter;

b) Existing Installations. The applicant will need to submit to the responsible authority a compliance statement which shows how the criteria of TGL1O have been satisfied for existing installations. Compliance may be established by inspection of the installed system to confirm the availability of required features and functionality. The performance and integrity criteria may be confirmed by reference to statements in the Aircraft Flight Manual or to other applicable approvals and supporting certification data. In the absence of such evidence, supplementary analyses and] or tests may be required. Aircraft Flight Manual changes might be necessary.

10.2.2.2 Operational Criteria

General

a) An operational evaluation will need to be made to confirm the adequacy of the Operator's normal and contingency procedures for the particular equipment installation;

b) The following operating procedures will be utilised. It should be noted that airworthiness approval alone does not authorize flight in airspace, along routes, or for terminal area procedures for which P-RNAV approval is required. Operational approval will be issued in accordance with national procedures as appropriate.

10.2.2.3 Normal Procedures

Pre-flight Planning

During the pre-flight planning phase, the availability of the navigation infrastructure required for the intended operation, including any non-RNAV contingencies must be confirmed for the period of intended operation.

NOTAMs will advise crews of any issues affecting the availability of P-RNAV.

Availability of the onboard navigation equipment necessary for the route to be flown must be confirmed.

The onboard navigation database must be appropriate for the region of intended operation and must include the navigation aids, waypoints and coded terminal airspace procedures for the departure, arrival and alternate airfields.

Where the responsible airspace authority has specified in the AIP that Dual P-RNAV systems are required for specific terminal P-RNAV procedure, the availability of dual P-RNAV systems must be confirmed. This typically will apply where procedures are effective below the applicable minimum obstacle clearance altitude or where radar coverage is inadequate for the purposes of supporting P-RNAV.

This will also take into account the particular hazards of a terminal area and the feasibility of contingency procedures following loss of P-RNAV capability.

If a stand-alone GPS is to be used for P-RNAV, the availability of RAIM must be confirmed with account taken of the latest information from the US Coastguard giving details of satellite non-availability.

NOTE: RAIM prediction may be a function of the equipment provided that satellite non-availability data can be entered. In the absence of such a function, an airspace service provider may offer an approved RAIM availability service to users.

10.2.2.4 Operations Departments Procedure

The operations department will log-on to the website at:

http://augur.ecacnav.com/augur/app/npa

They will enter the Departure, Destination, En-route and Destination Alternates airfields requiring P-RNAV RAIM prediction coverage. This information will be provided to the crews in the Commanders Flight Brief

Crews are to use this information before flight to check the predicted RAIM coverage at all the required airfields at the times of operation, if P-RNAV Arrivals and Departures are required.

10.2.2.5 Departure

Whilst conducting the system initialisation, the flight crew must confirm that the navigation database is current and verify that the aircraft position has been entered correctly. The active flight plan should be checked by comparing the charts, SID or other applicable documents, 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 procedure, a check will need to be made to confirm that updating will use a specific navigation aid(s), or to confirm exclusion of a specific navigation aid. A procedure shall not be used if doubt exists as to the validity of the procedure in the navigation database.

NOTE: If a discrepancy is found when cross checking the data: -

(i) The SID must not be used, and

(ii) The Database / Chart supplier notified as soon as possible, and an Air Safety Report filed for the Flight Safety Officer to raise as an MOR.

The creation of new waypoints by manual entry into the RNAV system by the flight crew is not permitted as it would invalidate the affected P-RNAV procedure. 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 in the flight plan of waypoints loaded from the database.

Prior to commencing take-off, the flight crew must verify that the RNAV system is available and operating correctly and, where applicable, the correct airport and runway data have been loaded.

Unless automatic updating of the actual departure point is provided, the flight crew must ensure initialisation on the runway either by means of a manual runway threshold or intersection update, as applicable. This is to preclude any inappropriate or inadvertent shift after take-off. Where GNSS is used, the signal must be acquired before take-off roll commences and GNSS position may be used in place of runway update.

During the procedure and where feasible, flight progress should be monitored for navigational accuracy, by cross-checks, with conventional navigation aids using the primary displays in conjunction with the CDU.

Where the departure initialisation is not achieved, the departure should be flown by conventional navigational means. A transition to the P-RNAV structure should be made at the point where the aircraft has entered DME/DME coverage and has had sufficient time to achieve an adequate input.

NOTE: If a procedure is designed to be started conventionally, then the latest point of transition to the P-RNAV structure will be marked on the charts. If a pilot elects to start a PRNAV procedure using conventional methods, there will not be any indication on the charts of the transition point to the P-RNAV structure.

10.2.2.6 Arrival

Prior to the arrival phase, the flight crew should verify that the correct terminal procedure 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 procedure, a check will need to be made to confirm that updating will exclude a particular navigation aid. A procedure shall not be used if doubt exists as to the validity of the procedure in the navigation database.

NOTE: If a discrepancy is found when cross checking the data: -

(i) The STAR must not be used, and

(ii) The Database / Chart supplier notified as soon as possible, and an Air Safety Report filed for the Flight Safety Officer to raise as an MOR.

The creation of new waypoints by manual entry into the RNAV system by the flight crew would invalidate the P-RNAV procedure and is not permitted. Where the contingency to revert to a conventional arrival procedure is required, the flight crew must make the necessary preparation.

During the procedure and where feasible, flight progress should be monitored for navigational reasonableness by cross-checks with conventional navigation aids using the primary displays in conjunction with the CDU. In particular, for a VOR/DME RNAV procedure, the reference VOR/DME used for the construction of the procedure must be displayed and checked by the flight crew.

For RNAV systems without GNSS updating a navigation accuracy check is required during the descent phase before reaching the Initial Approach Waypoint (IAWP). For GNSS based systems, absence of an integrity alarm is considered sufficient. If the check fails, ATC must be advised and a conventional procedure must then be flown.

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 manner. This may include the insertion of tactical waypoints loaded from the database. Manual entry or modification by the flight crew of the loaded procedure, using temporary waypoints or fixes not provided in the database, is not permitted.

Although a particular method is not mandated, any published altitude and speed constraints must be observed.

10.2.2.7 Contingency Procedures

General contingency procedures have been considered earlier in this Section. In addition, those specific to P-RNAV are listed below:

a) The flight crew must notify ATC of any problem with the RNAV system that results in the loss of the required navigation capability, together with the proposed course of action;

b) In the event of communications failure, the flight crew should continue with the RNAV Procedure in accordance with the published Loss of Communications procedure;

c) In the event of loss of P-RNAV capability, the flight crew must inform ATC immediately and should, in conjunction with ATC co-ordination carry out contingency procedures and navigate using an alternative means of navigation using VOR/DME aids as appropriate, which may include the use of an inertial system. The alternative means need not be an RNAV system.

10.2.2.8 Incident Reporting

Every incident associated with the operation of the aircraft which affect or could affect the safety of RNAV operations, needs to be reported to the company.

Specific examples are:

a) Aircraft system malfunctions during P-RNAV operations which lead to:

   (I) Significant navigation errors attributed to incorrect data or a navigation database coding error;
   (II) Unexpected deviations in lateral or vertical flight path not caused by pilot input;
   (III) Significant misleading information without a failure warning;
   (IV) Total loss or multiple navigation equipment failure;
   (V) Pilot error

Crews are to report all incidents through the Company ASR *(Air Safety Report)* Scheme, the Flight Safety Officer will raise any required MORs as the Company considers appropriate.

10.2.2.9 Flight Crew Training

For further information, see Operations Manual Part D.

10.2.3 DATABASE INTEGRITY

Databases will be obtained from an approved supplier who has complied with the approved Standards for Processing Aeronautical Data.

The company will undertake 'Integrity Check' to identify any discrepancies between the navigation database and the published charts / procedures. Integrity checks may be performed by an approved third party.

Discrepancies that invalidate a procedure must be reported to the navigation database supplier and the company, also affected procedures must be prohibited by the company by notice to its flight crews.

10.2.4 AUTOPILOT / FLIGHT DIRECTOR

The company considers that the use of the Autopilot / Flight Director is vital to the accurate flying of P-RNAV procedures, and as such has made the serviceability of the Autopilot / Flight Director systems a Go / No-Go item. All company aircraft MELs will be changed to reflect this ethos in due course.

Crews must ensure the Autopilot / Flight Director is serviceable before any flight requiring P-RNAV procedures to be flown and are to use the Autopilot / Flight Director system to fly all P-RNAV approaches.

In the event that an aircraft suffers an Autopilot / Flight Director failure during a P-RNAV procedure, ATC must be informed immediately and contingency procedures flown.

10.2.4.1 Phraseology

Controller / Pilot RTF

MESSAGE	PHRASEOLOGY
As a means for ATC to confirm the ability of an aircraft to accept a specific RNAV arrival or departure procedure, ATC shall use the phrase *(designator)*	Callsign ADVISE IF ABLE DEPARTURE (or ARRIVAL)
Pilot indication of RNAV ability status	**ABLE (designator) DEPARTURE (or ARRIVAL)**
If a RNAV arrival or departure procedure, which has been assigned, cannot be accepted by the pilot, for reasons of either the RNAV equipment or circumstances associated with its operational use, the pilot shall inform ATC immediately	**UNABLE (designator) DEPARTURE (or ARRIVAL) DUE RNAV TYPE**
If for any other reason the pilot is unable to comply with an assigned Terminal Procedure, the pilot shall inform ATC immediately	**UNABLE (designator) DEPARTURE (or ARRIVAL) (reasons)**
If ATC is unable to assign a RNAV arrival or departure requested by a pilot, for reasons associated with the type of on-board RNAV equipment indicated in the Flight Plan, (designator) ATC shall inform the pilot	Callsign UNABLE TO ISSUE DEPARTURE [or ARRIVAL] DUE RNAV TYPE
If for any other reason ATC is unable to assign an arrival or departure procedure requested by the pilot, ATC shall inform the pilot	Callsign UNABLE TO ISSUE (designator) DEPARTURE [or ARRIVAL]

NOTE: Items in **BOLD** are Pilot broadcasts.

10.2.5 CREW FMS MANAGEMENT

Crews must ensure that the Handling Pilots (HP) PFD is selected to GPS / FMS mode and the autopilot is coupled to the Handling Pilot side, with NAV selected and that the Autopilot / Flight Director is used for all P-RNAV approaches.

The Non Handling Pilot (NHP) will primarily monitor the approach with display selected to GPS / FMS, however will periodically select VOR / DME data to use as a cross reference for system accuracy.

The FMS must be monitored throughout all P-RNAV Departures and Arrivals for RAIM integrity, and contingency procedures initiated if the GPS integrity is in doubt.

10.2.5.1 Altimeter Setting Procedure

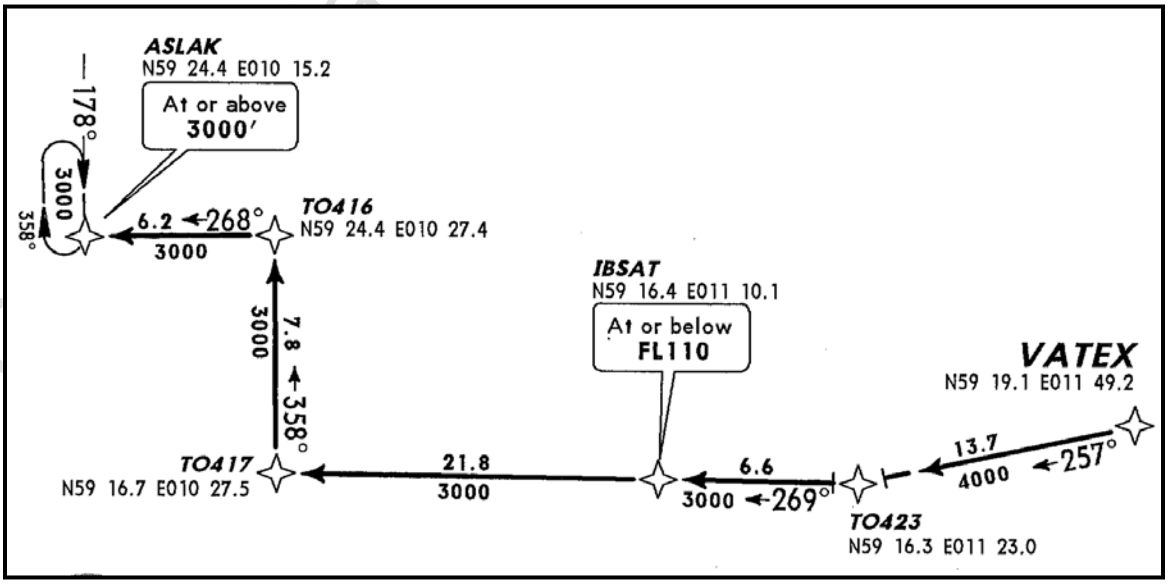
STAR *(Standard Arrival)*

As part of the P-RNAV TRANSITION to final approach crews may be required to automatically transfer from flight with reference to **Flight Levels** 1013 (STD) to flight with reference to **Altitude** QHN and thousands of feet.

The point at which this must occur will be detailed on the Jeppesen Plate. Some plates may highlight the changeover point using a box, e.g.

Set QNH after passing AB505

However, this is not always the case and the following examples are a possibility. In the case given directly below the QNH must be set after passing point 'IBSAT 'and a descent commenced to be at or not below 3000ft by point 'ASLAK'.



In all the examples below the QNH is set after passing point 'NARMU' and a descent commenced to be at or not below 3000ft by point 'LAPMO'.

STAR	ROUTING
BAGSO 1L	BAGSO (FL100: K250) - ADSIS - KERAV (FL80: K230) - KOLAX (FL80: K230) - KUDOM (FL80: K230) DW814 (FL80: K230) - DW815 (FL80: K230) - DW816 (FL80: K230) - NARMU - LAPMO (3000'+: K180)

The Crew's Descent and Approach Briefing must specifically highlight the point on the TRANSITION where this **1013.2 / QNH** changeover is required (IBSAT in the example given above). On reaching this point the HP should call for the QNH to be set, cross checked and the APPROACH CHECKS initiated, in accordance with company SOPs.

SID *(Standard Instrument Departure)*

On departures requiring a level off at a **Flight level** 1013.2 (STD) crews are to set 1013.2 (STD) once airborne on Altimeters 1 and 2.

Should ATC require a passing level with reference to the QNH the standby altimeter will still be set to the departure QNH and should be used to pass the required altitude.

10.2.5.2 Aircraft Minimum Equipment Lists (MEL) and P-RNAV Approaches

The applicable aircraft MEL details the minimum navigational equipment required to be serviceable to ensure the required navigational accuracy to complete a P-RNAV approach. This information is drawn from the aircraft flight manual (AFM)

10.3 REQUIRED NAVIGATION PERFORMANCE

10.3.1 RNP AREAS *(AREA NAVIGATION)*

This section deals with Area Navigation, which is covered by ICAO as Special Qualification Airspace. It does not include North Atlantic or Canadian Minimum Navigation Performance Specification Airspace, which is covered in the North Atlantic Procedures section later in this manual.

10.3.1.1 The Concept of Required Navigation Performance (RNP)

Traditionally, it has been common to define the required navigation capability of an aircraft by specifying the mandatory carriage of specific types of equipment *(e.g. dual VORs, ADF, etc.)*. In accordance with the guidance of ICAO's Future Air Navigation Systems (FANS) Committee, it is now accepted that it would be more efficient to define requirements in terms of Required Navigation Performance (RNP) rather than by the carriage of specific equipment. This approach would enable new navigation aids and/or navigation systems to be developed and introduced without the need for system selection on the part of ICAO. Any systems or combinations of equipment fits capable of satisfying the Required Navigation Performance Capability (RNPC) requirements could be accepted by States for use by operators. The navigation requirements could then be expressed in terms of an overall navigation accuracy which the aircraft would be required to meet. ICAO has recognised the desirability of applying this principle on a global basis.

10.3.1.2 RNP Definitions

Basic RNAV (B-RNAV) - for a track keeping performance of ± 5 nm for 95% of the flight time, and

Precision RNAV (P-RNAV) - for a track keeping performance of ± 1 nm for 95% of the flight time.

These were the two standards of Area Navigation. With the introduction of "Minimum Aircraft System Performance Standards (MASPS) for RNP Area Navigation", the term RNP-(x) RNAV has been adopted for RNAV systems fully conforming to the MASPS where (x) is the value of the required navigation performance.

Thus:

a) RNP-5 equates to a track keeping performance of ± 5 nm 95% of the flight time,
b) RNP-10 equates to a track keeping performance of ± 10 nm 95% of the flight time.

The terms Basic RNAV and Precision RNAV will be replaced by an RNP Value, which is a statement of the navigation performance accuracy necessary for operation within a defined airspace.

Area Navigation (RNAV) - A method of navigation that permits aircraft operation on any desired flight path.

Area Navigation Equipment - Any combination of equipment used to provide RNAV guidance.

ATS Route - A specified route, i.e., airway, advisory route, controlled or uncontrolled route, etc., designed for channeling the flow of traffic as necessary for the provision of air traffic services.

Geodesic - The shortest distance between two points on a model of the earth's surface defined by the WGS-84 (or equivalent) ellipsoid. For short distances, the geodesic converges to the great circle.

RNAV Route - An ATS route established for the use of aircraft capable of employing area navigation.

Waypoint - A specified geographical location used to define an area navigation route or the flight path of aircraft employing area navigation.

10.3.1.3 RNP Areas

RNP-4
- Canadian RNPC Airspace
- Tokyo Domestic Airspace

RNP-5
- ECAC Airspace
- MID / ASIA REGION — Amman; Baghdad; Bahrain; Beirut; Cairo; Damascus; Jeddah; Kabul; Kuwait; Muscat; Sana'a; Tehran; Tel Aviv; United Arab Emirates.

RNP-10
- Asia to Middle East / Europe, South of the Himalayas (EMARSSH)
- Australian RNAV Network
- EUR I SAM Corridor
- Indian Ocean Random RNAV Area (IORRA)
- Pacific Organised Track System (PACOTS)
- South China Sea RNAV Route Structure
- Tasman Sea New Zealand

NOTE 1: RNP-10 is intended for oceanic and remote areas where an aircraft separation minimum, in the order of 50 nm, is applied.

NOTE 2: The North Atlantic MNPS / RVSM area is not an RNP area.

10.3.1.4 Equipment Requirements - General

Required Functions

The following systems are the minimum required. All Company aircraft meets these Requirements where required.

a) A continuous indication of aircraft position relative to track must be displayed to the pilot flying on a navigation display situated in his primary field of view. In addition, it is desirable for the indication of aircraft position relative to track, to be displayed to the pilot not flying 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) Storage of waypoints; minimum of 4.

e) Appropriate failure indication of the RNAV system, including the sensors.

Recommended Functions

The following system functions and equipment characteristics are recommended.

a) Autopilot and / or Flight Director coupling;

b) Present position in terms of latitude and longitude;

c) “Direct To” function;

d) Indication of navigation accuracy *(e.g. quality factor)*;

e) Automatic channel selection of radio navigation aids;

f) Navigation database;

g) Automatic leg sequencing and associated turn anticipation.

10.3.1.5 RNP-4 Equipment Requirements

Minimum navigation equipment to satisfy the RNPC is:

a) Two GNSS based LRNS, and

b) VOR/DME and ADF.

10.3.1.6 RNP-5 Equipment Requirements

Determination of aircraft position is dependent on such factors as sensor availability, accuracy, and signal parameters *(e.g. signal source strength, transmitted signal degradation).*

Position determination, in no specific order of priority, may employ such inputs as:

a) Distance measurements from two or more Distance Measuring Equipment (DME) ground stations (DME / DME);

b) Very high frequency Omni directional Radio Range (VOR) with a co-located DME, (VOR / DME);

c) Inertial Navigation Systems (INS), or Inertial Reference Systems (IRS); supported by a suitable Navigation system;

d) Global Navigation Satellite System (GNSS) / Global Positioning System (GPS).

These various sensors may be used individually or combined to provide aircraft position.

Navigation parameters such as distance and bearing to a waypoint are computed from the aircraft position and the location of the waypoint. Track guidance is normally provided; this being referenced either to a track established.

10.3.1.7 RNP - 10 Equipment Requirements

Since RNP-10 airspace is over remote areas, then in order to satisfy ICAO Annex 2 and Annex 6, it has been decreed that the aircraft must be equipped with at least 2 LRNS.

This translates to dual FMS which interface with at least two sensors. These sensors may be comprised of either two x IRS or two x GPS *(of an acceptable specification)* or one of each.

Due to the drift characteristic of IRS sensors, their ability to meet RNP-10 requirements is limited in time, which is 6.2 hours flight time commencing when the IRS is placed in navigation mode or 5.9 hours after DME / DME updating or 5.7 hours after VOR / DME updating. With continuous GPS updating, there is no time constraint.

10.3.1.8 Contingency Procedures

System Failure. Accuracy and Integrity

Where failure of the RNAV system, or degradation of performance below that required for RNAV operations, results in an aircraft being unable either to enter the RNAV airspace or to continue operation in accordance with the current air traffic control clearance, ATC must be advised as soon as possible and a revised clearance requested. If contact with ATC is not achieved, and the aircraft is operating in RNP-10 airspace only, the aircraft should climb or descend 500’ (RVSM airspace) and turn 90° left or right to take up a parallel track laterally displaced by 15 nm.

Emergency procedures for operations in RNP airspace or on RNP routes are no different from normal emergency procedures with one exception, crews must be able to recognize and to advise ATC when the aircraft is no longer able to navigate to its RNP approval capability.

10.3.1.9 Operating Procedures

Flight Planning

During flight planning, the flight crew should pay particular attentions to conditions which may affect operations in RNP airspace (or on RNP routes). These include, but may not be limited to, verifying that:

a) The aircraft is approved for RNP operations;

b) The RNP-10 time limit has been accounted for when using IRS;

c) The letter “R” is annotated in Block 10 (Equipment) of the ICAO Flight Plan;

d) The requirements for GPS, such as FDE, if appropriate for the operation;

e) If required for a specific navigation system, there are no operating restrictions to the RNP approval.

Preflight Procedures

The following actions should be completed during pre-flight:

a) Review maintenance logs and forms to ascertain the conditions of equipment required for flight in RNP airspace or on an RNP route. Ensure the maintenance action has been taken to correct defects to required equipment;

b) During the external inspection of the aircraft, particular attention should be paid to the condition of navigation antenna and the condition of the fuselage skin in the vicinity of each of these antenna (this check may be accomplished by a qualified and authorised person other than the pilot);

c) Procedures to be followed in case of a weather deviation are to be found in *Section 10.1.5.4* and the following paragraphs.

En-route Procedures

Confirm the navigation equipment appropriate to the RNP airspace is serviceable. (At least two LRNS capable of navigating to the RNP should be operational at an oceanic entry point), If this is not the case, then the pilot should consider an alternate routing which does not require that equipment or diverting for repairs.

Before entering oceanic airspace, the aircraft's position should be checked as accurately as possible by using external navigation aids (navaids). This may require DME / DME and/or DME / VOR checks to determine navigation system errors through displayed and actual positions. If required the system is should be updated, following the procedure shown in the POM or AFM.

The systems should be crosschecked to identify navigation errors in sufficient time to prevent inadvertent deviation from ATC cleared routes.

Crews must 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.

10.3.1.10 Crew Training

Crew training details can be found in OM - D.

The training programme for RNAV operations will consider:

a) All phases of the operation and the responsibilities of flight crew members, flight dispatchers and maintenance personnel;

b) The technical content for flight crews in respect of
   (I) Theory and procedures, limitations, detection of malfunctions, preflight and in-flight testing, cross-checking methods, and the actual plotting of fixes, etc., relating to the operation;
   (II) Pre-flight, en-route and post-flight procedures;
   (III) The use of the systems performance and limitations at high latitudes, a review of navigation, flight planning and applicable meteorology;
   (IV) The methods for updating by means of reliable fixes, where permitted;
   (V) Use of appropriate Radiotelephony (RTF) phraseology pertaining to RNAV applications;
   (VI) Procedures in the event of loss or impairment of navigation capability, and
   (VII) Use of MEL and conditions imposed by the MEL.

10.4 RVSM

10.4.1 NAT Region

Lateral limits:	FL 290- FL 410 inclusive.
FIRs/UIRs:	Gander, New York, Santa Maria and Shanwick Oceanic together with Sondrestrom and Reykjavik FIRs, and Bodo Oceanic when more than 100 nm seaward from the shoreline. This includes NAMNPS airspace and New York FIR portion of WATRS.
Contingency Procedures:	Standard Oceanic with 15 nm lateral track separation from assigned track. The standard wake turbulence procedures implemented in the NAT have been modified in the WATRS RVSM, details below.

10.4.1.1 EUR / SAM Region Corridor

Lateral limits:	FL 290 — FL 410 inclusive.
FIRs/UIRs:	That airspace over the South Atlantic along fixed tracks which lie within the FIRs of: Canaries, Sal Oceanic, Dakar Oceanic and Recife/Atlántico. Crossing traffic entering or leaving along the eastern or western boundaries must be RVSM approved and should operate at conventional levels.
Contingency Procedures:	Standard Oceanic with 15 nm lateral track separation.

10.4.1.2 EUR Region

Lateral limits:	FL 290 - FL 410 inclusive.
FIRs/UIRs:	Amman, Amsterdam, Ankara, Athens, Barcelona, Beirut, Belgrade, Berlin, Bratislava, Bremen, Brindisi, Brussels, Bucharest, Budapest, Cairo, Canaries (AFI Region), Casablanca, Chisinau, Copenhagen, Damascus, Dusseldorf, France, Frankfurt, Hannover, Istanbul, Kaliningrad, Kishinev, Lisbon, Ljubljana, London, Lvov, Madrid, Malmo, Malta, Milan, Minsk, Munich, Nicosia, Norway, Odessa, Prague, Rhein, Riga, Rome, Rovaniemi, Sarajevo, Scottish, Shannon, Simferopol, Skopje, Sofia, Stockholm, Sundsvall, Switzerland, Tallinn, Tampere, Tirana, Tunis, Varna, Vienna, Vilnius, Warsaw, Zagreb, together with Kharkov and Khiv from 31.10.02.

The 41 States participating in the European RVSM Programme:

Albania	Germany	Norway
Austria	Greece	Poland
Belarus	Hungary	Portugal
Belgium	Ireland	Romania
Bosnia & Herzegovina	Italy	Slovak Republic
Bulgaria	Latvia	Slovenia
Croatia	Lithuania	Spain
Cyprus	Luxembourg	Sweden
Czech Republic	Malta	Ukraine
Denmark	Moldova	United Kingdom
Estonia	Monaco	Yugoslavia
Finland	Morocco	
France	Netherlands	

NOTE: The entry and exit points into / out of EUR RVSM airspace together with the new flight level must be entered in the Route section of Item 16 of the ICAO Flight Plan.

10.4.1.3 PAC Regions

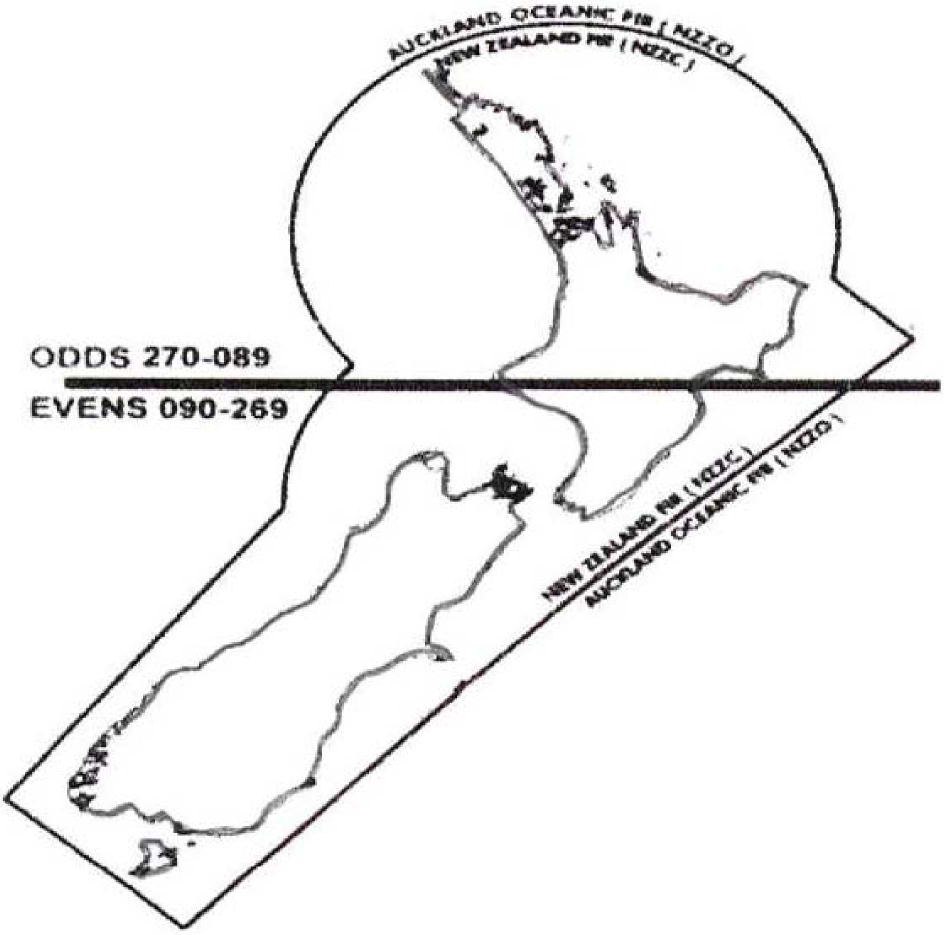
Lateral limits:	FL 290 — FL 410 inclusive
FIRs/UIRs:	RVSM shall be applied for flights within the Anchorage Arctic, Anchorage Continental, Anchorage Oceanic, Auckland Oceanic, Los Angeles, Nadi, Oakland, Oakland Oceanic, Seattle, Tahiti and Vancouver Flight Information Regions (FIRs). **NOTE**: Several FIRs detailed above are contained in the ICAO North America (NAM) Region. They are integrated as they are FIRs where transition to / from RVSM flight levels will take place.
Contingency Procedures:	Standard Oceanic with 15 nm lateral track separation from assigned route.

10.4.1.4 MID / ASIA Region

Lateral limits:	FL 290- FL 410 inclusive.
FIRs/UIRs:	RVSM shall be applied for flights within the FIRs: Auckland Oceanic, Bali, Bahrain, Bangkok, Brisbane, Calcutta, Chennai, Colombo, Delhi, Dhaka, Emirates, Hanoi, Ho Chi Minh, Hong Kong, Honiara, Jakarta, Jeddah, Karachi, Kathmandu, Kota Kinanbalu, Kolkata, Kuala Lumpur, Lahore, Male, Manila, Melbourne, Mumbai, Muscat, Myanmar, Naha, Nauru, New Zealand*, Phnom Penh, Port Moresby, Sana'a, Sanya AOR, Singapore, Taigu, Taipei,

	Tehran, Tokyo Oceanic, Ujung Pandang, Vientiane and Yangon. **NOTE:** Includes EMARSSH Area & Routes.
Contingency Procedures:	Varies with National AIP's

NOTE: New Zealand FIR



The RVSM stratum within the New Zealand FIR is designated "RVSM Exclusive".

Within this FIR (NZZC) the line of orientation for altitude separation is East - West rather than the normal North - South datum. 'Odd Levels' are allocated to tracks between 270° to 089° North (in lieu of 0000 to 179° East) and 'Even Levels' are allocated to tracks between 090° and 269° South *(in lieu of 180° to 359° West).*

The Standard Weather Deviation within the New Zealand FIR is based on that same orientation.

10.4.1.5 NAM Region (Canada)

Lateral limits:	FL 290 — FL 410 inclusive.
FIRs/UIRs:	Canadian Northern Domestic Airspace.

Contingency Procedures:	Standard Remote - the pilot's judgement shall determine the sequence of actions to be taken, considering the specific circumstances, and ATC shall render all possible assistance.

10.4.2 FLIGHT CREW OPERATING PROCEDURES

10.4.2.1 Flight Crew Training

See OMD 2.1.14

10.4.2.2 Flight Planning

During flight planning, the flight crew should check all conditions which may affect operation in RVSM airspace. These include, but may not be limited to:

a) Reported and forecast weather conditions on the route of flight, especially turbulence;

b) Minimum equipment requirements pertaining to height-keeping systems, and

c) Review flight plan for correct annotation for approved RVSM flight.

10.4.2.3 Pre-Flight Procedures at the Aircraft

The following actions are to be accomplished during pre-flight:

a) Review maintenance logs and forms to ascertain the condition of equipment required for flight in the RVSM airspace. Ensure that maintenance action has been taken to correct defects to required equipment;

b) During the external inspection of aircraft, particular attention should be paid to the condition of static sources and the condition of the fuselage skin in the vicinity of each static source (this check may be accomplished by a qualified and authorised person other than the pilot, e.g. a flight engineer or maintenance personnel);

c) Before take-off, the aircraft altimeters should be set to the local altimeter (QNH.-setting and should display a known elevation (e.g. field elevation) within the limits specified in aircraft operating manuals, the limits for company aircraft are given within Section 8 of OM-A. The two primary altimeters should also agree to within limits specified by the aircraft operating manual (50 feet).

   An alternative procedure using absolute altitude (QFE) may also be used;

   NOTE: The maximum value for these checks cited in operating manuals should not exceed 75 feet.

d) Before take-off, equipment required for flight in RVSM airspace should be operative and be turned on and engaged as necessary, and indications of malfunction should be resolved.

10.4.2.4 Procedures to Follow Prior to RVSM Airspace Entry

Before entering RVSM airspace, the pilot is to review the status of required equipment.

The following equipment is to be operating normally:

a) Two primary altitude measurement systems. A cross check between both primary altimeters must be made and both readings noted. Any difference of 200ft/60m must be noted and reported to the appropriate ATC unit as ‘unable RVSM due altimetry error.

b) one automatic altitude control system,

c) one altitude-alerting device, and

d) One operating SSR transponder with altitude reporting connected to the altitude measurement system in use for altitude control.

In the event that any of the required equipment fails prior to the aircraft entering RVSM airspace, the pilot is to notify the relevant ATC unit and request a new clearance so as to avoid flight within RVSM airspace.

10.4.2.5 In-flight Procedures within RVSM Airspace

The following actions should be accomplished while in flight:

a) Emphasis should be placed on promptly setting the sub-scale on all primary altimeters to 29.92 in. HPa / 1013.2 HPa when passing the transition altitude and re-checking for proper altimeter setting when reaching the initial cleared flight level (CFL)

b) In level cruise, it is essential that the aircraft is flown at the CFL. This requires that particular care is taken to ensure that ATC clearances are fully understood and complied with. Except in the event of an emergency, the aircraft should not intentionally depart from CFL without a positive clearance from ATC;

c) During cleared transition between levels, the aircraft should not be allowed to overshoot or undershoot the old or new w flight level by more than 45 m (150ft);

d) An automatic Altitude Control System must be operative and engaged during level cruise, except when circumstances such as the need to re-trim the aircraft or turbulence require disengagement. In any event, adherence to cruise altitude should be done by reference to one of the two primary altimeters;

e) The altitude-alerting device should be operative and engaged;

f) At intervals of approximately one hour, cross-checks between the primary altimeters should be made. A minimum of two must agree within 60 m (200ft). Failure to meet this condition will require that the altimetry system be reported as defective and notified to ATC; Future systems may make use of altimeter comparisons in lieu of regular checks. On aircraft equipped with automated ADC monitoring this hourly altimeter cross check is not required to be noted but best practice dictates a regular cross check of all altimeters.

g) Normally, the altimetry system being used to control, the aircraft should be selected to provide the input to the altitude reporting transponder transmitting information to ATC;

h) If the aircraft is identified as exceeding a total vertical error of 300ft or an altimetry system error of 275ft, then the pilot should follow the established regional procedures;

i) If the pilot is notified by ATC of an assigned altitude deviation error which exceeds 90 m (300ft), then the pilot should take action to return to the CFL as quickly as possible, and a MOR to the company in the event of.

j) Operating flight crew should be aware of the mach number/IAS limits for RVSM operations as per the aircraft AFM and ensure that all operations within RVSM airspace are conducted within these limits.

k) Operating Flight Crew must report recorded or communicated occurrences of height-keeping errors caused by malfunction of aircraft equipment or an operational nature, equal to or greater than:

1) a total vertical error (TVE) of ±90 m (±300 ft);
2) an altimetry system error (ASE) of ±75 m (±245 ft); and
3) an assigned altitude deviation (AAD) of ±90 m (±300 ft).

Reports of such occurrences shall be sent to the competent authority within 72 hours. Reports shall include an initial analysis of causal factors and measures taken to prevent repeat occurrences.

When height-keeping errors are recorded or received, the operator shall take immediate action to rectify the conditions that caused the errors and provide follow-up reports, if requested by the competent authority.

10.4.2.6 In-Flight Contingencies

Pilot-in-Command Responsibility

In addition to emergency conditions that require immediate descent, such as loss of thrust or pressurisation, ATC must be made aware of the less explicit conditions that may make it impossible for an aircraft to maintain its CFL appropriate to RVSM.

Controllers must react to such conditions but these actions cannot be specified, as they will be dynamically affected by the real-time situation.

The following guidance for contingency procedures should not be interpreted in any way which prejudices the final authority and responsibility of the pilot-in- command for the safe operation of the aeroplane.

10.4.2.7 Contingencies Applicable to all RVSM Airspace

After entering RVSM airspace

a) The pilot should notify ATC of contingencies (equipment failures, weather conditions) which affect his ability to maintain his CFL and co-ordinate a plan of action;

b) Examples of equipment failures which should be notified to ATC are:
   (i) Failure of all automatic altitude keeping devices aboard the aircraft;
   (ii) Loss of redundancy of altimetry systems, or any part of these, aboard the aircraft;
   (iii) Loss of thrust on an engine necessitating descent; and any other equipment failure affecting the ability to maintain CFL;

c) The pilot should notify ATC when encountering greater than moderate turbulence, and, if unable to notify ATC and obtain an ATC clearance prior to deviating from the assigned CFL, the pilot should follow established contingency procedures and obtain ATC clearance as soon as possible.

10.4.2.8 Failure of Automatic Altitude Keeping Devices (e.g. autopilot altitude hold)

The pilot should consider the following actions:

a) **Initial actions:**
   (i) Maintain CFL;
   (ii) Evaluate the aircraft's capability to maintain altitude through manual control.

b) **Subsequent actions:**
   (i) Watch for conflicting traffic;
   (ii) If considered necessary, alert nearby aircraft by making maximum use of exterior lights; and broadcasting position, flight level, and immediate intentions on 121.5 MHz;

c) Notify ATC of the failure and the intended course of action. Possible courses of action include:
   (i) Continuing in RVSM airspace provided that the aircraft can maintain the CFL;
   (ii) Requesting ATC clearance to climb above or descend below
   (iii) Executing the contingency manoeuvre specified later in this document to leave the assigned route or track if prior ATC clearance cannot be obtained and the aircraft cannot maintain level flight, if this is appropriate.

10.4.2.9 Loss of Redundancy in Primary Altimetry System

The pilot should, if the remaining altimetry system is functioning normally, couple that system to the Altitude Keeping Device, notify ATC of the loss of redundancy and maintain increased vigilance of altitude-keeping.

If the remaining altimetry system is not functioning normally, see below.

10.4.2.9.1 **All Primary Altimetry Systems Fail or are Considered Unreliable**

The pilot should take the following actions:

a) Initial actions:
   (i) Maintain altitude by reference to the standby altimeter.
   (ii) Alert nearby aircraft by:
   - making maximum use of exterior lights;
   - broadcasting position, flight level and intentions on 121.5 MHz
   (iii) Notify ATC of the inability to meet RVSM performance requirements, consider declaring an emergency and request clearance to exit RVSM airspace.

b) Subsequent courses of action:
   (i) If unable to obtain ATC clearance, in a timely manner, execute contingency procedures specified later in this document to leave the assigned route or track and descend below RVSM airspace (if operationally feasible);

   (ii) If not operationally feasible, continue to alert nearby aircraft and coordinate with ATC.

10.4.2.9.2 **The Primary Altimeters Diverge by more than 200ft**

The pilot should:

a) Attempt to determine the defective system;

b) If the defective system can be determined, couple the functioning altimetry system to the Altitude Keeping Devices; and

c) If the altimeter displays diverge by more than 200ft and the defective system cannot be determined, follow the guidance regarding failure or unreliable altimeter indications of all primary altimeters (see previous paragraph). In the event of loss of altimetry redundancy ATC must notified accordingly.

10.4.2.9.3 **Failure of the Transponder**

The pilot must notify ATC prior to entering airspace where a transponder is normally required, e.g. when departing NAT HLA.

10.4.2.9.4 **Contingency Procedures Applicable to Oceanic or Remote RVSM Airspace**

The following guidance is recommended for aircraft operating within the above areas unless regional requirements dictate otherwise.

a. Initial Action
If unable to obtain prior air traffic clearance, the aircraft should leave its assigned route or track by turning 90° to the right or left whenever this is possible. The direction of the turn should, where possible, be determined by the position of the aircraft relative to any organised route or track system (e.g. whether the aircraft is outside, at the edge of, or within the system). Other factors which may affect the direction of the turn are the direction to an alternate airport, terrain clearance and the levels allocated to adjacent routes or tracks.

b. Subsequent Action
An aircraft **able** to maintain its assigned flight level should:

(i) Turn to acquire and maintain in either direction a track laterally separated from its assigned route or track, and

(ii) if above FL 410, climb or descend 300 m (1,000ft); or

(iii) if below FL 410, climb or descend 150 m (500ft); or

(iv) if at FL 410, climb 300 m (1,000ft) or descend 150 m (500ft).

An aircraft not able to maintain its assigned flight level should:

(i) Initially minimise its descent rate to the extent that it is operationally feasible;

(ii) turn while descending to acquire and maintain in either direction a track laterally separated* from its assigned route or track; and

(iii) for the subsequent flight level, a level should be selected which differs from those normally used by 300 m (1,000ft) if above FL410 or by 150 m (500ft) if below FL 410.

NOTE: The lateral distance will depend on the region / FIR.

10.4.2.10 Contingency Procedures for Wake Vortex Encounters

If a pilot experiences wake vortex from aircraft ahead on the same route and 1,000ft above, the pilot should notify ATC and request a revised clearance.
However, in situations where a revised clearance is not possible or practicable: along a route or track there will be three positions that an aircraft may fly: centreline or one or two miles right; and

- Offsets will not exceed 2 NM right of centreline.

  Distributing aircraft laterally and equally across the three available positions adds an additional safety margin and reduces collision risk. Aircraft without automatic offset programming capability must fly the centreline.

- Aircraft with the capability of programming automatic offsets may fly the centreline or offset one or two nautical miles right of centreline to obtain lateral spacing from nearby aircraft. *(Offsets will not exceed 2 NM right of centreline and **offsets left of track centreline must not be made**)*. An aircraft overtaking another aircraft should offset within the confines of this procedure, if capable, so as to create the least amount of wake turbulence for the aircraft being overtaken.
- Pilots should use whatever means are available *(e.g. TCAS, communications, visual acquisition, GPWS)* to determine the best flight path to fly.
- For wake turbulence purposes, pilots should also fly one of the three positions shown above. Pilots should not offset to the left of centreline nor offset more than 2 nm right of centreline. Pilots may contact other aircraft on the air-to-air channel, 123.45 MHz, as necessary; to co-ordinate the best wake turbulence mutual offset option. As indicated below, contact with ATC not required.
- Pilots may apply an offset outbound at the oceanic entry point and must return to centreline prior to the oceanic exit point.
- Aircraft transiting radar-controlled airspace mid-ocean should remain on their already established offset positions.
- There is no ATC clearance required for this procedure and it is not necessary that ATC be advised.
- Voice Position reports should be based on the waypoints of the current ATC clearance and not the offset positions.

This procedure should not be interpreted in any way that prejudices the responsibility of the pilot-in-command for the safe operation of the aircraft.

10.4.2.11 Contingency Procedures Applicable to UK and EUR RVSM Airspace

A. Introduction

In this RVSM airspace, it is expected that all aeroplanes will be in continuous radio contact with ATC either on the assigned frequency or on the distress and emergency frequencies (121.5 MHz). 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 (unapproved deviations from track should not be initiated).

It is however recognised, 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.

B. Communication Failure

As soon as it is known that two-way communication has failed, ATC shall maintain separation between the aircraft having the communication failure and other aircraft based on the assumption that the aircraft will operate in accordance with the following procedures.

A controlled IFR flight experiencing communication failure in VMC shall:

a) Set transponder to Code 7600;

b) Continue to fly in VMC;

c) Land at the nearest suitable aerodrome; and

d) Report its arrival time by the most expeditious means to the appropriate ATS unit.

A controlled IFR flight experiencing communication failure in IMC, or where it does not appear feasible to continue in VMC shall:

a) Set transponder to Code 7600;

b) Maintain for a period of 7 minutes the last assigned speed and level, or the minimum flight altitude if the minimum flight altitude is higher than the last assigned level.

   The period of 7 minutes commences:

   1. If operating on a route without compulsory reporting points or if instructions have been received to omit position reports:
      i. At the time the last assigned level or minimum flight altitude is reached; or
      ii. At the time the transponder is set to Code 7600, whichever is later; or
   2. If operating on a route with compulsory reporting points and no instruction to omit position reports has been received:
      i. At the time the last assigned level or minimum flight altitude is reached; or
      ii. At the previously reported pilot estimate for the compulsory reporting point; or
      iii. At the time of a failed position report over a compulsory reporting point, whichever is later.

   NOTE: The period of 7 minutes is to allow the necessary air traffic control and coordination measures.

c) Thereafter, adjust level and speed in accordance with the flied flight plan;

   NOTE: With regard to changes to levels and speed, the filed flight plan, which is the flight plan as filed with an ATS unit by the pilot or a designated representative without any subsequent changes, will be used.

d) If being radar-vectored or proceeding offset according to RNAV without a specified limit, proceed in the most direct manner possible to re-join the current flight plan route no later than the next significant point, taking into consideration the applicable minimum flight altitude;

NOTE: With regard to the route to be flown or the time to begin descent to the arrival aerodrome, the current flight plan, which is the flight plan, including changes, if any, brought about by subsequent clearances, will be used.

e) Proceed according to the current flight plan route to the appropriate designated navigation aid serving the destination aerodrome and, when required to ensure compliance with f) below, hold over this aid until commencement of descent;

f) Commence descent from the navigation aid specified in e) above at, or as close as possible to, the expected approach time last received and acknowledged or, if no expected approach time has been received and acknowledged, at, or as close as possible to, the estimated time of arrival resulting from the current flight plan;

g) Complete a normal instrument approach procedure as specified for the designated navigation aid; and

h) Land, if possible, within thirty minutes after the estimated time of arrival specified in the flight plan or the last acknowledged expected approach time, whichever is later.

NOTE: UK FIRs. In certain circumstances, namely in the more complex areas of the UK ATS route structure, it is considered that the 7-minute parameter referred to previously would be too long. If being radar vectored, or proceeding offset according to RNAV, without having been given a specified limit, pilots are to continue with ATC instructions last acknowledged for 3 minutes only, before returning to their flight plan route.

NOTE: Pilots are reminded that the aircraft may not be in an area of secondary surveillance radar coverage.

10.4.2.12 Meteorological Conditions

Meteorological conditions can cause turbulence which can be detrimental to accurate height keeping. If an aircraft reports greater than moderate turbulence and is within 5 minutes of another aircraft at 1000 feet vertical spacing, ATC should endeavour to establish 2000 feet separation by climbing/descending either aircraft.

The pilot should take the following action:

a) Watch for possible conflicting traffic and make maximum use of exterior lights;

b) broadcast call sign, position, flight level, nature and severity of turbulence and intentions on 121.5 MHz *(123.45 MHz may be used as a back-up);*

c) notify ATC as soon as possible and request flight level change if necessary; and

d) if the aircraft cannot maintain flight level, execute established contingency procedures.

NOTE: If a revised Air Traffic clearance cannot be obtained, carry out the Standard Weather deviation procedures.

10.4.2.13 TCAS Alerts and Warnings

In the event that a Traffic Advisory (TA) is issued, use all available information to prepare to respond to a Resolution Advisory (RA), if one should follow. In the event that an RA is issued, initiate the required manoeuvre immediately even if there is a conflict between the

RA and an Air Traffic Control (ATC) instruction to manoeuvre, unless to do so would jeopardise the safety of the aeroplane *(stall warning, windshear and GPWS alerts have precedence over ACAS).*

ATC does not know when ACAS issues RAs so it is important that they be notified when an ATC instruction is not being followed because of an RA confliction. Manoeuvres should **never** be made in an opposite sense to an RA, nor should an RA be discounted on the belief that the conflict has been visually identified as the visually acquired traffic may not be the cause of the RA, especially at night.

To reduce the likelihood of TAs and RAs occurring in RVSM airspace where separation may be less than 2000 feet vertically and 5 nm horizontally, when first approaching a cleared flight level, and/or when changing flight level, vertical speeds should be confined to less than 1500ft / mm, and ideally between 500 and 1000ft / mm, for the final 1500ft.

The aircraft should not overshoot or undershoot the assigned level by more than 150 ft.

10.4.2.14 Phraseology

Controller-pilot RTF: *(*indicates a pilot transmission)*

MESSAGE	PHRASEOLOGY
To ascertain the RVSM approval status of a flight:	(Callsign) CONFIRM RVSM APPROVED
Pilot indication of non-RVSM approval status:	* NEGATIVE RVSM

To be stated:

a) In the initial call on any frequency within the RVSM airspace (controllers shall provide a read-back with this same phrase), and

b) In all requests for flight level changes pertaining to flight levels within the RVSM airspace,

c) In all read-backs to flight level clearances pertaining to flight levels within the RVSM airspace as well, pilots of aircraft, other than State aircraft, shall respond to level clearances involving the vertical transit through either FL290 or FL41O with this phrase.

MESSAGE	PHRASEOLOGY
Pilot indication of non-RVSM status:	*AFFIRM RVSM
State aircraft, non-RVSM approved, shall indicate their status as being that of a State aircraft, in conjunction with a negative response to the RTF with the phrase:	*NEGATIVE RVSM STATE AIRCRAFT
Denial of clearance into the RVSM airspace: *(Callsign)*	*UNABLE CLEARANCE INTO RVSM AIRSPACE MAINTAIN or CLIMB TO)

	FLIGHT LEVEL
For the case of an individual aircraft reporting severe turbulence or other severe weather related phenomenon, the pilot phraseology shall be:	*UNABLE RVSM DUE TURBULENCE
The phraseology required of a pilot to communicate those circumstances which would cause an aircraft's equipment to degrade to below altimetry MASPS compliance levels shall be:	*UNABLE RVSM DUE EQUIPMENT

The phrase is to be used to convey both the initial indication of the non-altimetry MASPS compliance and henceforth, on initial contact on all frequencies within the RVSM airspace until such time as the problem ceases to exist. The phrase is to be used to convey both the initial indication of the non-altimetry compliance and henceforth, on initial contact on all frequencies within the lateral limits of the RVSM airspace.

MESSAGE	PHRASEOLOGY
The pilot shall communicate his ability to resume operation within the RVSM airspace after an equipment related contingency, or his/her ability to resume RVSM operations after a weather related contingency with the phrase:	* READY TO RESUME RVSM
Controllers wishing to solicit this information shall use the phrase:	*REPORT ABLE TO RESUME RVSM

10.4.2.15 Post Flight Action

In making technical log entries against malfunctions in height-keeping systems, the pilot should provide sufficient detail to enable maintenance to effectively troubleshoot and repair the system.

The pilot should detail the actual defect and the crew action taken to try to isolate and rectify the fault.

The following information should be recorded when appropriate:

a) Primary and standby altimeter readings;
b) Altitude selector setting;
c) Subscale setting on altimeter;
d) Autopilot used to control the aeroplane and any differences when an alternative autopilot system was selected;
e) Differences in altimeter readings, if alternate static ports selected;
f) Use of air data computer selector for fault diagnosis procedure.

The transponder selected to provide altitude information to ATC and any difference noted when an alternative transponder was selected.

10.5 FLIGHT IN THE NAT HIGH LEVEL AIRSPACE (HLA)

10.5.1 INTRODUCTION

Operations within the North Atlantic are to be conducted in accordance with the procedures specified following.

Because of the special conditions that exist in the area known as NAT HLA formerly NAT MNPS with the limited availability of suitable airports, frequency of adverse weather and single engine performance requirements, it is essential that both operations staff and crews give careful and detailed consideration to pre-flight planning, route selection and in flight procedures.

NOTE: All operations in the NAT HLA are PROCEDURAL and crews must appreciate that in this busy airspace, situations may arise where they will have to rely not only on the following guidelines but also good airmanship.

NOTE: NAT HLA is a re-designation of the airspace formerly known as the North Atlantic Minimum Navigation Performance Specifications Airspace (NAT MNPSA).

All flights within the NAT HLA must have the approval of either the State of Registry of the aircraft, or the State of the Operator. Aircraft operating in RVSM Airspace are required to be compliant with the altimetry minimum aircraft system performance specification (MASPS) and hold an issued approval. Approval issued by the Civil Aviation Authority, and the aircraft is equipped in accordance with equipment laid down in within this Manual.

Since NAT HLA is designated as RVSM airspace at all levels *(i.e. FL290-410 inclusive)* specific State RVSM Approval is also required to operate within MNPS Airspace.

10.5.1.1 Area of NAT HLA

The vertical dimension of NAT HLA is between FL285 and FL420 *(i.e. in terms of normally used cruising levels, from FL290 to FL410 inclusive).*

The lateral dimensions include the following Control Areas *(CTAs):*

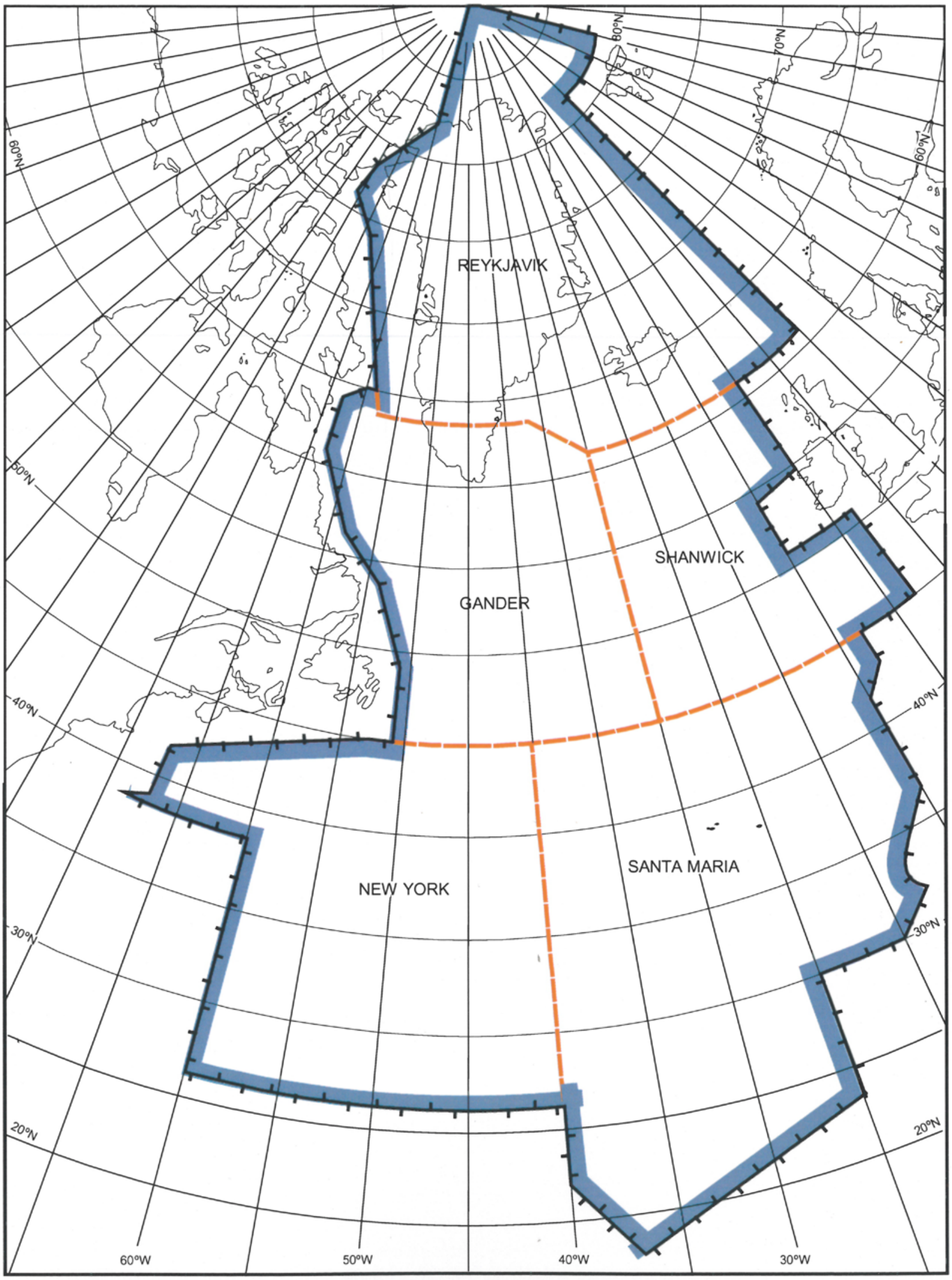
- REYKJAVIK *(To the North Pole)*
- SHANWICK, GANDER and SANTA MARIA OCEANIC
- NEW YORK OCEANIC North of 27°N but excluding the area west of 60°W and south of 38°30'N.

Crews MUST NOT fly across the North Atlantic, within NAT HLA, nor at flight levels designated as RVSM Airspace, unless they are in possession of the appropriate Approval.

At present RVSM is applied from FL290 to FL410 throughout the entire NAT HLA.

IFR fights above Flight Level 55 require a flight plan.

10.5.1.2 NAT HLA Area of Applicability



10.5.2 NAVIGATION REQUIREMENTS

10.5.2.1 Introduction

The aircraft navigation systems necessary for flying in NAT HLA must be capable of high-performance standards. However, it is essential that stringent crosschecking 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.

Rather than specifying the types of equipment required for flying in defined airspace, current thinking is moving towards specifying a Required Navigation Performance (RNP), in other words a track keeping capability. As an example, the navigation performance accuracy of the aircraft population operating in airspace designated RNP X airspace would be expected to be X nm on a 95% containment basis.

The NAT HLA *inter alia* defines a requirement for the standard deviation of lateral track errors to be less than 6.3 nm. This effectively equates to an RNP value of 12.6 nm - or two standard deviations.

Obviously, there are several combinations of airborne sensors, receivers, computers with navigation data bases and displays which are capable of producing like accuracies, with inputs to automatic flight control systems giving track guidance. However, regardless of how 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.

NOTE: A GNE within NAT HLA is defined as a deviation from cleared track of 25 nm or more.

These errors are normally detected by means of long range radars as aircraft leave oceanic airspace. Such errors may also be identified through the scrutiny of routine position reports from aircraft.

10.5.2.2 Longitudinal Navigation

Longitudinal separations between subsequent aircraft following the same track (in-trail) and between aircraft on intersecting tracks in the NAT HLA are assessed in terms of differences in ATAs / ETAs at common waypoints.

The longitudinal separation minima currently used in the NAT HLA are thus expressed in clock minutes. The maintenance of in-trail separations is aided by the application of the Mach Number Technique. However, aircraft clock errors resulting in waypoint ATA errors in position reports can lead to an erosion of actual longitudinal separations between aircraft. 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. In many modern aircraft, the Master Clock can only be reset while the aircraft is on the ground. Thus **the pre-flight procedures** for any NAT MNPS operation **must include** a UTC time check and resynchronisation of the aircraft Master Clock *(typically the FMS).*

Lists of acceptable time sources for this purpose have been promulgated by NAT ATS Provider States.

NOTE: Whilst time checks are important, a key aspect is to ensure ATC are advised if the reported ETA at a waypoint changes by 3 mins or more. Failure to do this results in an automatic trigger of a report from NATS to the CAA, which the company is required to follow up.

This is all to ensure that longitudinal separation is maintained.

The following are examples of acceptable time standards:

1) GPS (Corrected to UTC) - Available at all times to those crews who can access time via approved on-board GPS (TSO-C129) equipment.
2) 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.
3) 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).
4) 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.

10.5.2.3 Lateral Navigation

There are two navigational requirements for aircraft planning to operate in the NAT HLA

One refers to the navigation performance which should be achieved, in terms of accuracy.

The second refers to the need to carry standby equipment with comparable performance characteristics.

In order to justify consideration for State approval of unrestricted operation in the MNPS Airspace an aircraft must be equipped with the following:

a) At least two fully serviceable Long Range Navigation Systems (LRNSs).
   A LRNS may be one of the following:
   - One Inertial Navigation System (INS);
   - One Global Navigation Satellite System (GNSS); or
   - One navigation system using the inputs from one or more Inertial Reference System (IRS) or any other sensor system complying with the NAT HLA requirement.

NOTE:

1. Currently the only GNSS system fully operational and for which approval material is available, is GPS.
2. A GPS installation must be approved as follows:

   If the two required LRNSs are both GPS, they must be approved in accordance with FAA Advisory Circular AC-20-138A Appendix 1 and their operation approved in accordance with FAA HBAT 95-09. AC-20-138A (previously FAA

Notice 8110.60) requires that GPS systems used in Oceanic airspace must have a FDE function. Equipment which previously demonstrated compliance with N8110.60 need not be re-evaluated. States other than the USA may set their own standards for operational approval of GPS to provide Primary Means of Navigation in Oceanic and remote areas but in all cases these approvals will include the requirement to carry out Pre-Departure Satellite Navigation Prediction.

If, however, GPS serves as only one of the two required LRNSs, then it must be approved in accordance with FAA TSO-C129 or later standard as Class A1, A2, B1, B2, C1 or C2, or with equivalent EASA documentation ETSO-C129a. In this instance individual States vary in their insistence upon the need for the conduct of pre-departure satellite navigation prediction programmes (i.e. FDE RAIM).

3. Currently equivalent approval material for GLONASS is not under development but it will need to be available prior to approval of any GLONASS equipped aircraft for NAT HLA operations.

b) Each LRNS must be capable of providing to the flight crew a continuous indication of the aircraft position relative to desired track.

c) It is highly desirable that the navigation system employed for the provision of steering guidance is capable of being coupled to the autopilot.

10.5.3 ROUTES FOR USE BY AIRCRAFT NOT EQUIPPED WITH TWO LRNS

10.5.3.1 Routes for Aircraft with only One LRNS

A number of special routes have been developed for aircraft 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 the NAT HLA, and that State approval must be obtained prior to flying along them.

These routes are also available for interim use by aircraft normally approved for unrestricted MNPS operations that have suffered a partial loss of navigation capability and have only a single remaining functional LRNS.

Detailed descriptions of the special routes known as ‘Blue Spruce Routes’ are given at *para 10.5.3.2 below.*

Other routes also exist within the NAT HLA that may be flown by aircraft 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 Spain / Canaries / Lisbon FIR to the east of longitude 009° 01' W (viz. T9).

Other routes available for single LRNS use are also established in the NAT HLA, including a routing between Iceland and the east coast of Greenland and two routings between Kook Islands on the west coast of Greenland and Canada.

NOTE: If this single LRNS is a GPS it must be approved in accordance with FAA TSO-C129 or later standard as Class A1, A2, B1, B2, C1 or C2, or with equivalent EASA documentation ETSO-C129a. Some States may have additional requirements regarding the carriage and use of GPS (e.g. a requirement for FDE RAIM) and pilots should check with their own State of Registry to ascertain what, if any, they are.

10.5.3.2 **Blue Spruce Routes**

From / Between	Waypoints	No: LRNS Required
Stornoway or Benbecula	60°N10°W – 61°N12°34'W – ALDAN – Keflavik *(HF is required on this route)*; 61°N10°W - ALDAN – Keflavik *(VHF coverage exists and, subject to prior co-ordination with Scottish Airways and Reykjavik. This route can be used by non HF equipped aircraft*);	1
Machrihanish or Glasgow or Shannon or Belfast	57°N10°W - 60°N15°W - 61°N16°30'W - BREKI - Keflavik (HF is required on this route);	1
Keflavik or GIMLI	DA (Kulusuk) – Søndre Strømfjord – Kuujjuaq;	1
Keflavik or EMBLA	63°N30°W – 61°N40°W – Prins Christian Sund;	1
Prins Christian Sund (Greenland)	59°N50°W - PRAWN - Nain;	1
Prins Christian Sund (Greenland)	59°N50°W - PORGY - Hopedale;	1
Prins Christian Sund (Greenland)	58°N50°W - LOACH - Goose Bay;	1

NOTE: The “Blue Spruce” routes above have continuous VHF coverage at FL 300 and above except as noted.

10.5.3.3 Routes within NAT HLA other than the Organised Track System

From / Between	Waypoints	No: LRNS Required
Cork or Lands End or GAPLI	LASNO - BEGAS - Santiago or Asturias VOR; (HF is required on this route);	1
Funchal or Porto or Santo	Santa Maria/Ponta Delgada/Lajes;	1
Lisboa or Porto or Faro;	Ponta Delgada/Santa Maria/Lajes;	1
Between Greenland and Canada	Søndre Strømfjord NDB - 67°N60°W - YXP (Pangnirtung); Kook Islands NDB - 66°N60°W - YXP (Pangnirtung); Kook Islands NDB - 64°N60°W - 64°N63°W (LESAM) - Kuujjuaq;	1
Between Iceland and Greenland:	Reykjanesskoli NDB - 69°30'N22°40'W - Constable Pynt NDB.	1

10.5.4 THE ORGANISED TRACK SYSTEM (OTS)

10.5.4.1 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 uni-directionally, with peak westbound traffic occurring between 1130 UTC and 1900 UTC and peak eastbound traffic occurring between 0100 UTC and 0800 UTC, both at 30°W.

Due to the constraints of large horizontal separation criteria and a limited economical height band (FL300-FL400) the airspace is congested at peak hours. In order to provide the best service to the bulk of the traffic, a system of organised tracks is constructed to accommodate as many flights as possible within the major flows on or close to their minimum time tracks and profiles. Due to the energetic nature of the NAT weather patterns, including the presence of jet streams, eastbound and westbound minimum time tracks are seldom identical. The creation of a different organised track system is therefore necessary for each of the major flows. Separate Organised Track Structures (OTS) are published each day for eastbound and westbound flows.

It should be appreciated, however, that use of OTS tracks is not mandatory. Currently about half of NAT flights utilise the OTS. Aircraft 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 operator from planning a route which crosses the OTS. However, in this case, operators must be aware that 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.

Over the high seas, the NAT Region is primarily Class A airspace *(at and above FL60)*, in which Instrument Flight Rules (IFR) apply at all times. Throughout the NAT Region, below FL410, 1000 feet separation is applied. However, airspace utilisation is under continual review, and within the HLA portion of NAT airspace, in addition to the strategic and tactical use of 'opposite direction' flight levels during peak flow periods the Mach Number Technique is applied.

10.5.4.2 Organised Track System Construction

The appropriate OAC constructs the OTS after determination of basic minimum time tracks; with due consideration of airlines' preferred routes and taking into account airspace restrictions such as danger areas and military airspace reservations. The night time OTS is produced by Gander OAC and the day-time OTS by Shanwick OAC *(Prestwick)*, each incorporating any requirement for tracks within the New York, Reykjavik, Bodø and Santa Maria Oceanic Control Areas (OCAs).

OAC planner's co-ordinate with adjacent OACs and domestic ATC agencies to ensure that the proposed system is viable. They also take into account the requirements of opposite direction traffic and ensure that sufficient track / flight level profiles are provided to satisfy anticipated traffic demand. The impact on domestic route structures and the serviceability of transition area radars and navaids are checked before the system is finalised.

When the expected volume of traffic justifies it, tracks may be established to cater for the EUR / CAR traffic axis or for traffic between the Iberian Peninsula and North America.

Extra care is required when planning these routes as they differ slightly from the 'core tracks' in that they may cross each other (using vertical separations via different flight level allocations), and in some cases may not extend from coast-out to coast-in (necessitating random routeing to join or leave). Similarly, some westbound tracks may commence at 30°W, north of 61°N, to cater for NAT traffic routeing via the Reykjavik OCA and northern Canada.

10.5.4.3 The NAT Track Message

The agreed OTS is promulgated by means of the NAT Track Message via the AFTN to all interested addressees. A typical time of publication of the day-time OTS is 2200 UTC and of the night-time OTS is 1400 UTC.

This message gives full details of the co-ordinates of the organised tracks as well as the flight levels that are expected to be in use on each track. In most cases there are also details of domestic entry and exit routeings associated with individual tracks *(e.g. 'EUR RTS WEST…' or 'NAR …..')*.

In the westbound (day-time) system the track most northerly, at its point of origin, is designated Track 'A' (Alpha) and the next most northerly track is designated Track 'B' (Bravo) etc.

In the eastbound (night-time) system the most southerly track, at its point of origin, is designated Track 'Z' (Zulu) and the next most southerly track is designated Track 'Y' (Yankee), etc.

An example of a Track Messages and Tracks is shown in *Paras 10.5.4.5.1 and 10.5.4.5.2* following.

The originating OAC identifies each NAT Track Message, within the Remarks section appended to the end of the NAT Track message, by means of a 3-digit Track Message Identification (TMI) number equivalent to the Julian calendar date on which that OTS is effective. For example, the OTS effective on February 1st will be identified by TMI 032. *(The Julian calendar date is a simple progression of numbered days without reference to months, with numbering starting from the first day of the year.)* Any subsequent NAT

Track amendments affecting the entry / exit points, route of flight *(co-ordinates*) or flight level allocation, for an OTS on a given day, will include a successive alphabetic character, i.e. ‘A’, then ‘B’, etc., added to the end of the TMI number.

10.5.4.4 Track Message Identification (TMI)

The remarks section is an important element of the Track Message. The Remarks may vary significantly from day to day. They include essential information that Shanwick or Gander needs to bring to the attention of operators. These Remarks sometimes include details of special flight planning restrictions that may be in force and in the case of the Night-time Eastbound OTS Message, they include information on clearance delivery frequency assignments.

The hours of validity of the two Organised Track Systems (OTS) are normally as follows:

a) Day-time OTS 1130 UTC to 1900 UTC at 30°W

b) Night-time OTS 0100 UTC to 0800 UTC at 30°W

Changes to these times can be negotiated between Gander and Shanwick OACs and the specific hours of validity for each OTS are indicated in the NAT Track Message. For flight planning, operators should take account of the times specified in the relevant NAT Track Message(s). Tactical extensions to OTS validity times can also be agreed between OACs when required, but these should normally be transparent to operators.

Correct interpretation of the track message by handling agents and aircrews is essential for both economies of operation and in minimising the possibility of misunderstanding leading to the use of incorrect track co-ordinates.

Oceanic airspace outside the published OTS is available, subject to application of the appropriate separation criteria and NOTAM restrictions. It is possible to flight plan to join or leave an outer track of the OTS. If an operator wishes to file partly or wholly outside the OTS, knowledge of separation criteria, the forecast upper wind situation and correct interpretation of the NAT Track Message will assist in judging the feasibility of the planned route. When the anticipated volume of traffic does not warrant publication of all available flight levels on a particular track, ATC will publish only those levels required to meet traffic demand. The fact that a specific flight level is not published for a particular track does not necessarily mean that it cannot be made available if requested.

10.5.4.4.1 EXAMPLES OF DAY-TIME WESTBOUND AND NIGHT-TIME EASTBOUND TRACK MESSAGES AND ASSOCIATED TRACK SYSTEMS.

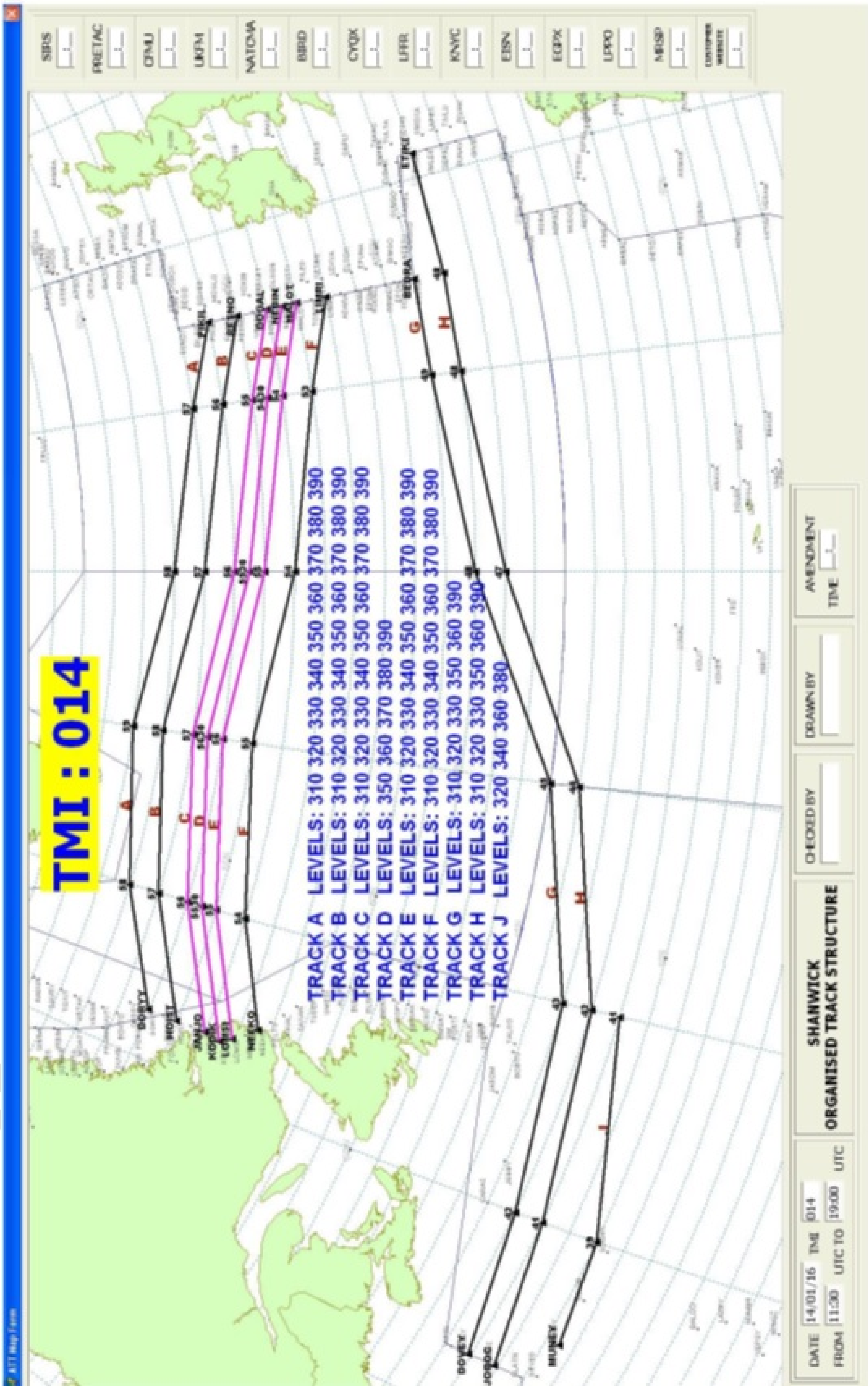
Example of Westbound NAT Track Message

```
FF CYZZWNAT 102151 EGGXZOZX (NAT-1/3 TRACKS FLS 310/390 INCLUSIVE
JAN 14/1130Z TO JAN 14/1900Z
PART ONE OF THREE PARTS-
A PIKIL 57/20 58/30 59/40 58/50 DORYY
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
B RESNO 56/20 57/30 58/40 57/50 HOIST
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
C DOGAL 55/20 56/30 57/40 56/50 JANJO
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
END OF PART ONE OF THREE PARTS)

FF CYZZWNAT 102151 EGGXZOZX (NAT-2/3 TRACKS FLS 310/390 INCLUSIVE
JAN 14/1130Z TO JAN 14/1900Z
PART TWO OF THREE PARTS-
D NEBIN 54/20 55/30 56/40 55/50 KODIK
EAST LVLS NIL
WEST LVLS 350 360 370 380 390
EUR RTS WEST NIL
NAR -
E MALOT 54/20 55/30 56/40 55/50 LOMSI
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
F LIMRI 53/20 54/30 55/40 54/50 NEEKO
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
G BEDRA 49/20 48/30 45/40 43/50 42/60 DOVEY
EAST LVLS NIL
WEST LVLS 310 320 330 350 360 390
EUR RTS WEST NIL
NAR -
H ETIKI 48/15 48/20 47/30 44/40 42/50 41/60 JOBOC
EAST LVLS NIL
WEST LVLS 310 320 330 350 360 390
EUR RTS WEST REGHI
NAR -
END OF PART TWO OF THREE PARTS)

FF CYZZWNAT 102152 EGGXZOZX (NAT-3/3 TRACKS FLS 310/390 INCLUSIVE
JAN 14/1130Z TO JAN 14/1900Z
PART THREE OF THREE PARTS-
J 41/50 39/60 MUNEY
EAST LVLS NIL
WEST LVLS 320 340 360 380
EUR RTS WEST
NAR -
REMARKS.
1. TMI IS 014 AND OPERATORS ARE REMINDED TO INCLUDE THE
TMI NUMBER AS PART OF THE OCEANIC CLEARANCE READ BACK.
2. ADS-C AND CPDLC MANDATED OTS ARE AS FOLLOWS
TRACK A 350 360 370 380 390
TRACK B 350 360 370 380 390
TRACK C 350 360 370 380 390
TRACK D 350 360 370 380 390
TRACK E 350 360 370 380 390
TRACK F 350 360 370 380 390
TRACK G 350 360 370 380 390
TRACK H 350 360 370 380 390
END OF ADS-C AND CPDLC MANDATED OTS
3. RLATSM OTS LEVELS 350-390. RLATSM TRACKS AS FOLLOWS
TRACK C
TRACK D
TRACK E
END OF RLATSM OTS
4. FOR STRATEGIC LATERAL OFFSET AND CONTINGENCY PROCEDURES RELATED TO OPS
IN NAT FLOW PLEASE REFER TO THE NAT PROGRAMME COORDINATION WEBSITE AT
WWW.NAT PCO.ORG. SLOP SHOULD BE USED AS A STANDARD PROCEDURE AND NOT JUST
AS WEATHER TURBULENCE AVOIDANCE
5. EIGHTY PERCENT OF GROSS NAVIGATION ERRORS RESULT FROM POOR COCKPIT
PROCEDURES. ALWAYS CARRY OUT PROPER WAY POINT CHECKS.
6.OPERATORS ARE REMINDED THAT THE CLEARANCE MAY DIFFER FROM YOUR
FLIGHT PLAN, FLY YOUR CLEARANCE.
7.UK AIP. ENR 2.2.4.2 PARA 5.2 STATES THAT NAT OPERATORS SHALL FILE PRM'S.
8.FLIGHTS REQUESTING WESTBOUND OCEANIC CLEARANCE VIA ORCA DATALINK SHALL
INCLUDE IN THE RMK/ FIELD THE HIGHEST ACCEPTABLE FLIGHT LEVEL WHICH CAN BE
MAINTAINED AT THE OAC ENTRY POINT-
END OF PART THREE OF THREE PARTS ...
```

Example of Day-Time Westbound NAT Organised Track System



10.5.4.5 OTS Changeover Periods

To ensure a smooth transition from night-time to day-time OTSs and vice-versa, a period of several hours is interposed between the termination of one system and the commencement of the next. These periods are from 0801 UTC to 1129 UTC: and from 1901 UTC to 0059 UTC.

During the changeover periods some restrictions to flight planned routes and levels are imposed. Eastbound and westbound aircraft operating during these periods should file flight level requests in accordance with the Flight Level Allocation Scheme (FLAS) as published in the *UK and Canada AIPs*.

It should also be recognised that during these times there is often a need for clearances to be individually co-ordinated between OACs and cleared flight levels may not be in accordance with those flight planned. If, for any reason, a flight is expected to be level critical, operators are recommended to contact the initial OAC prior to filing of the flight plan to ascertain the likely availability of required flight levels.

10.5.4.6 Route Structures Adjacent to NAT HLA

10.5.4.6.1 **North American Routes (NAR's)**

The North American Routes (NARs) consist of a numbered series of predetermined routes, which provide an interface between NAT oceanic and North American domestic airspace.

The NAR System is designed to accommodate major airports in North America.

Full details of all NAR routings *(eastbound and westbound)* together with associated procedures are published in two saleable documents:

- **THE UNITED STATES AIRPORT FACILITY DIRECTORY – NORTHEAST**
  https://www.faa.gov/air_traffic/flight_info/aeronav/productcatalog/supplementalcharts/
  or
  https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dafd/

- **THE CANADA FLIGHT SUPPLEMENT**
  http://www.navcanada.ca/NavCanada.asp?Language=en&Content=ContentDefinitionFiles%5CPublications%5CAeronauticalInfoProducts%5CPublications%5Cdefault.xml.

It should be noted that these routes are subject to occasional changes and are republished / updated on a regular AIRAC 56-day cycle.

10.5.4.6.2 **US East Coast Transitions**

Aircraft Operators are encouraged to refer to FAA Air Traffic Control System Command Centre Advisory Database *(www.fly.faa.gov)* for NAT Advisory Message, published daily, for specified transitions from select U.S. airports to the NAT Entry Points. Additionally, route advisories are published, as necessary, to address special route requirements eastbound and westbound through the New York Oceanic FIR/CTA.

10.5.4.6.3 **Canadian Domestic Track Systems**

Within Canada there are three track systems:

a) The Northern Control Area tracks (NCAs),

b) the Southern Control Area tracks (SCAs) and

c) the Northern Organised Track System (NOROTS);

These provide links for NAT traffic operating between Europe and North America to central and western North American airports. Track procedures and details are published in Transport Canada's Aeronautical Information Manual (TC AIM).

NOTE: The co-ordinates of the NOROTS are published daily via NOTAM.

10.5.4.6.4 **Routes between North America and the Caribbean Area**

An extensive network of routes linking points in the United States and Canada with Bermuda, the Bahamas and the Caribbean area are defined in the New York OCA West. This network has been known as the West Atlantic Route System (WATRS). Since 5 June 2008 the original WATRS airspace together with portions of the Miami Oceanic airspace and the San Juan FIR have been designated as "WATRS Plus Airspace".

In this airspace New York Air Route Traffic Control Center (ARTCC) applies 30 NM lateral and 30 NM longitudinal separation minima, and 50 NM longitudinal separation minimum between appropriately authorized and equipped aircraft. *(FANS1/A and RNP 4 or RNAV 10 (RNP 10), respectively.)*

New York ARTCC will continue to accommodate operators that are not eligible for these reduced separations.

Details of these routes and associated procedures are contained in the United States AIP.

Some information on WATRS can be currently found at:
http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/rvsm/watrs/

10.5.4.6.5 **Shannon Oceanic Transition Area and Northern Oceanic Transition Area (SOTA & NOTA)**

Parts of the Shanwick OCA are designated as the Shannon Oceanic Transition Area (SOTA) and the Northern Oceanic Transition Area (NOTA).

NOTA airspace is included in the NAT HLA and hence NAT HLA airspace requirements are still applicable from FL285 to FL420 in NOTA.

However, SOTA is not included in the NAT HLA, therefore flights within SOTA routing such that they are subject to an Oceanic Clearance, are required to be NAT HLA Approved.

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

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.

10.5.4.6.6 **Brest Oceanic Transition Area (BOTA)**

Part of the Shanwick OCA is designated as the Brest Oceanic Transition Area (BOTA).

BOTA is not included in the NAT HLA. Hence only flights routing such that they are subject to an Oceanic Clearance, are required to be NAT HLA MNPS Approved.

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

10.5.4.6.7 **Gander Oceanic Transition Area (GOTA)**

The GOTA is comprised of airspace from 6530N 060W east to the Reykjavik ACC boundary; south to 6330N 055W; south to OYSTR; north to PRAWN; then MOATT; then north to 61N 063W; along the Montreal ACC boundary north to the Edmonton ACC boundary.

10.5.4.7 FLIGHT PLAN REQUIREMENTS

All flights which generally route in an eastbound or westbound direction should normally be flight planned so that specified ten degrees of longitude *(20°W, 30°W, 40°W etc.)* are crossed at whole degrees of latitude; and all generally northbound or southbound flights should normally be flight planned so that specified parallels of latitude spaced at five degree intervals *(65°N, 60°N, 55°N etc.)* are crossed at whole degrees of longitude.

Exceptions apply in the case of flights routing north of 70°N, these are noted below. However, where appropriate ALL oceanic ten-degree meridians should be included as waypoints in the flight plan submitted to ATC, even where “named” significant points are close to these "prime" meridians of longitude.

It is not appropriate to then omit the ten-degree crossings from the ATC Flight Plan.

All flights should plan to operate on great circle tracks joining successive significant waypoints.

10.5.4.7.1 **Routings**

a) During the hours of validity of the OTS, operators are encouraged to flight plan as follows:
   - 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. However, they should be aware that whilst 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.

It must also be noted that aircraft without the equipage necessary for the Data Link Mandate will not be permitted during the OTS validity period to join or cross those tracks within the mandate, as specified via the daily OTS Track Message Remarks.

For such aircraft, however, continuous climb or descent through the specified levels may be available on request, subject to traffic.

b) Outside of the OTS periods operators may flight plan any random routing, except that during a period of one hour prior to each OTS period the following restrictions apply:
   - Eastbound flights that cross 30°W less than one hour prior to the incoming / pending Westbound OTS (i.e. after 1029 UTC), or Westbound flights that cross 30°W less than one hour prior to the incoming / pending Eastbound OTS (i.e. after 2359 UTC), should plan to remain clear of the incoming / pending OTS structure.

10.5.4.7.2 **Flight Levels**

Within RVSM Airspace improved opportunity exists for step climbs and such opportunities are even more improved from the trial applications of 5 minutes' longitudinal separations.

Step climbs may be included in the flight plan, although each change of level during flight must be requested from ATC by the pilot.

The chance of approval of such requests will, of course, be entirely dependent upon potential traffic conflicts. Outside the OTS there is a good likelihood of achieving the requested profiles. However, within the prime OTS levels at peak times, ATC may not always be able to accommodate requested flight level changes and prudent pre-flight fuel planning should take this into consideration.

During the OTS Periods aircraft intending to follow an OTS Track for its entire length may plan at any of the levels as published for that track on the current daily OTS Message. However, all NAT OTS Tracks in the altitude band FL350-390 are subject to the FANS equipage requirement.

In order to fly on any OTS Track at FL350 to FL390 inclusive. Aircraft must be equipped for FANS 1/A and operated in accordance with the requirements specified.

The Remarks section of the OTS Message carries such notification.

Trials of reduced lateral separation of (nominally) 30 NMs (RLatSM) have commenced. The two core OTS Tracks are designated and a central ½ Degree Spaced Track between them is published. To plan or fly on any of these three Tracks at FL350 – 390 inclusive aircraft must be RNP 4 Approved

Flights planned to remain entirely clear of the OTS or which join or leave an OTS Track *(i.e. follow an OTS track for only part of its published length)*, are all referred to as Random Flights. Pilots intending to fly on a random route or outside the OTS time periods, should normally plan flight level(s) appropriate to the direction of flight.

- iaw Semi-circular Rule

If a flight is expected to be level critical, operators should contact the initial OAC prior to filing of the flight plan to determine the likely availability of specific flight levels.

10.5.4.7.3 **ATC Flight Plans**

The correct completion and addressing of each flight plan is extremely important as errors will lead to delays in data processing and to the subsequent issuing of clearances to the flights concerned.

The flight plan should indicate RNP, RNAV, RVSM, FANS 1/A data link, ADS- B and NAT HLA capability. It is important that this information is indicated in flight plans in order to ensure that the full benefits of current capacity and safety improvement initiatives in the NAT Region are made available to appropriately equipped flights.

The provision of this information will also support planning for future initiatives by providing more accurate information regarding the actual capabilities of the fleet operating in the ICAO NAT Region.

In order to signify that a flight is approved to operate in NAT HLA airspace, the letter ‘X’ shall be inserted within Item 10 of the flight plan. A ‘W’ must also be included in Item 10 to indicate that the flight is approved for RVSM operations.

Currently 50 Nm lateral separation standard is implemented in the New York Oceanic East and Santa Maria Oceanic FIRs between aircraft meeting RNAV 10 (RNP 10) or RNP 4 specifications.

Hence, in order to benefit from these separation standards any NAT HLA Aircraft intending to fly through these NAT FIRs or through the adjacent WATRS Plus airspace, should ensure that its RNP Approval status is included in the Flight Plan.

Specifically, such operators should:

a) Annotate ICAO Flight Plan Item 10 (Equipment) with the letter “R” and
b) annotate Item 18 (Other Information) with, as appropriate, “PBN/A1 (for RNAV 10 (RNP 10) Approval) or PBN/L1 (for RNP 4 Approval)”.

10.5.4.7.4 The speeds / 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.

The proposed speeds should be reflected in the following sequence:

a) Cruising True Airspeed (TAS) prior to oceanic entry;
b) oceanic entry point and cruising Mach Number;
c) TAS subsequent to oceanic exit.

For Flights planning to operate through specified ADS-B service areas and wishing to benefit from that service the appropriate equipage and authorisation for ADS-B use should be indicated by filing the B1 or B2 descriptor as appropriate in Item 10b of the flight plan.

10.5.5 FLIGHT PLANNING REQUIREMENTS ON SPECIFIC ROUTES

10.5.5.1 Flights Planning on the Organised Track System

If *(and only if)* the flight is planned to operate along the entire length of one of the organised tracks, from oceanic entry point to oceanic exit point, as detailed in the NAT Track Message, should the intended organised track be defined in Item 15 of the flight plan using the abbreviation 'NAT' followed by the code letter assigned to the track.

Flights wishing to join or leave an organised track at some intermediate point are considered to be random route aircraft and full route details must be specified in the flight plan. **The track letter must not be used to abbreviate any portion of the route in these circumstances.**

The planned Mach Number and flight level for the organised track should be specified at either the last domestic reporting point prior to oceanic airspace entry or the organised track commencement point.

For flights operating along the whole length of one of the organised tracks, estimates are only required for the commencement point of the track and Oceanic FIR boundaries.

Phase 2A of the NAT data Link Mandate was implemented 05 February 2015. In this phase all OTS tracks will be designated as DLM airspace at Flight Levels 350 to 390 inclusive. Aircraft / crews which are not DLM compliant **are not** permitted to plan / fly on, or to join or cross, any OTS track at these levels.

For such aircraft, however, continuous climb or descent through the specified levels (FL350-390) may be available, on request, subject to traffic. When a “Split” westbound structure is published, although eastbound flights which are not DLM compliant may flight plan in the airspace between the branches of the Split OTS they should not plan any route which results in a partial back-tracking of a westbound OTS track.

10.5.5.2 Flights Planning on Random Route Segments in a Predominantly East – West Direction

For flights operating **at or south of 70°N**, the planned tracks shall normally be defined by significant points formed by the intersection of half or whole degrees of latitude with meridians spaced at intervals of 10 degrees from the Greenwich meridian to longitude 70°W.

For flights operating **north of 70°N and at or south of 80°N**, the planned tracks shall normally be defined by significant points formed by the intersection of parallels of latitude expressed in degrees and minutes with meridians normally spaced at intervals of 20 degrees from the Greenwich meridian to longitude 60°W, using the longitudes 000W, 020W, 040W and 060W.

For flights operating **at or south of 80°N**, the distance between significant points shall, as far as possible, not exceed one hour's flight time. Additional significant points should be established when deemed necessary due to aircraft speed or the angle at which the meridians are crossed, e.g.

a) at intervals of 10 degrees of longitude *(between 5°W and 65°W)* for flights operating at or south of 70°N; and

b) at intervals of 20 degrees of longitude *(between 10°W and 50°W)* for flights operating north of 70°N and at or south of 80°N.

For flights operating **north of 80°N**, the planned tracks shall normally be defined by significant points formed by the intersection of parallels of latitude expressed in degrees and minutes with meridians expressed in whole degrees. The distance between significant points shall normally equate to not less than 30 and not more than 60 minutes of flying time. *(The 30-minute minimum was introduced in the Iceland AIP in 2014).*

10.5.5.3 Flights Planning on Random Routes in a Predominantly North - South Direction

For flights whose flight paths **at or south of 80°N** are predominantly oriented in a north-south direction, the planned tracks shall normally be defined by significant points formed by the intersection of whole degrees of longitude with specified parallels of latitude which are spaced at intervals of 5 degrees.

For flights operating **north of 80°N**, the planned tracks shall be defined by points of intersection of parallels of latitude expressed in degrees and minutes with meridians expressed in whole degrees. The distance between significant points shall normally equate to not less than 30 and not more than 60 minutes of flying time.

10.5.5.4 Flights Planning to Enter or Leave the NAT Region via the North American Region

To provide for the safe and efficient management of flights to/from the NAT Region, a transition route system is established in the NAM Region *(North American Routes - NARs).*

This system details particular domestic routings associated with each oceanic entry or landfall point. These routes are promulgated to expedite flight planning; reduce the complexity of route clearances and minimize the time spent in the route clearance delivery function.

The NAR System is designed to accommodate major airports in North America where the volume of North Atlantic (NAT) traffic and route complexity dictate a need to meet these objectives. It consists of a series of pre-planned routes from/to coastal fixes and identified system airports. Most routes are divided into two portions:

a) **Common Portion** — that portion of the route between a specified coastal fix and specified Inland Navigation Fix (INF)

b) **Non-common Portion** — that portion of the route between a specified INF and a system airport.

The routes are prefixed by the abbreviation “N,” with the numbering for the common portions orientated geographically from south to north. The odd numbers have eastbound application while the even numbers apply to westbound. Following a one-to-three-digit number, an alpha character indicates the validation code and forms part of the route identifier. Validation codes are associated to amendments to the common routes only and not to non-common route portions.

The use of NARs is, however, not compulsory.

10.5.5.5 Flights Planning to Operate without Using HF Communications

The carriage of functioning HF communications is mandatory for flight in the Shanwick OCA, even if the pilot intends using alternative media for regular ATS air-ground contacts.

Aircraft with only functioning 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.

Such strict routing restriction may not apply in all NAT Oceanic Control Areas. Some may permit the use of SATCOM Voice to substitute for or supplement HF communications. Details of communication requirements by individual NAT ATS Providers are published in State AIPs.

Any operation intending to fly through NAT HLA Airspace without fully functional HF communications or wishing to use an alternative medium should ensure that it will meet the requirements of its State of Registry and those of all the relevant ATS Providers throughout the proposed route.

10.5.5.6 Flights Planning to Operate with a Single Functioning LRNS

Within the NAT HLA airspace only those routes identified in *paragraph 10.5.3.1* above may be flight planned and flown by aircraft equipped with normal short-range navigation equipment (VOR, DME, ADF) and at least one approved fully operational LRNS. Specific State Approval for such NAT HLA operations must, however, be obtained from the State of the Operator or the State of Registry of the aircraft.

10.5.5.7 Flights Planning to Operate with Normal Short-Range Navigation Equipment Only

Two routes providing links between Iceland and the ICAO EUR Region (G3 and G11) are designated as special routes of short stage lengths where it is deemed that aircraft equipped with normal short-range navigation equipment can meet the NAT HLA track-keeping criteria. Nevertheless, State Approval for NAT HLA operations is still required in order to fly along these routes.

10.5.6 OCEANIC ATC CLEARANCES

10.5.6.1 General

There are three elements to an Oceanic Clearance:

- Route,
- Speed, and
- Level.

These elements serve to provide for the three basic elements of separation: lateral, longitudinal and vertical.

Oceanic Clearances are required for all flights within NAT controlled Airspace *(at or above FL55)*. Pilots should request Oceanic Clearances from the ATC responsible for the first OCA within which they wish to operate. 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 except when entering the Reykjavik area from the Scottish or Stavanger areas, then the clearance should be requested 20 minutes before the Oceanic entry point ETA.

When requesting an oceanic clearance the crew should notify the OAC of the maximum acceptable flight level possible at the boundary, taking into account that a climb to the assigned oceanic flight level must normally be achieved prior to entering oceanic airspace and normally whilst the aircraft is within radar coverage.

The crew should also notify the OAC of any required change to the oceanic flight planned level, track or Mach Number as early as practicable after departure to assist the OAC in pre-planning optimum airspace utilisation. If requesting an OTS track, the clearance request should include the next preferred alternative track.
Methods of obtaining Oceanic Clearances include:

a) Use of published VHF clearance delivery frequencies;
b) By HF communications to the OAC through the appropriate aeradio station.
c) A request via domestic or other ATC agencies;
d) By data link, when arrangements have been made with designated airlines to request and receive clearances using on-board equipment (ACARS).

This method of Oceanic Clearance delivery is only possible from participating OACs with the necessary means of automation. Detailed procedures for its operation may vary.

Gander, Shanwick, Santa Maria and Reykjavik OACs have been providing such a facility, relevant operational procedures are available at:

http://www.worldairops.com/NAT/docs/NAT_ShanwickOceanicDatalinkClearances_WorldAirOps.com.pdf

New York OAC uses the FANS 1/A CPDLC function to uplink oceanic clearances to all aircraft utilising CPDLC.

At some airports **situated close to oceanic boundaries or within the NAT Region**, it may be necessary to obtain the Oceanic Clearance before departure.

On the east side of the NAT, this will apply to departures from all Irish airfields, all UK airfields west of 2° 30'W and all French Airfields west of zero-degree longitude. Oceanic Clearances for controlled flights leaving airports **within the region** are issued by the relevant ATS unit prior to departure.

If an aircraft, which would normally be RVSM and / or NAT HLA approved, encounters, whilst en route to the NAT Oceanic Airspace, a critical in-flight equipment failure, or at dispatch is unable to meet the MEL requirements for RVSM or NAT HLA approval on the flight, then the pilot must advise ATC at initial contact when requesting Oceanic Clearance.

After obtaining **and reading back** the clearance, the crew should monitor the ETA for oceanic entry and if this ETA changes by **3 minutes or more**, they must pass a revised ETA to ATC as soon as possible. As planned longitudinal spacing by these OACs is based solely on the estimated times over the oceanic entry fix or boundary, failure to adhere to this ETA amendment procedure may jeopardise planned separation between aircraft, thus resulting in re-clearance to a less economical track / flight level for the complete crossing; any such failure may also penalise following aircraft.

FURTHERMORE, IT MUST BE RECOGNISED THAT 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 crews 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 crews are awaiting receipt of a delayed Oceanic Clearance.

Crews should always endeavour to obtain Oceanic Clearance prior to entering these other NAT OCAs; however, if any difficulty is encountered the crew should not hold while awaiting Clearance unless so directed by ATC.

An example of a crew voice request for Oceanic Clearance is as follows:

> *"Gama 123 - request Oceanic Clearance. Estimating PIKIL at 1131. Request Mach decimal seven zero, Flight Level three five zero, able Flight Level three six zero, second choice Track Charlie".*

If the request also includes a change to the original flight plan, affecting the OCA, then it should be according to the following example:

> *"Gama 123 - request Oceanic Clearance. Estimating RESNO at 1147. Request Mach decimal seven zero, Flight Level three four zero. Now requesting Track Charlie, able Flight Level three six zero, second choice Track Delta".*

Where practicable, two flight crew members should listen to and record every ATC clearance and both agree that the recording is correct. Any doubt should be resolved by requesting clarification from ATC.

If the ATC oceanic cleared route is identical to the flight planned track, it should be drawn on the plotting chart and verified by the other crew.

If the aircraft is cleared by ATC on a different track from that flight planned, it is strongly recommended that a new Master Document be prepared showing the details of the cleared track. Overwriting of the existing flight plan can cause difficulties in reading the waypoint numbers and the new co-ordinates. For this purpose, a pro-forma 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 flight plan pro-forma and this should be checked by the other crew member. If necessary, a new plotting chart may be used on which to draw the new track. 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.

Experience suggests that when ATC issues a re-clearance involving re-routing and new waypoints, there is a consequential increase in the risk of errors being made. Therefore, this situation should be treated virtually as the start of a new flight; and the procedures employed with respect to the following, should all be identical to those procedures employed at the beginning of a flight:

a) Copying the ATC re-clearance;

b) Amending the Master Document;

c) Loading and checking waypoints;

d) Extracting and verifying flight plan information, tracks and distances, etc.; and

e) The preparation of a new chart;

Strict adherence to the above procedures should minimise the risk of error. However, flight deck management should be such that one crew is designated to be responsible documentation and reprogramming of the navigation systems - appropriately supervised by the crew flying the aircraft, as and when necessary.

REMEMBER

FLY THE NEW CLEARED ROUTE – NOT THE FLIGHT PLANNED ROUTE

10.5.6.2 Content of Clearances

An abbreviated clearance is issued by Air Traffic Services when clearing an aircraft to fly along the whole length of an Organised Track, or along a Polar Track within the Reykjavik CTA and / or Bodø OCA.

When an abbreviated clearance is issued it includes:

- Clearance Limit, which will normally be destination airfield;
- Cleared track specified as "Track" plus code letter, or "Polar Track" plus code ident;
- Cleared flight level(s);
- Cleared Mach Number; and
- If the aircraft is designated to report Met information en route, the phrase "SEND MET REPORTS".

Procedures exist for an abbreviated read back of an Oceanic Clearance issued on VHF. A typical example of such a clearance is as follows:

"Gama 123 - is cleared to Teterboro via Track Bravo, from PIKIL 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 TMI number in the read-back of the Oceanic Clearance, as follows:

"Gama 123 - is cleared to Teterboro via Track Bravo ***206A,*** *from PIKIL maintain Flight Level three five zero, Mach decimal eight zero".*

If the TMI number is included in the read-back there is no requirement for the crew to read back the NAT Track co-ordinates even if the cleared NAT Track is not the one which was originally requested. Similarly, if the crew cannot correctly state the TMI, the OAC will read the cleared NAT Track co-ordinates in full and request a full read back of those co-ordinates.

For aircraft cleared by Shanwick OAC on random routeings in the NAT Region the present procedure of reading the full track co-ordinates as part of the Oceanic Clearance and requesting from the crew a full read back of the co-ordinates is expected to continue.

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

10.5.6.3 Oceanic Clearances for Westbound Flights Routing VIA 61°N 010°W

The provision of air traffic service at RATSU (61°N 010°W) has been delegated by Shanwick to Reykjavik. Flights intending to enter NAT Oceanic airspace via RATSU (61°N 010°W) should not call Shanwick for an Oceanic Clearance.

The required Oceanic Clearance will be issued by Reykjavik Control.

There are three points established at the boundary of delegated airspace from Scottish to Reykjavik, BESGA, DEVBI and BARKU on routes to RATSU. Reykjavik will issue Oceanic Clearances from those points. Aircraft that have not received their oceanic clearance prior to those points shall enter Reykjavik airspace at the domestic cleared flight level while awaiting such oceanic clearance.

10.5.6.4 Oceanic Clearances for Flights Intending to Operate Within the NAT Region and Subsequently Enter the NAM Regions

As indicated earlier in this Manual, to provide for the safe and efficient management of flights to / from the NAT Region, transition route systems / schemes are established in the NAM Region. These schemes detail particular domestic routings associated with each landfall point. Flights in this category must be planned in accordance with these schemes. Should a pilot of a flight in this category receive a clearance on a route other than originally flight planned, special caution should be exercised to ensure that the co-ordinates of the assigned route and of the associated landfall **and** subsequent domestic routings are fully understood and correctly inserted into the automated navigation systems. 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 concerning the subsequent domestic routing, details should be checked with the ATC unit issuing the clearance/re-clearance.

10.5.6.5 Oceanic Clearances for Random Flights Intending to Operate Within the NAT Region and Subsequently Enter Regions other than NAM or EUR

Oceanic Clearances issued to flights in this category are similar to domestic ATC clearances in that clearances are to destination on the assumption that co-ordination will be effected ahead of the aircraft's passage. In this case, if necessary, the flight profile may be changed en-route, prior to hand-over from one centre to another, subject to traffic conditions in the adjacent area.

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

There are three elements to an Oceanic Clearance;

- Complete Route,
- Flight, and
- Mach number.

These elements do not have to be issued in the same clearance. Additionally, these elements may not be issued by the same ATS Provider. For example, the Route portion may be issued by one ATC Unit, the Oceanic Altitude issued by another and finally the Mach Number by a third. The receipt of all three elements, even if not received at the same time, constitutes receipt of an Oceanic Clearance and no further request for one is necessary. The detail of the procedures followed may differ depending on the ICAO region from which the flight originates.

For aircraft planning to enter the NAT via the New York Oceanic East FIR from the NAM Region or the New York Oceanic West FIR, 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, aircraft will be assigned a Mach number and an Altitude by the FAA.

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

Example 1: 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 aircraft 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.

Example 2: On a flight from New York (KJFK) to Madrid (LEMD), Kennedy Clearance Delivery up-links a clearance via Pre-Departure Clearance (PDC) with a complete route and altitude; later, New York Center assigns the aircraft a 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.

In cases where aircraft have been cleared via a North Atlantic Organized 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.

10.5.6.7 Clearances Including Variable Flight Level

Clearances which include Variable Flight Level may on occasions be requested and granted, traffic permitting. Clearances requests which include a variable Flight Level may be made by voice or using 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, however, does not always seem to be fully understood.

Cruise climb is defined as follows:

> “*An aeroplane cruising technique resulting in a net increase in altitude as the aeroplane mass decreases* “.

As far as is known, no current aircraft have the capability to automatically conduct a cruise climb. Cruise climb can however be approximated by the pilot instructing the aircraft to climb in small incremental steps *(for example 100 or 200 feet at a time)* as the weight of the aircraft decreases and the optimum flight level increases.

When an aircraft is executing a cruise climb and reports at a specific level, the controller will release the airspace that is more than 1000 feet *(in RVSM airspace)* below the aircraft and may assign that airspace to another aircraft.

The flight level report may be received by ATC in a position report delivered by the pilot, by radar or ADS-B information or in an ADS-C periodic or event report. If the aircraft is within ATS surveillance airspace or is using ADS-C the pilot must be aware that ATC is periodically being informed about the aircraft level and the controller will adjust the aircraft's protected airspace accordingly.

It is therefore imperative that aircraft conducting a cruise climb **do not under any circumstances descend**. A cruise climbing aircraft may only climb or maintain a level.

By contrast, when an aircraft is cleared into a block of flight levels the pilot may operate anywhere within the block of levels and may climb and / or descend within the block as desired. ATC will not release the protection of the block of flight levels, regardless of flight level reports from the aircraft, until the block clearance is cancelled.

NOTE: Requesting a block of flight levels when the intention is to only climb results in an inefficient use of airspace and may deny other aircraft to receive economic flight profiles.

10.5.6.8 Errors Associated with Oceanic Clearances

Navigation errors associated with Oceanic Clearances fall into several categories of which the most significant are ATC System Loop errors and Waypoint Insertion errors.

10.5.6.9 ATC System Loop Errors

An ATC system loop error is any error caused by a misunderstanding between the pilot and the controller regarding the assigned flight level, Mach Number or route to be followed.

Such errors can arise from:

- Incorrect interpretation of the NAT Track Message by dispatchers;
- Errors in co-ordination between OACs; or
- Misinterpretation by pilots of Oceanic Clearances or re-clearances.

Errors of this nature, which are detected by ATC from pilot 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 SATCOM Voice communications.

10.5.6.10 Waypoint Insertion Errors

Experience has shown that many of the track-keeping errors in the NAT HLA airspace occur because of crews programming the navigation system(s) with incorrect waypoint data. These are referred to as Waypoint Insertion Errors.

They frequently originate from:

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

b) failure to load waypoint information carefully; or

c) failure to cross-check on-board navigation systems.

Many of the navigation error occurrences are the product of one or both, of the foregoing causes. It is therefore extremely important that pilots 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.

10.5.7 ATS COMMUNICATIONS

It is important that pilots appreciate that routine air / ground ATS Voice communications in the NAT Region are conducted via aeradio stations staffed by communicators **who have no executive ATC authority.** Messages are relayed by the ground station to / from the air traffic controllers in the relevant OAC.

This is the case, whether communications are via HF, GP / VHF or SATCOM Voice.

10.5.7.1 HF Voice Communications

Most NAT air / ground communications are conducted on single side-band HF frequencies.

In the North Atlantic Region, there are six aeronautical radio stations, one associated with each of the Oceanic Control Areas.

They are:

- Bodo Radio (Norway, Bodo ACC),
- Gander Radio (Canada, Gander OACC),
- Iceland Radio (Iceland, Reykjavik ACC),
- New York Radio (USA, New York OACC),
- Santa Maria Radio (Portugal, Santa Maria OACC) and
- Shanwick Radio (Ireland, Shanwick OACC).

However, the aeradio stations and OACs are not necessarily co-located. For example, in the case of Shanwick operations, the OAC is located at Prestwick in Scotland whilst the associated aeradio station is at Ballygirreen in the Republic of Ireland.

In addition to the six aeronautical stations, there are two other stations that operate NAT frequencies. They are Canarias Radio which serves Canarias ACC and Arctic Radio serving Edmonton, Winnipeg and Montreal ACC's.

To support air / ground ATC communications in the North Atlantic Region, twenty-four HF frequencies have been allocated, in bands ranging from 2.8 to 18 MHz. There are a number of factors which affect the optimum frequency for communications over a specific path. The most significant is the diurnal variation in intensity of the ionisation of the refractive layers of the ionosphere. Hence frequencies from the lower HF bands tend to be used for communications during night-time and those from higher bands during day-time.

Generally, in the North Atlantic frequencies of less than 7 MHz are utilised at night and frequencies greater than 8 MHz during the day.

The 24 NAT frequencies are organized into six groups known as Families. The families are identified as NAT Family A, B, C, D, E and F. Each Family contains a range of frequencies from each of the HF frequency bands.

A number of stations share families of frequencies and co-operate as a network to provide the required geographical and time of day coverage. Each family is designated for use by aircraft of specific States of Registry and according to the route to be flown.

Each individual aircraft is normally allocated a primary and a secondary HF frequency, either when it receives its clearance or by domestic controllers shortly before the oceanic boundary.

When initiating contact with an aeradio station the pilot should state the HF frequency in use. HF Radio operators usually maintain a listening watch on more than one single frequency. Identification by the calling pilot of the frequency being used is helpful to the radio operator.

10.5.7.2 SELCAL

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 ensure the following sequence of actions:

a) Provision of the SELCAL code in the flight plan; *(any subsequent change of aircraft for a flight will require passing the new SELCAL information to the OAC);*

b) checking the operation of the SELCAL equipment, at or prior to entry into Oceanic airspace, with the appropriate aeradio station. *(This SELCAL check must be completed prior to commencing SELCAL watch);* and

c) maintenance thereafter of a SELCAL watch.

<u>NOTE</u>: 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 aircraft.

10.5.7.3 VHF Voice Communications

Aeradio stations are also responsible for the operation of General Purpose VHF (GP / VHF) stations. North Atlantic flights may use these facilities for all regular and emergency communications with relevant OACs. Such facilities are especially valuable near Iceland, Faroes and Greenland since VHF is not susceptible to sunspot activity as HF.

Stations are situated at Prins Christian Sund, which is remotely controlled from Gander Aeradio station, and at Qaqaroqaq, Kulusuk, several locations in Iceland and the Faroes, via Iceland Radio.

When using GP / VHF frequencies in areas of fringe coverage however, care should be taken to maintain a SELCAL watch on HF thus ensuring that if VHF contact is lost the aeradio station is still able to contact the aircraft. It is important for the pilot to appreciate that when using GP / VHF, these communications are with an aeradio station and the pilot is not in direct contact with ATC.

However, Direct Controller / Pilot Communications (DCPC) can be arranged, if necessary, via patch-through on some GP / VHF frequencies.

Reykjavik centre operates several Direct Controller Pilot Communications (DCPC) VHF stations providing coverage to approximately 250 NM from the coast of Iceland and Faroes. Those stations are used to provide tactical procedural control and radar control within the South and East sectors of the Reykjavik area. The Callsign of the Reykjavik centre is *"Reykjavik control"* or just *"Reykjavik"* and indicates that the pilot is communicating directly with an air traffic controller.

The Callsign of Iceland radio is *"Iceland radio"* or just *"Iceland"* and indicates that the pilot is communicating with a radio operator who is relaying messages between the pilot and the appropriate control facility.

The carriage of HF communications equipment is mandatory for flight in the Shanwick OCA. Aircraft with only functioning 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.

10.5.7.4 SATCOM Voice Communication

Since 2011 it has been agreed that SATCOM Voice, can be used as a supplement to HF communications throughout the NAT Region for any routine, non-routine or emergency ATS air / ground communications.

Details of SATCOM numbers to be used can be found in the applicable Jeppesen manual for the region

Since oceanic traffic typically communicate with ATC through aeradio facilities, routine SATCOM Voice calls should be made to such a facility rather than the ATC Centre. Only when the urgency of the communication dictates otherwise should SATCOM Voice calls be made to the ATC Centre.

SATCOM voice communication initiated due to HF propagation difficulties does not constitute urgency and should be addressed to the air-ground radio facility.

10.5.7.5 Data Link Communications

Data link communications are gradually being introduced into the NAT environment for position reporting *(via FANS 1/A ADS-C & CPDLC)* and for other air / ground ATS exchanges *(using FANS 1/A CPDLC).*

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

Like SATCOM Voice usage, Pilots electing to use Data link communications for regular ATS communications in the NAT Region remain responsible for operating SELCAL *(including completion of a SELCAL Check)*, or maintaining a listening watch on the assigned HF frequency.

Flights equipped with FANS CPDLC and /or ADS-C should ensure that the data link system is logged on to the appropriate control area when operating within the NAT south of 80

North. This applies even when the aircraft is provided with ATS surveillance services. CPDLC provides communication redundancy and controllers will in many cases use CPDLC for communication even though the pilot is maintaining a listening watch on the assigned DCPC VHF frequency. ADS-C furthermore enables ATC to perform route conformance monitoring for downstream waypoints.

The NAT Data Link Mandate airspace has been expanded to include all OTS tracks at **FLs 350 to 390**, inclusive. Only aircraft with functioning CPDLC and ADS-C may plan and / or fly in the height band FL350-390 inclusive on any OTS Track.

If a flight experiences an equipment failure **AFTER** departure which renders the aircraft non-DLM compliant, requests to operate in the NAT Region Data Link Airspace will be considered on a tactical basis. Such flights must indicate their non-DLM status prior to entering the airspace.

If the failure occurs **WHILE** the flight is in NAT DLM Airspace, ATC must be immediately advised. Such flights may be re-cleared to avoid the airspace, but consideration will be given to allowing the flight to remain in the airspace, based on tactical considerations.

If a flight experiences an equipment failure **PRIOR** to departure which renders the aircraft non-DLM compliant, the flight should not flight plan to enter the NAT Regional DLM Airspace.

10.5.7.6 Inter Pilot Air-to-Air VHF Facility 123.45 MHz and EMERGENCY FREQUENCY 121.5 MHz

The frequency 121.5 MHz should be continuously monitored by all aircraft operating in the NAT region to be prepared to aid any other aircraft advising an emergency.

An air-to-air VHF frequency has been established for world-wide use when aircraft are out of range of VHF ground stations which utilise the same or adjacent frequencies, this frequency, 123.45 MHz, is intended for pilot-to-pilot exchanges of operationally significant information.

NOTE: **It is not to be used for a “chat” frequency.**

123.45 MHz may be used to relay position reports via another aircraft in the event of an air-ground communications failure.

123.45 MHz may also be used by pilots to contact other aircraft when needing to coordinate offsets required in the application of the Strategic Lateral Offset Procedures (SLOP).

If necessary initial contact for relays of offset coordination can be established on 121.5 MHz – although great care must be exercised should this be necessary, in case it is being used by aircraft experiencing or assisting with an ongoing emergency.

To minimise unnecessary use of 121.5 MHz, it is recommended that aircraft additionally monitor 123.45 MHz when flying though NAT airspace.

10.5.8 POSITION REPORTS

10.5.8.1 Time and Place of Position Reports

Unless otherwise requested by Air Traffic Control, position reports from flights on routes which are not defined by designated reporting points should be made at the significant points listed in the flight plan.

Air Traffic Control may require any flight operating in a North / South direction to report its position at any intermediate parallel of latitude when deemed necessary.

In requiring aircraft to report their position at intermediate points, ATC is guided by the requirement to have positional information at approximately hourly intervals and also by the need to accommodate varying types of aircraft and varying traffic and MET conditions.

If the estimated times for the 'next position', as last reported to ATC, has changed by **three minutes or more**, a revised estimate must be transmitted to the ATS unit concerned as soon as possible.

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

10.5.8.2 Contents of Position Reports

For flights outside domestic ATC route networks, position should be expressed in terms of latitude and longitude except when flying over named reporting points. For flights whose tracks are predominantly east or west, latitude should be expressed in degrees and minutes, longitude in degrees only.

For flights whose tracks are predominantly north or south, latitude should be expressed in degrees only, longitude in degrees and minutes.

However, it should be noted that when such minutes are zero then the position report may refer solely to degrees *(as per examples below).*

All times should be expressed in four digits giving both the hour and the minutes UTC.

10.5.8.3 Standard Message Types

Standard air / ground message types and formats are used within the NAT Region and are published on the Atlantic Orientation charts. To enable ground stations to process messages in the shortest possible time, pilots should observe the following rules:

a) Use the correct type of message applicable to the data transmitted;

b) State the message type in the contact call to the ground station or at the start of the message;

c) Adhere strictly to the sequence of information for the type of message;

d) **All times** in any of the messages should be expressed in hours and minutes **UTC**.

Position

Example: "Position, Gama 123, on 8831, RESNO at 1235, Flight Level 330 Estimating 56 North 020 West at 1310, 56 North 030 West Next"

Request Clearance

Example: "Request Clearance, Gama 123, on 8831, 56 North 020 West at 1308, Flight Level 330, Estimating 56 North 030 West at 1340, 56 North 040 West Next. Request Flight Level 350"

or if a position report is not required

Example: "Request Clearance, Gama 123 on 3476, Request Flight Level 370"

Revised Estimate

Example: "Revised Estimate, Gama 123 on 3476, 57 North 040 West at 0305"

Miscellaneous

Example: Any Plain Language with free format.

10.5.8.4 Addressing of Position Reports

Position reports for aircraft operating on tracks through successive points on the mutual boundary of two OCAs *(e.g. when routing along the 45°N parallel),* should be made to both relevant OACs. (In practice this only requires an addition to the address. *(e.g. "Shanwick copy Santa Maria").*

10.5.8.5 "When Able Higher" (WAH) Reports

Prior advice to ATC of the time or position that a flight will be able to accept the next higher level can assist ATC in ensuring optimal usage of available altitudes. A WAH Report must be provided by all flights entering the NAT HLA Airspace portion of the New York OCA and entering the Santa Maria OCA.

Due to the higher number of step climb requests on the generally longer NAT route segments that transit New York and Santa Maria OCAs and because of the greater frequency of crossing traffic situations here, the strategy of issuing "coast-out to coast-in" conflict-free clearances are not always employed by these two oceanic control centres. Here, air traffic control of a more tactical nature is often exercised. The provision of WAH Reports in these circumstances allows the controllers to more effectively utilise their airspace and provide more fuel-efficient profiles.

Provision of WAH Reports on entering other NAT OCAs is optional or they may be requested by any OAC.

When required or when otherwise provided, upon entering an oceanic FIR, pilots should include in the initial position report the time or location that the flight will be able to accept the next higher altitude. The report may include more than one altitude if that information is available.

Example: "Gama 123, 40 North 040 West at 1010, Flight Level 350, Estimating 40 North 050 West at 1110, 40 North 060 West Next. Able Flight Level 360 at 1035, Able Flight Level 370 at 1145, Able Flight Level 390 at 1300"

Information thus provided of the aircraft's future altitude "ability" will not automatically be interpreted by ATC as an advance "request" for a step climb. It will be used as previously indicated to assist ATC in planning airspace utilisation. However, should the pilot 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".

Example: "Gama 123, 42 North 040 West at 1215, Flight Level 330, Estimating 40 North 050 West at 1310, 38 North 060 West Next. Request Flight Level 340 at 1235, Able Flight Level 350 at 1325, Request Flight Level 360 at 1415"

Although optimal use of the WAH reports is in conjunction with a Position Report, a WAH report can be made or updated separately at any time.

Example: "Gama 123, Able Flight Level 360 at 1035, Request Flight Level 370 at 1145, Able Flight Level 390 at 1300"

It should be noted that ATC acknowledgement of a WAH report *(and any included requests)* **is NOT** a clearance to change altitude.

10.5.9 METEOROLOGICAL REPORTS

Since 2010 aircraft are no longer required to provide voice reports of MET observations of wind speed and direction nor outside air temperature.

When an ATS unit establishes an event contract with an aircraft to provide ADS–C position reports, it may also establish an additional periodic report contract *(e.g. with a 30 mins' interval)*. Such ADS–C periodic reports, unlike event reports, contain wind and temperature data and thereby satisfy the MET authorities requirements for the provision of MET data. However, it must be appreciated that any such automated MET Reports do not include information on any observations of special or non-routine significant meteorological phenomena, such as moderate / severe turbulence or icing, volcanic ash, thunderstorms, etc. Therefore, any pilot providing position reports via data link, who encounters any such significant meteorological phenomena should report this information via voice or, if appropriate, via a CPDLC free text downlink message. The format to be used for the reporting of such observations should, where appropriate, be by reference to geographical co-ordinates.

10.5.10 HF COMMUNICATIONS FAILURE

Rules and procedures for the operation of an aircraft following a radio communications failure (RCF) are established to allow ATC to anticipate that aircraft's subsequent actions and thus for ATC to be able to provide a service to all other flights within the same vicinity, so as to ensure the continued safe separation of all traffic.

It must be recognised that there is in general an underlying premise in "normal" radio communications failure procedures that they are for use when a single aircraft 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, extremely important to differentiate between two distinct circumstances: - firstly, an on-board communications equipment failure, resulting in an individual aircraft losing HF communications with ATC and; secondly, the occurrence of poor HF propagation conditions *(commonly referred to as "HF Blackouts"),* which can simultaneously interrupt HF air-ground communications for many aircraft over a wide area.

In the case of an on-board communications equipment failure, even though ATC loses contact with that aircraft, it can anticipate that aircraft's actions and, if necessary, modify the profiles of other aircraft 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 aircraft over a wide area and ATC may then be unable to make any interventions to assure safe traffic separations. Notwithstanding the gradual introduction of Data link and SATCOM Voice for regular air-ground ATS communications in the NAT Region, all pilots must recognise that, pending the mandatory carriage and use of such means, 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 aircraft which experience a communications failure while operating in, or proposing to operate in, the NAT Region. These procedures are intended to complement and not supersede State procedures / regulations.

General Provisions

a) In the event of a two-way communications failure pilots should operate the SSR Transponder on identify Mode A Code 7600 and Mode C.
b) When equipped, an aircraft should use Satellite Voice Communications to contact the responsible aeradio station via special telephone numbers / short codes published in State AIPs (see also "HF Management Guidance Material for the NAT Region"). However, it must be appreciated that pending further system developments and facility implementations the capability for Ground (ATC) – initiated calls vary between different NAT OACs.
c) If the aircraft is not equipped with SATCOM then the pilot should attempt to use VHF to contact any (other) ATC facility or another aircraft, inform them of the difficulty, and request that they relay information to the ATC facility with which communications are intended.
d) The inter-pilot air-to-air VHF frequency, 123.45 MHz may be used to relay position reports via another aircraft
e) In view of the traffic density in the NAT Region, pilots of aircraft experiencing a two-way ATS communications failure should broadcast regular position reports on the inter-pilot frequency (123.45 MHz) until such time as communications are re-established.

Communications Procedures for Use in the Event of an On-Board HF Equipment Failure.

Use SATCOM voice communications, if so equipped. *(See General Provisions 'b)' above)*

If not SATCOM equipped, try VHF relay via another aircraft *(See General Provisions ‘c)’ and ‘d)’ above)*

Communications Procedures for Use during Poor HF Propagation Conditions

Poor HF propagation conditions are the result of ionospheric disturbances. These are usually caused by sun-spot or solar flare activity creating bursts of charged particles in the solar wind which can spiral down around the Earth’s magnetic lines of force and distort or disturb the ionised layers in the stratosphere which are utilised to refract HF radio waves. As with the Aurora Borealis, which is of similar origin, these ionospheric disturbances most commonly occur in regions adjacent to the Magnetic Poles. Since the Earth’s North Magnetic Pole is currently located at approximately 87N 150W, flights through the North Atlantic and Northern Canada regions can, on occasion, experience resulting HF communications difficulties.

SATCOM Voice communications are unaffected by most ionospheric disturbances. Therefore, when so equipped, an aircraft may use SATCOM Voice for ATC communications *(See General Provisions ‘b)’ above).*

If not SATCOM Voice equipped, in some circumstances it may be feasible to seek the assistance, via VHF, of a nearby SATCOM Voice equipped aircraft to relay communications with ATC *(See General Provisions ‘c)’ & ‘d)’ above).*

Whenever aircraft encounter poor HF propagation conditions that would appear to adversely affect air-ground communications generally, it is recommended that all pilots then broadcast their position reports on the air-to-air VHF frequency 123.45 MHz. Given the density of traffic in the NAT Region and the fact that in such poor propagation conditions ATC will be unable to maintain contact with all aircraft, it is important that even those aircraft that have been able to establish SATCOM Voice contact also broadcast their position reports.

If for whatever reason SATCOM Voice communications *(direct or relayed)* are not possible, then the following procedures may help to re-establish HF communications. Sometimes these ionospheric disturbances are very wide-spread and HF air-ground communications at all frequencies can be severely disrupted throughout very large areas *(e.g. simultaneously affecting the whole of the NAT Region and the Arctic.).* However, at other times the disturbances may be more localised and / or may only affect a specific range of frequencies.

In this latter circumstance, HF air-ground communications with the intended aeradio station may sometimes continue to be possible but on a frequency, other than either the primary or secondary frequencies previously allocated to an aircraft. Hence, in the event of encountering poor HF propagation conditions pilots should first try using alternative HF frequencies to contact the intended aeradio station.

However, while the ionospheric disturbances may be severe, they may nevertheless only be localized between the aircraft’s position and the intended aeradio station, thus rendering communications with that station impossible on any HF frequency. But the aeradio stations providing air-ground services in the NAT Region do co-operate as a network and it may, even then, still be possible to communicate with another aeradio station in the NAT network on HF and request that they relay communications. Efforts should therefore be made to contact other NAT aeradio stations via appropriate HF frequencies.

Nevertheless, as previously indicated, there are occasions when the ionospheric disturbance is so severe and so widespread that HF air-ground communications with any aeradio station within the NAT Region network are rendered impossible.

10.5.10.1 Loss Communications Rationale

Tactical ATC Environment

In a tactical ATC environment, such as one in which Secondary Surveillance Radar and VHF voice communications are used, ATC has continuous real-time data on the position / progress of all relevant traffic and the intentions of any individual aircraft with which ATC may have lost communications can be inferred from that aircraft's filed flight plan. Hence, in such an environment, when voice communications with a single aircraft fail, the relevant published "lost comms procedures" normally require that aircraft to "land at a suitable aerodrome or continue the flight and adjust level and speed in accordance with the filed flight plan". Communications blackouts affecting multiple aircraft, are not a feature of this type of VHF environment and hence in these circumstances, if required, ATC will be able to re-clear other traffic to ensure safe separations are maintained.

10.5.10.2 Procedural ATC Environment

However, in a (largely) non-radar environment such as the North Atlantic, ATC must rely significantly upon the HF Voice Position Reports communicated by each aircraft for position, progress and intent data. Communications equipment failures and / or poor propagation conditions can interrupt the provision of this information. Therefore, to mitigate against such occurrences in the busy NAT HLA airspace, outside of VHF coverage ATC often employs strategic traffic planning and issues Oceanic Clearances which have been pre co-ordinated with downstream OACs. Thereby ensuring that flights following such a pre-coordinated strategic oceanic clearance are guaranteed conflict-free progress to oceanic exit. By this means, safe NAT passage for flights continuing to adhere to such a received oceanic clearance, is ensured, even if not ATS communications are subsequently possible with any one, or even with all, of those strategically planned aircraft.

Every effort is made by the initial NAT OAC to clear aircraft as per thief filed flight plans. However, this is not always possible, particularly during peak traffic flow periods. Aircraft may receive clearances at flight levels or speeds other than those flight planned or, less frequently, may be cleared on oceanic tracks via entry or exit points other than those contained in the filed flight plan. Also, it must be recognised that while a filed NAT flight plan may contain one or more step climbs for execution within the NAT region, the initially issued oceanic clearance, or even any subsequently updated clearance (i.e. re-clearance), has only been coordinated for a single *(i.e. initial or current)* flight level. It must therefore be appreciated that it is only the flight routing and profile contained in the current received oceanic clearance that has been guaranteed to provide conflict-free progress. Unless the oceanic clearance is precisely the same as the filed flight plan, in any lost communications situation in the NAT Region, if a pilot in receipt of an oceanic clearance unilaterally reverts to his/her filed flight plan *(even by simply executing a later step climb),* then a guarantee of conflict-free progress no longer exists. Consequently, if a NAT aircraft loses the possibility of communications with the relevant OAC at any time after receiving and acknowledging an oceanic clearance, and the pilot elects to continue the flight, then the aircraft must adhere strictly to the routing and profile of the current oceanic clearance until exiting the NAT Region.

Pilots must not unilaterally revert to their filed flight plan.

10.5.10.3 Operational Procedures Following Loss of HF Communications PRIOR to Entry into the NAT

On-Board HF Communications Equipment Failure – Your Aircraft Unable to Establish Communications

Due to the potential length of time in oceanic airspace, it is strongly recommended that a pilot, experiencing an HF communications equipment failure **prior** to entering the NAT, whilst still in domestic airspace and still in VHF contact with the domestic ATC unit, does not enter NAT airspace but lands at a suitable airport. Should the pilot, nevertheless, elect to continue the flight then every effort must be made to obtain an oceanic clearance and the routing, initial level and speed contained in that clearance must be maintained throughout the entire oceanic segment. Any level or speed changes required to comply with the Oceanic Clearance must be completed within the vicinity of the oceanic entry point.

If, however, an oceanic clearance cannot be obtained, the individual aircraft suffering radio communications equipment failure should enter oceanic airspace at the fist oceanic entry point, level and speed contained in the filed flight plan and proceed via the filed flight plan route to landfall. **The initial oceanic level and speed included in the filed flight plan must be maintained until landfall.**

NOTE: This is the ONLY situation in which a pilot may unilaterally elect to "fly the flight plan" through the NAT region.

HF Blackout – All Aircraft Unable to Establish Communications

In the case of aircraft that lose ATC communications as a result of poor propagation conditions *("HF Blackouts")* when approaching NAT airspace through domestic airspace where ATC communications are also conducted via HF (e*.g. entering the NAT through Northern Canadian airspace into the Reykjavik OCA),* it is probably less advisable to execute unscheduled landings. These poor propagation conditions are very likely to affect many aircraft simultaneously and multiple diversions of "lost comms" aircraft might create further difficulties and risks.

As with the equipment failure situation, aircraft approaching the NAT and losing ATC communications as a result of poor HF radio propagation conditions should, if already in receipt of an oceanic clearance, follow the routing specified in that clearance and maintain the **initial cleared level and speed** throughout the oceanic segment i.e. though to landfall.

However, in these HF Blackout circumstances, if no oceanic clearance has been received, the aircraft must remain at the last cleared domestic flight level, not only to the ocean entry point but also throughout the whole subsequent oceanic segment *(i.e. until final landfall).* This is in stark contrast to the equipment failure case. In such HF Blackouts, pilots must not effect level changes to comply with filed flight plans. Such aircraft should, however, enter oceanic airspace at the first oceanic entry point and speed contained in the filed flight plan and proceed via the filed flight plan route to landfall.

The rationale here must be appreciated. In such circumstances, it is likely that ATC will have simultaneously lost HF communications with multiple aircraft in the same vicinity. Should pilots then wrongly apply the "normal" radio failure procedures and "fly the flight plan", there is a possibility that two such aircraft may have filed conflicting flight paths / levels through the subsequent oceanic airspace, and without communications with either aircraft, ATC would then be unable to intervene to resolve the conflict. Since safe aircraft level separation assurance has already been incorporated into the current domestic clearances, it is consequently imperative that under such *(Domestic and Oceanic)* HF-blackout circumstances, all aircraft electing to continue flight into NAT oceanic airspace without a received and acknowledged oceanic clearance, should adhere to the flight level in the last received domestic clearance. No level changes should be made to comply with a filed oceanic level that is different from that of the domestic clearance in effect at the time that ATC air-ground communications were lost.

Operational Procedures Following Loss of HF Communications AFTER Entry into the NAT

If the HF communications equipment failure occurs or HF Blackout conditions are encountered after entering the NAT then: -

The pilot must proceed in accordance with the last received and acknowledged Oceanic Clearance, including level and speed, to the last specified oceanic route point *(normally landfall).* After passing this point, re-join the filed flight plan route by proceeding, via the published ATS route structure where possible, to the next significant point contained in the filed flight plan.

Aircraft with a destination within the NAT Region should proceed to their clearance limit and follow the ICAO standard procedure to commence descent from the appropriate designated navigation aid serving the destination aerodrome, at or as close as possible to, the expected approach time.

Summary

- Equipment Failure before receiving an Oceanic Clearance: -
  Divert of fly the Flight Plan route; speed and initial planned oceanic level to landfall.
- Blackout encountered *(in an HF comms 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.

In all cases, after landfall re-join, or continue, the flight planned route.

10.5.11 OPERATION OF TRANSPONDERS

10.5.11.1 General

All aircraft operating as IFR flights in the NAT Region shall be equipped with a pressure altitude reporting SSR transponder. Unless otherwise directed by ATC, pilots flying in the NAT FIRs will operate transponders continuously in Mode A/C Code 2000, except that the last assigned code will be retained for a period of 30 minutes after entry into NAT airspace or after leaving a radar service area.

Pilots should note that it is important to change from the last assigned domestic code to the Mode A/C Code 2000 since the original domestic code may not be recognised by the subsequent Domestic Radar Service on exit from the oceanic airspace.

NOTE: Because of the limited time spent in the NAT HLA airspace, when flying on Route Tango 9, the change from the last assigned domestic code to Code 2000 should be made Northbound 10 minutes after passing BEGAS and Southbound 10 minutes after passing LASNO.

Reykjavik ACC provides a radar control service in the south-eastern part of its area and consequently transponder codes issued by Reykjavik ACC must be retained throughout the Reykjavik OCA until advised by ATC

10.5.11.2 Special Codes

It should be noted that this procedure above, does not affect the use of the special purpose codes *(7500, 7600 and 7700)* in cases of unlawful interference, radio failure or emergency. However, given the current heightened security environment crews must exercise CAUTION when selecting Codes not to inadvertently cycle through any of these special purpose codes and thereby possibly initiate the launching of an interception.

10.5.12 AIRBORNE COLLISION AVOIDANCE SYSTEMS (ACAS)

Pilots should report all ACAS / TCAS Resolution Advisories which occur in the NAT Region to the controlling authority for the airspace involved.

10.5.13 APPLICATION OF MACH NUMBER TECHNIQUE

The term ‘Mach Number Technique’ is used to describe a technique whereby aircraft operating successively along suitable routes are cleared by ATC to maintain appropriate Mach Numbers for a relevant portion of the en-route phase of their flight.

10.5.13.1 Objective

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 aircraft is not reduced below the established minimum.

Where aircraft, operate 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.

10.5.13.2 Procedure

The Oceanic 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 flight plan for aircraft intending to fly in NAT oceanic airspace.

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 aircraft and for co-ordination with adjacent ATC units.

ATC will try to accommodate pilot 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 aircraft flying a particular track at the same flight level is established over the oceanic entry point. Successive aircraft 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 aircraft 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 aircraft providing accurate waypoint passing times in position reports. It is therefore essential that pilots conducting flights in NAT HLA Airspace utilise accurate clocks when operating within NAT HLA Airspace.

Pilots must adhere strictly to their assigned True Mach Numbers unless a specific re-clearance is obtained from the appropriate ATC unit. However, as the aircraft weight reduces 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.

Pilots must recognise that adherence to the assigned Mach Number is essential. No tolerance is provided for. 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 HLA airspace

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

10.5.13.3 After Leaving NAT HLA

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.

10.5.14 PRE-FLIGHT PROCEDURES

10.5.14.1 General

The following actions should be completed prior to flight:

a) Review of maintenance logs and forms to ascertain the condition of equipment required for flight in the NAT HLA or RVSM Airspace. It should be ensured that maintenance action has been taken to correct defects to required equipment;

b) During external inspection of the aircraft, attention should be paid to the condition of static sources and the condition of the fuselage skin near each static source.

c) Before take-off, the aircraft altimeters should be set to the local altimeter setting (QNH) and should display a known elevation *(e.g. an airfield elevation)* within the height limits specified in aircraft operating manuals. The two primary altimeters should also agree to within height limits specified by the aircraft operating manual.

NOTE: The maximum height difference between primary altimeters for should not exceed 50 feet.

d) Before take-off, equipment required for flight in NAT HLA or RVSM Airspace should be operative, turned-on and engaged as necessary, and indications of any malfunction should be resolved.

e) Ensure all the safety equipment is on board the aircraft as specified in the applicable Part B.

f) Conduct a HF/SELCAL check with a ground bases radio station to ensure the equipment is working correctly, should the equipment fail to work correctly then re-plan your route via the Blue Spruce routes.

10.5.14.2 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. Some systems will align in about 10 minutes; others can take 15 minutes or more; expect alignment to take longer in extreme cold or at higher latitudes or when the aircraft (*and hence the inertial platform)* is buffeted by winds or rocked during cargo loading. A rapid realignment feature is sometimes provided but should only be used if, during an intermediate stop, it becomes necessary to increase the system accuracy.

The aircraft must be stationary during rapid realignment, which typically will take about one minute.

To ensure that there is adequate time for the initial alignment, the first crew member on the flight deck should normally put the inertial system(s) into the align mode as soon as practicable.

10.5.14.3 The Master Document

To help eliminate waypoint entry errors as far as is humanly possible, a stringent routine of navigational crosschecking procedures has been adopted by the Company, involving the use of a Master Document.

A master working document is to be used on the flight deck. This document will be based upon the navigation flight plan, and will list sequentially the waypoints defining the routes, the tracks and distances between each waypoint, and other information relevant to navigation along the cleared track. When mentioned subsequently in this guidance material, this document will be referred to as the 'Master Document'.

Misuse of the Master Document can result in gross navigation errors being made and, for this reason, strict adherence to the following procedure is imperative.

One navigation flight plan shall be the Master Document. This, however, does not preclude other navigation flight plans being used on the flight deck.

A waypoint numbering sequence should be established from the outset of the flight and entered on the Master Document. The identical number sequence will be used in storing waypoints in the navigation computers. The example below utilises the ARINC 424 Naming Convention but it can be adapted to suit any waypoint indicator.

The Master Document will be retained by the Company for a period of six months from the date of the flight, together with fuel log, progress chart and planning weather.

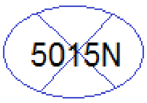
An appropriate symbology will be adopted to indicate the status of each waypoint listed on the Master Document:

5015N

a) The waypoint indicator used in the aircraft system is entered against the corresponding waypoint co-ordinates in the Master Document to indicate that the waypoint has been inserted in the navigation computers.

b) The waypoint number is circled, to signify that insertion of the correct co-ordinates in the navigation computers had been double-checked independently by another crew member.

c) The circled waypoint numbers is ticked, to signify that the relevant track and distance information have been double-checked.



d) The circled waypoint number is crossed out, to signify that the aircraft has overflown the waypoint concerned.

All navigational information appearing on the Master Document must be checked against the best available prime source data. When an ATC track change is received or the ATC clearance is otherwise updated, it is recommended that a new Master Document be 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 ATC clearances or re-clearances are being obtained, headsets should be worn, because the inferior clarity of loud speakers has been known to result in mistakes. Two qualified crewmembers should monitor such clearances, one of them recording the clearance on the Master Document as it is received, the other checking the receipt and read-back.

All waypoint co-ordinates should be read back in detail, unless receiving an Abbreviated Clearance.

10.5.14.4 Special Considerations

a) When cross-checking present-position coordinates, be alert for the correct hemispheric indicator *(i.e., N, S, E, and W)* as well as the correct numerical values.

b) If remote loading capabilities are used, care must be taken to ensure that waypoints are entered and cross-checked separately on each individual FMS to avoid errors. In addition, the software must be verified and the ground speed checked:

   (i) At “turn on” verify the software number to ensure that the checklist and operating procedures agree with the loaded program, and
   (ii) while the aircraft is stationary and the IRS is selected to the NAV mode, observe the ground speed readout. A reading of more than a few knots may indicate a faulty unit or a less reliable unit at best. If an error is detected, a check of the malfunction codes must be undertaken.

10.5.14.5 GPS Pre-Departure Procedures

When both required LRNSs are GPSs, special pre-departure procedures are required. In these cases, operators conducting GPS primary means navigation in NAT HLA Airspace must utilise a Fault Detection and Exclusion (FDE) Availability Prediction Programme for the installed GPS equipment; one that is capable of predicting, prior to departure for flight on a specified route*, the following:

- The maximum outage duration of the loss of fault exclusion;
- The loss of fault detection; and
- The loss of navigation function.

This FDE programme must use the same FDE algorithm that is employed by the installed GPS equipment. To perform the prediction accurately, the FDE prediction programme must provide the capability to manually designate satellites that are scheduled to be unavailable. Information on GPS satellite outages is promulgated via the U.S. NOTAM Office.

When GPS is being used as a supplementary navigation means or when GPS is only one of the two LRNSs required for NAT HLA approval FDE checks should also be undertaken for that GPS unit.

10.5.14.6 Satellite Availability

Given suitable geometry:
- Four satellites are required to determine 3-D position;

For Receiver Autonomous Integrity Monitoring (RAIM) purposes:
- Five satellites are required to detect the presence of a single faulty satellite;

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. *(Note that an FDE algorithm is normally associated with a RAIM algorithm).*

NOTE: The above numbers of satellites *(for RAIM and FDE purposes only)* may in each case be reduced by one if barometric aiding is used.

10.5.14.7 Satellite Navigation Prediction

When so required, crew intending to conduct GPS navigation in NAT HLA Airspace must utilise a Satellite Navigation Availability Prediction Programme specifically designated for the GPS equipment installed. This prediction programme must be capable of predicting, prior to departure for flight on a ‘specified route’, the following:

- Any loss of navigation coverage *(meaning that less than 3 satellites will be in view to the receiver)*; **and**
- Any loss of the RAIM function and its duration.

10.5.14.8 ATC Oceanic Clearances

Where practicable, two flight crew members should listen to and record every ATC clearance and both agree that the recording is correct. Any doubt should be resolved by requesting clarification from ATC.

If the ATC oceanic cleared route is identical to the flight planned track, it should be drawn on the plotting chart and verified by the other pilot.

However, cockpit management should be such that one pilot is designated to be responsible for flying the aircraft while any amendments to the cockpit documentation and reprogramming of the navigation systems are being carried out. If there is a change to the flight planned OTS track or random track, the co-ordinates of the new track must be plotted on the progress chart and tracks and distances extracted from the 'Track and Distance Tables' and recorded on a revised Master Document. It is these tracks and distances that should be compared with the CDU information and the necessary checks carried out if there are differences greater than 1NM / 1°.

Remember to compare like with like, i.e., compare true tracks on the Master Document with true tracks from the CDU; remember, also, the CDU gives initial great circle tracks.

If the aircraft is cleared by ATC on a different track from that flight planned, it is strongly recommended that a new Master Document be prepared showing the details of the cleared track. Over writing of the existing flight plan can cause difficulties in reading the waypoint numbers and the new coordinates. For this purpose, it is helpful if a blank pro-forma Master Document *(flight plan)* is 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 pro-forma and this should be checked by another crew member. If necessary, a new plotting chart may be used on which to draw the new track. 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.

10.5.14.9 Plotting Chart

All crews will use a simple plotting chart to provide themselves with a visual presentation of the intended route, which is defined only in terms of navigational co-ordinates. Merely plotting the intended route on such a chart may reveal errors and discrepancies in the navigational co-ordinates that 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 aircraft's position on this chart will also serve the purpose of a gross navigation error check, and will help to confirm that the flight is proceeding in accordance with its clearance.

If the plotted position is laterally offset, the flight may be deviating unintentionally, and this possibility should be investigated at once. A suitable chart, as supplied by the Company, will be used to plot the progress of the flight.

10.5.14.10 Waypoint Crossing

As soon as the waypoint alert is activated, the following checks should be carried out:

a) Check the present position in the navigation system against the cleared route in the Master Document *(it should confirm approaching the waypoint);*

b) Check the next two waypoints in each navigation system against the Master Document;

c) When overhead the waypoint, check the distance to the next waypoint, confirm that the aircraft turns in the correct direction and takes up a new heading and track appropriate to the leg to the next waypoint;

d) Before transmitting the position report to ATC, verify the active waypoint co-ordinates against the Master Document and those in the steering system;

e) After the ATC position report has been sent, the position of the aircraft should be again plotted *(approximately 10 minutes after the waypoint and when crossing a whole degree of longitude)* to verify correct tracking;

f) At this stage, the crew should be particularly alert in maintaining HF watch in view of possible ATC follow up to the position report.

g) If, subsequently, the ETA for a reporting point changes by 3 minutes or more the appropriate Oceanic Centre must be advised of the revised ETA.

Even if automatic waypoint position reporting via data link *(e.g. ADS, CPDLC or FMC WPR)* is being used to provide position reports to ATC the above checks should still be performed.

The crew should be prepared for possible ATC follow-up to the position report.

Crews should also be aware that trials are underway in the NAT HLA Region of ADS-C conformance monitoring. ATC may establish event contracts that will result in automatic alerts whenever the aircraft diverges from its cleared profile. Unless previously advised by the pilot of the need for such a divergence. Crews should expect ATC to query the situation. Standardised CPDLC alert messages have been developed for use here.

10.5.14.11 Provision of Step Climbs

Tactical radar control and tactical procedural control are exercised in some areas of the NAT HLA Airspace. However, oceanic ATC 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, there is often scope for en route step-climb re-clearances as fuel burn-off makes higher levels more optimal. Controllers will accommodate requests for step-climbs whenever possible.

When so re-cleared, pilots should initiate the climb without delay (*unless their discretion was invited or unless a conditional clearance was issued)* and **always** report to ATC immediately upon **leaving** the old and on **reaching** the new cruising levels.

10.5.14.12 Approaching the Ocean

Prior to entering MNPS Airspace, the accuracy of the LRNSs should be thoroughly checked, if necessary by using independent navigation aids. For example, INS position can be checked by reference to en route or proximate VOR/DMEs, etc. However, with a modern FMS, the system decides which LRNS is to be used, and indeed, the FMS may be taking information from DMEs *(and possibly VORs*) as well as the LRNS carried.

Nevertheless, despite all this modern technology and even if the FMS is using GPS, it is still worthwhile to carry out a 'reasonable' check of the FMS/GPS position, using (or example) DME/VOR distance and bearing.

When appropriate and possible, the navigation system which, in the opinion of the pilot, has performed most accurately since departure should be selected for automatic navigation steering.

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.

10.5.14.13 Routine Monitoring

It is important to remember that there are several ways in which the autopilot may unobtrusively become disconnected from the steering mode. Therefore, regular checks of correct engagement with the navigation system should be made.

It is recommended that where possible the navigation system coupled to the autopilot should display the present position coordinates throughout the flight. If these are then plotted as suggested above, they will provide confirmation that the aircraft is tracking in accordance with its ATC clearance.

Distance to go information should be available on the instrument panel, whilst a waypoint alert light, where fitted, provides a reminder of the aircraft's imminent arrival over the next waypoint.

It is good practice to cross check winds midway between oceanic waypoints by comparing the flight plan. LRNS and upper HPa wind charts data. The LRNS information will need to be included in a position report if the flight has either been designated as an OTS MET reporting flight or is a flight on a random route. Such a cross check will also aid crews in case there is a subsequent need for a contingency requiring the use of Dead Reckoning.

The navigation system not being used to steer the aircraft should display cross-track distance and track angle error. Both these should be monitored, with cross-track distance being displayed on the HSI where feasible.

10.5.14.14 Approaching Landfall

When the aircraft is within range of land based navaids, and the crew is confident that these navaids are providing reliable navigation information, consideration should be given to updating the LRNSs. Automatic updating of the LRNs from other navaids should be closely monitored, and before entry into airspace where different navigation requirements have been specified *(e.g. RNP-5 in European BRNAV airspace),* crews should check 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 must be informed.

10.5.15 SPECIAL IN-FLIGHT PROCEDURES

10.5.15.1 Strategic Lateral Offset Procedures (SLOP)

ATC clearances are designed to ensure that separation standards are continually maintained for all traffic. However, the chain of clearance definition, delivery and execution involves a series of technical system processes and human actions. Errors are very rare but they do occur. Neither pilots nor controllers are infallible. Gross Navigation Errors *(usually involving whole latitude degree mistakes in route waypoints)* are made, and aircraft are sometimes flown at flight levels other than those expected by the controller. When such errors are made, ironically, the extreme accuracies of modern navigation and height keeping systems themselves increase the risk of an actual collision. Within an ATS surveillance environment the controller is alerted to such errors and can, using VHF voice communications, intervene in a timely fashion.

This is not the case in Oceanic airspace, such as the North Atlantic, where the controller's awareness of the disposition of a significant proportion of the traffic is reliant largely upon pilot position reports through communication links utilising HF or SATCOM Voice via third party radio operators. And furthermore, even among that proportion of traffic utilising data link for automated position reporting, and perhaps ATS communications, navigation errors continue to occur. Consequently, it has been determined that allowing aircraft conducting oceanic flight to fly self-selected lateral offsets will provide an additional safety margin and mitigate the risk of traffic conflict when non-normal events such as aircraft navigation errors, height deviation errors and turbulence induced altitude-keeping errors do occur.

Collision risk is significantly reduced by application of these offsets. These procedures are known as "Strategic Lateral Offset Procedures (SLOP)".

This procedure provides for offsets within the following guidelines:

a) Along a route or track there will be three positions that an aircraft may fly:
   (i) centreline, or
   (ii) one mile right, or
   (iii) two miles right;

b) Offsets will not exceed 2 NM right of centreline; and

c) Offsets left of centreline must not be made.

Distributing aircraft laterally and equally across the three available positions adds an additional safety margin and reduces collision risk. This is now **a standard operating procedure** for the entire NAT Region and pilots **are required** to adopt this procedure as is appropriate.

In this connection, it should be noted that:

a) Aircraft without automatic offset programming capability must fly the centreline.

b) It is recommended that pilots of aircraft capable of programming automatic offsets elect to fly an offset one or two nautical miles to the right of the centre line to obtain lateral spacing from nearby aircraft *(i.e. those immediately above and/or below).* Pilots should use whatever means are available *(e.g. TCAS, communications, visual acquisition, GPWS)* to determine the best flight path to fly.

c) An aircraft overtaking another aircraft should offset within the confines of this procedure, if capable, to create the least amount of wake turbulence for the aircraft being overtaken.

d) For wake turbulence purposes, pilots should fly one of the three positions shown above. Pilots should not offset to the left of centreline nor offset more than 2 NM right of centreline. Pilots may contact other aircraft on the air-to-air channel, 123.45 MHz, as necessary; to coordinate the best wake turbulence mutual offset option.

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

As indicated below, contact with ATC is not required.

e) Pilots may apply an offset outbound at the oceanic entry point and must return to centreline prior to the oceanic exit point.

f) Aircraft transiting radar-controlled airspace mid-ocean should remain on their already established offset positions.

g) There is no ATC clearance required for this procedure and it is not necessary that ATC be advised.

h) Voice position reports should be based on the waypoints of the current ATC clearance and not the offset positions.

10.5.15.2 Auto-Pilot Disconnect

If during flight the autopilot becomes 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.

10.5.15.3 Avoiding Confusion between Magnetic and True Track Reference

Crews who decide to check or update their LRNSs by reference to VORs should remember that in the Canadian Northern Domestic Airspace these may be oriented regarding **true north**, rather than magnetic north.

10.5.15.4 Navigation in Areas of Compass Unreliability

As aircraft move towards the Earth's North magnetic pole the horizontal field strength reduces and the ability of the compass to accurately sense magnetic North is reduced. It is generally recognised that when the horizontal magnetic field strength falls below 6000 nano-tesla, the magnetic compass can no longer be considered to be reliable. Moreover, when the horizontal magnetic field strength falls below 3000 nano-tesla, the magnetic compass is considered to be unusable.

Within the NAT HLA North West of Greenland is an area of Compass Unreliability and adjoining areas of Canadian airspace include areas where the magnetic Compass is Unusable. En route charts for the Northern Atlantic and North Polar areas show the area where the compass is either unreliable or unusable.

In areas where the compass is unreliable or unusable, basic inertial navigation requires no special procedures. Different manufacturers may offer their known solutions to the special problems existing in such areas. However, such solutions should not involve the use of charts and manual measurement of direction.

Before operating in an area of Compass Unreliability, Operators / Pilots are responsible for checking that the operation is approved or if training is required.

10.5.15.5 Deliberate Deviation from Track

Deliberate temporary deviations from track are sometimes necessary, usually to avoid severe weather; whenever possible, prior ATC approval should be obtained. Such deviations have often been the source of gross errors because of failing to reengage the auto-pilot with the navigation system. It should also be noted that selection of the 'turbulence' mode of the auto-pilot on some aircraft may have the effect of disengaging it from the aircraft navigation system. After use of the turbulence mode, extra care should be taken to ensure that the desired track is recaptured by the steering navigation system.

10.5.15.6 Encountering Turbulence

Meteorological conditions can cause turbulence that may be detrimental to accurate height-keeping, particularly in RVSM Airspace. If an aircraft reports greater than moderate turbulence and is within 5 minutes of another aircraft at 300 m (1,000ft) vertical spacing, ATC will endeavour to establish 600 m (2,000ft) separation by climbing / descending either aircraft.

Any OAC might request an increase in separation minima due to adverse weather conditions. This could lead to the temporary suspension of RVSM in selected areas.

When encountering greater than moderate turbulence, which affects the aircraft's ability to maintain CFL, the crew should take the following action:

a) Watch for possible conflicting traffic and make maximum use of exterior lights;
b) Broadcast call sign, position, flight level, nature and severity of turbulence and intentions, on frequency 121.5 MHz (with 123.45 MHz used as a back-up frequency);
c) Notify ATC as soon as possible and request a flight level or / and a Mach number change as necessary; and
d) If the aircraft cannot maintain the assigned flight level, execute established contingency procedures to leave assigned track or route.

ATC should take the following action:

a) If possible, establish increased vertical, longitudinal or lateral separation;
b) accommodate the request for a change in altitude, if possible; or
c) if neither of the above actions is possible, notify other aircraft in the vicinity and monitor the situation; and
d) consider suspending RVSM operations in the affected area.

10.5.16 PROCEDURES IN THE EVENT OF NAVIGATION SYSTEM DEGRADATION OR FAILURE

10.5.16.1 General

The navigation systems fitted to NAT HLA approved aircraft are generally very accurate and very reliable and GNEs in NAT HLA are rare. Nevertheless, the risks that such errors pose can be significant and crews must employ rigorous procedures to ensure early detection of any possible errors and hence mitigation of the ensuing risk. The NAT CMA thoroughly investigates the circumstances of all reported GNEs in the NAT HLA.

For unrestricted operation in the NAT HLA an approved aircraft must be equipped with a minimum of **two fully serviceable** LRNSs. NAT HLA approved aircraft 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 specified routes established for this purpose. Aircraft may be approved for NAT HLA operations with only a single LRNS. However, such aircraft are only permitted to plan and fly on these same specified routes and on certain other routes serving individual traffic axes e.g. the Tango Routes, Routes between the Iberian Peninsula and the Azores/Madeira and Routes between Iceland and Greenland.

If after take-off, abnormal navigation indications relating to INS or IRS systems occur, they should be analysed to discover their cause. Unless the flight can proceed safely using alternative approved navigation sources only, the crew should consider landing at the nearest appropriate airfield 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.

For Aircraft specific Long Range Navigation Equipment see relevant Part B.

10.5.16.2 Detection of Failures

Normally, navigation installations include comparator and / or warning devices, but it is still necessary for the crew to make frequent comparison checks. When an aircraft is fitted with three or more independent systems, the identification of a defective system should be straightforward.

10.5.16.3 Methods of Determining which System is Faulty

With only two systems on board, identifying the defective unit can be difficult. If such a situation does arise in oceanic airspace any or all the following actions should be considered:

a) Checking displayed warnings and malfunction codes.

b) Obtaining a fix. It may be possible to use the following:
   1) Using the weather radar (range marks and relative bearing lines) to determine the position relative to an identifiable landmark such as an island; or
   2) Using the ADF to obtain bearings from a suitable NDB, in which case magnetic variation at the position of the aircraft should be used to convert the RMI bearings to true; or
   3) If within range, a VOR, in which case the magnetic variation at the VOR location should be used to convert the radial to a true bearing (except when flying in the Canadian Northern Domestic Airspace where VOR bearings may be oriented regarding true as opposed to magnetic north).

c) Contacting a nearby aircraft on VHF, and comparing information on spot wind, or ground speed and drift.

d) If such assistance is not available, and as a last resort, the flight plan wind speed and direction for the current DR position of the aircraft, can be compared with that from navigation system outputs.

10.5.16.4 Action if the Faulty System cannot be identified

Occasions may still arise when distance or cross track differences develop between systems, but the crew cannot determine which system is at fault. It has been determined that the procedure most likely to limit gross tracking errors under such circumstances is to fly the aircraft half way between the cross track differences as long as the uncertainty exists. In such instances, ATC should be advised that the flight is experiencing navigation difficulties so that appropriate separation can be effected if necessary.

10.5.16.5 Dead Reckoning

When no navigation sensor data is available for the FMS, the system begins navigating in the dead reckoning (DR) mode. In this mode, the FMS estimates its position based only on the last known position, heading and airspeed.

To identify this mode, FMS DR is annunciated on the MFD and on the PFD if the navigation source is FMS. It also shows on the CDU message line and MESSAGES page.

10.5.16.6 FMS / GPS Control Page

The pilot monitors the FMS aircraft position in relationship with GPS on the GPS control page. The position differential (POS DIFF) is shown in direction and magnitude from the FMS position. When enabled, the FMS uses GPS position information as a sensor. Select the appropriate line key to disable GPS input in the FMS, if required. When disabled, the GPS receiver cannot supply position information to the FMS.

10.5.16.7 Predicted RAIM

If GPS is going to be used for navigation, the satellite RAIM can be checked for constellation accuracy. RAIM ensures the GPS solution *(satellite computation)* meets the required accuracy.

The accuracy levels are as follows:

- 4 nm for oceanic/remote
- 2 nm for en-route
- 1 nm for terminal
- 0.3 nm for final approach

Predicted approach RAIM for destination is displayed on the CDU along with arrival time. The pilot can enter the ETA in the FMS and the predicted APPR RAIM is calculated. If not available, UNAVAIL is displayed on the CDU.

10.5.16.8 Required Navigation Performance

Required navigation performance (RNP) is a statement of the navigation performance accuracy necessary for operation within a defined airspace. The pilot enters the RNP value on the FMS PROGRESS page.

The FMS computes its expected position accuracy based on the sensors in use. The expected position accuracy (POS ACCURACY) is also displayed on the PROGRESS page.

When flying in RNP airspace, the FMS position error should be less than the RNP value 95% of the time. If the expected position accuracy error is more than the RNP value, a message LOW POS ACCURACY is displayed on the CDU. Navigation by other means must be utilised.

10.5.16.9 Satellite Deselect

Up to eight individual satellites that are scheduled to be out of service may be deselected. The FMS ignores data from these satellites and does not include them in the predicted RAIM computations.

10.5.16.10 Inertial System Failures

INSs have proved to be highly accurate and very reliable in service. Manufacturers claim a drift rate of less than 2 NM per hour; however, in practice IRSs with laser gyros are proving to be capable of maintaining accuracy to better than 1 NM per hour. This can lead to complacency, although failures do still occur. Close monitoring of divergence of output between individual systems is essential if errors are to be avoided and faulty units identified.

10.5.16.11 GPS Failures

If the GPS displays a “loss of navigation function alert”, the crew should immediately revert to other available means of navigation, including DR procedures if necessary, until GPS navigation is regained. The crew must report the degraded navigation capability to ATC.

10.5.16.12 Satellite Fault Detection Outage

If the GPS receiver displays an indication of a fault detection function outage (i.e. RAIM is not available), navigation integrity must be provided by comparing the GPS position with the position indicated by another LRNS sensor *(i.e. other than GPS)*, if the aircraft is so equipped. However, if the only sensor for the approved LRNS is GPS, then comparison should be made with a position computed by extrapolating the last verified position with airspeed, heading and estimated winds. If the positions do not agree within 10 nm, the crew should adopt navigation system failure procedures as described, until the exclusion function or navigation integrity is regained, and should report degraded navigation capability to ATC.

10.5.16.13 Fault Detection Alert

If the GPS receiver displays a fault detection alert *(i.e. a failed satellite)*, the crew may choose to continue to operate using the GPS-generated position if the current estimate of position uncertainty displayed on the GPS from the FDE algorithm is actively monitored. If this exceeds 10 nm, the crew should immediately begin using the following navigation system failure procedures, until the exclusion function or navigation integrity is regained, and should report degraded navigation capability to ATC.

Partial or Complete Loss of Navigation / FMS Capability by Aircraft Having State Approval for Unrestricted Operations in MNPS Airspace

Some aircraft carry triplex equipment (3 LRNSs) and hence if one system fails, even before take-off, the two basic requirements for NAT HLA operations may still be met and the flight can proceed normally. The following guidance is offered for aircraft equipped with only two operational LRNSs.

10.5.17 LOSS OF NAVIGATION CAPABILITY

10.5.17.1 Partial, or Complete Loss of, Navigation Capability by Aircraft having State Approval for Unrestricted Operations in Oceanic / Remote Airspace

The loss of one LRNS from three presents no problems regarding NAT HLA or RNP-10 Approval. The following guidance is offered to those aircraft with only two operational LRNSs remaining:

a) One out of two Systems fails **before take-off.** The Commander should consider:
   1) Delaying departure if timely repair is possible; or
   2) Planning on the special routes which are recommended for use by aircraft suffering partial loss of navigation capability, subject to the following conditions:
      (i) Sufficient navigation capability remains to meet the Long-Range Navigation requirements and the aircraft is fitted with serviceable standard short-range navaids (VOR/DME, ADF);
      (ii) a revised flight plan is filed with the appropriate ATS unit;

(iii) an appropriate ATC clearance is obtained; or

3) Obtaining a clearance above or below Special Rules Airspace.

b) One out of two systems fails **before the Oceanic / Remote Boundary is reached.** The Commander must consider:

1) Landing at a suitable aerodrome before the boundary or returning to the aerodrome of departure; or
2) diverting by the special routes indicated in the above paragraph (a), subject to the same conditions; or
3) obtaining a re-clearance above or below Special Rules Airspace.

c) One out of two systems fails **after the Oceanic / Remote Boundary is crossed.**

Once the aircraft has entered Special Rules Airspace, the Commander should normally continue to operate the aircraft in accordance with the clearance already received, appreciating that the reliability of his total navigation system has been significantly reduced. He should, however:

1) Assess the prevailing circumstances *(e.g., remaining portion of the flight in Special Rules Airspace, etc.)*, and
2) prepare a proposal to ATC with respect to the prevailing circumstances (*e.g., request clearance above or below Special Rules Airspace, turn back, obtain clearance to the special routes, etc.),* and
3) advise and consult with ATC as to the most suitable action, and
4) obtain appropriate clearance prior to any deviation from original clearance.

When the flight continues in accordance with its original clearance *(especially if the distance ahead within Special Rules Airspace is considerable),* the Commander should begin a special monitoring programme:

1) To take special care in the operation of his remaining system, taking account of the fact that his routine method of error checking is no longer available;
2) to check the main and standby compass systems against the information which is available;
3) To check the performance record of the remaining equipment and if doubt arises regarding the performance and/or reliability he should consider:
   (i) Attempting visual sighting of other aircraft, or their contrails, which may provide a track indication;
   (ii) calling the appropriate OAC to obtain information on aircraft adjacent to his estimated position and/or calling on VHF to establish contact with such aircraft *(preferably same track/level)* obtaining from them information which could be useful *(drift, heading, wind details).*

d) **All systems fail after entering** Oceanic / Remote Airspace. (*Or the 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).* The Commander should:

1) Notify ATC, requesting a revised clearance;
2) Make best use of procedures specified above, relating to attempting visual sightings and establishing contact on VHF with adjacent aircraft for useful information;

3) Keep a special lookout for possible conflicting aircraft, and make maximum possible use of exterior lights;

4) If no Instructions are received from ATC within a reasonable period, consider:
   (i) Climbing or descending 500 feet if below FL 410;
   (ii) climbing or descending 1000 feet if above FL 410;
   (iii) climbing 1000 feet or descending 500 feet if at FL 410; and
   (iv) advising ATC as soon as possible.

10.5.18 WEATHER DEVIATIONS

If the aircraft is required to deviate from track to avoid weather *(e.g. thunderstorms)*, the pilot should request a revised clearance from ATC and obtain essential traffic information, if possible prior to deviating. However, if such prior ATC clearance cannot be obtained, the procedures described below should be adopted and in the meantime efforts should be continued to obtain an appropriate ATC clearance.

a) If possible, deviate away from the organised track or route system;

b) establish communications with and alert nearby aircraft broadcasting, at suitable intervals: aircraft identification, flight level, aircraft position *(including ATS route designator or the track code)* and intentions, on the frequency in use and on frequency 121.5 MHz *(or, as a back-up, on the VHF inter-pilot air-to-air frequency 123.45 MHz);*

c) watch for conflicting traffic both visually and be reference to ACAS/TCAS (if equipped);

d) turn on all aircraft exterior lights.

e) For deviations of less than 10 NM, aircraft should remain at the level assigned by ATC.

f) For deviations of greater than 10 NM, when the aircraft is approximately 10 NM from track, initiate a level change of 300ft.
   1) If flying generally Eastbound (*i.e. a magnetic track of 000° to 179°)* and deviating left (i.e. north) of track then **descend** 300ft; if, however, deviating right (i.e. south) of track then **climb** 300ft.
   2) If flying generally Westbound *(i.e. a magnetic track of 180° to 359°)* and deviating left (i.e. south) of track then climb 300ft; if, however, deviating right (i.e. north) of track then descend 300ft.

Route Centre Line Track	Deviations > 10nm	Level Change
EAST (000° - 179° magnetic)	LEFT	DESCEND 300ft
	RIGHT	CLIMB 300ft
WEST (180° - 359° magnetic)	LEFT	CLIMB 300ft
	RIGHT	DESCEND 300ft

g) When returning to track, regain the last assigned flight level, when the aircraft is within approximately 10 NM of centre line.

h) Inform ATC when weather deviation is no longer required and the aircraft has been returned to centre line or previously adopted SLOP offset.

10.5.19 WAKE TURBULENCE

The Strategic Lateral Offset Procedures are now a standard operating procedures throughout the NAT Region. Thus, when flying within NAT MNPS Airspace, if the aircraft encounters wake turbulence and the pilot considers it necessary to offset from the current tack then the pilot may only elect to fly another of the three options allowable in SLOP *(i.e. Cleared Track centre-line, or 1 NM or 2 NM right of centre-line).*

If neither of the remaining SLOP offset tracks are upwind of the other aircraft which is causing the wake turbulence, then the pilot should co-ordinate with the other aircraft via the inter-pilot frequency 123.45 MHz, and perhaps request that the other aircraft adopt an alternative (SLOP) allowable downwind offset. If wake turbulence is encountered, even if it is subsequently avoided by judicious use of offsets, a report should still be made.

If turbulence is encountered but the pilot is unsure whether the cause is wake vortex or perhaps Clear Air Turbulence, a report should be submitted annotated to this effect.

10.5.20 FUEL RESERVES INBOUND TO UK

The information concerning arrival delays that is passed to the crew by the controller is the best available at the time and takes account of the expected volume of traffic at the aeroplane's expected arrival time. If that information indicates an easy flow of traffic, such that Estimated Approach Times (EAT) are not being passed for the arrival airfield, the response to a request regarding delay will be **'No Delay Expected'**.

Under these circumstances this means 'Do not anticipate being required to remain in a holding pattern longer than 20 minutes before commencing an approach'.

When a delay greater than 20 minutes is expected, the controller will pass an EAT. Traffic situations can change very quickly and 'No Delay Expected' can often mean exactly that. However, crews should expect that on occasions some holding will be required before they are fitted into the final approach pattern and it is therefore important that crews take a realistic view of the amount of fuel required to satisfy the minimum fuel overhead destination requirements. Crews should plan to arrive overhead a destination aerodrome with at least sufficient fuel to:

a) Make an approach to land; and
b) carry out a missed approach; and
c) fly to an alternate aerodrome; and
d) carry out a subsequent approach and landing, and
e) hold for 30 minutes at 1500 feet AAL in ISA at estimated landing mass.

Pilots must be aware that a call such as 'Fuel Emergency' has no status in the UK, and ATC cannot give priority to an aircraft with a shortage of fuel unless an emergency is declared. A radio call prefixed by MAYDAY[3] or PAN.PAN[3] will ensure priority handling but the aeroplane's actual fuel state should reflect the seriousness of the emergency call. A commander should only make such a call when he believes the aircraft to be in danger, not simply because the fuel state has fallen below the amount needed to comply with the above formula.

10.5.21 AMVER

The Coast Guard in New York maintains a computer system called AMVER, *(Automated Mutual-Assistance Vessel \ Rescue System).* Every merchant on the North Atlantic files a sail plan with the computer in New York giving intended route, speed, etc., making it possible to estimate the position of a ship at any given time.

When the ditching of an aircraft is a possibility, the Commander should call the oceanic radio on HF, giving his position, and request AMVER information. The position of every merchant vessel within 100 miles of the aircraft's reported position will be available in a short time.

10.5.22 NAT HLA CHECKLIST

To assist those pilots who are less familiar with operating in NAT HLA airspace, following is a list of questions which address the unique and / or particularly important NAT HLA check list elements.

FLIGHT PLANNING

- Plotting Chart – plot route from coast out to coast in
- Equal Time Points (ETP) – plot
- Track message *(current copy available for all crossings)*
  1) Note nearest tracks on plotting chart
- Review possible navigation aids for accuracy check prior to coast out.

PREFLIGHT

- Master Clock for all ETAs / ATAs
- Maintenance Log – check for any navigation / communication / surveillance or RVSM issues.
- RVSM
  1) Altimeter checks (tolerance)
  2) Wind shear or turbulence forecast
- Computer Flight Plan (CFP) Vs. ICAO Flight Plan (*check routing, fuel load, times, groundspeeds)*
- Dual Long Range NAV System (LRNS) for remote oceanic operations.
- HF check *(including SELCAL)*
- Confirm Present Position coordinates (best source)
- Master CFP (symbols: O, / or X)
- LRNS programming
  1) Check currency and software version
  2) Independent verification
  3) Check expanded coordinates of waypoints
  4) Track and distance check (± 2° and ± 2 NM)
  5) Upload winds, if applicable
- Groundspeed check

TAXI AND PRIOR TO TAKE-OFF

- Groundspeed check
- Present Position check

CLIMB OUT
- Transition altitude – set altimeters to 29.92 in (1013.2 HPa)
- Manually compute ETAs above FL180

PRIOR TO OCEANIC ENTRY
- Gross error accuracy check – record results
- HF check, if not done during pre-flight
- Log on to CPDLC or ADS - 15 to 45 minutes' prior, if equipped
- Obtain oceanic clearance from appropriate clearance delivery
  1) Confirm and maintain correct Flight Level at oceanic boundary.
  2) Confirm Flight Level, Mach and Route for crossing
  3) Advise ATC When Able Higher (WAH)
  4) Ensure aircraft performance capabilities for maintaining assigned
  5) altitude / assigned Mach
- Re-clearance – update LRNS, CFP and plotting chart
  1) Check track and distance for new route
- Altimeter checks – record readings
- Compass heading check – record

AFTER OCEANIC ENTRY
- Squawk 2000 – 30 minutes after entry, if applicable
- Maintain assigned Mach, if applicable
- VHF radios – set to inter-plane and guard frequency
- Strategic Lateral Offset Procedure (SLOP)
- Hourly altimeter checks

APPROACHING WAYPOINTS
- Confirm next latitude/longitude

OVERHEAD WAYPOINTS
- Confirm aircraft transitions to next waypoint
  1) Check track and distance against Master CFP
- Confirm time to next waypoint

  Note: 3-minute or more change requires ATC notification
- Position report – fuel

10 MINUTE PLOT (APPR. 2° OF LONGITUDE AFTER WAYPOINT)
- Record time and latitude/longitude on plotting chart - non steering LRNS

MIDPOINT
- Midway between waypoints compare winds from CFP, LRNS and upper HPa wind charts
- Confirm time to next waypoint

COAST IN
- Compare ground based NAVAID to LRNS
- Remove Strategic Lateral Offset
- Confirm routing after oceanic exit

DESCENT
- Transition level – set altimeters to QNH

DESTINATION / BLOCK IN
- Navigation Accuracy Check
- RVSM write-ups

OTHER ISSUES
1) Contingencies
    a) Published Weather Deviation Procedure
    b) **15 NM offset** (*formerly 30NM in the NAT, 25 NM in the Pacific)*
    c) Lost Comm / NAV procedures
2) ETOPS
3) Weather – Destination/Alternate(s) Airport(s)
4) Data Link Contingency Procedures
5) Dead Reckoning (DR)
6) GPS – RAIM / FDE Requirements

10.5.23 VHF RADIO COVERAGE IN THE NAT REGION AT FL300

10.6 POLAR NAVIGATION – *(High Latitude Navigation)*

10.6.1 LIMITATIONS

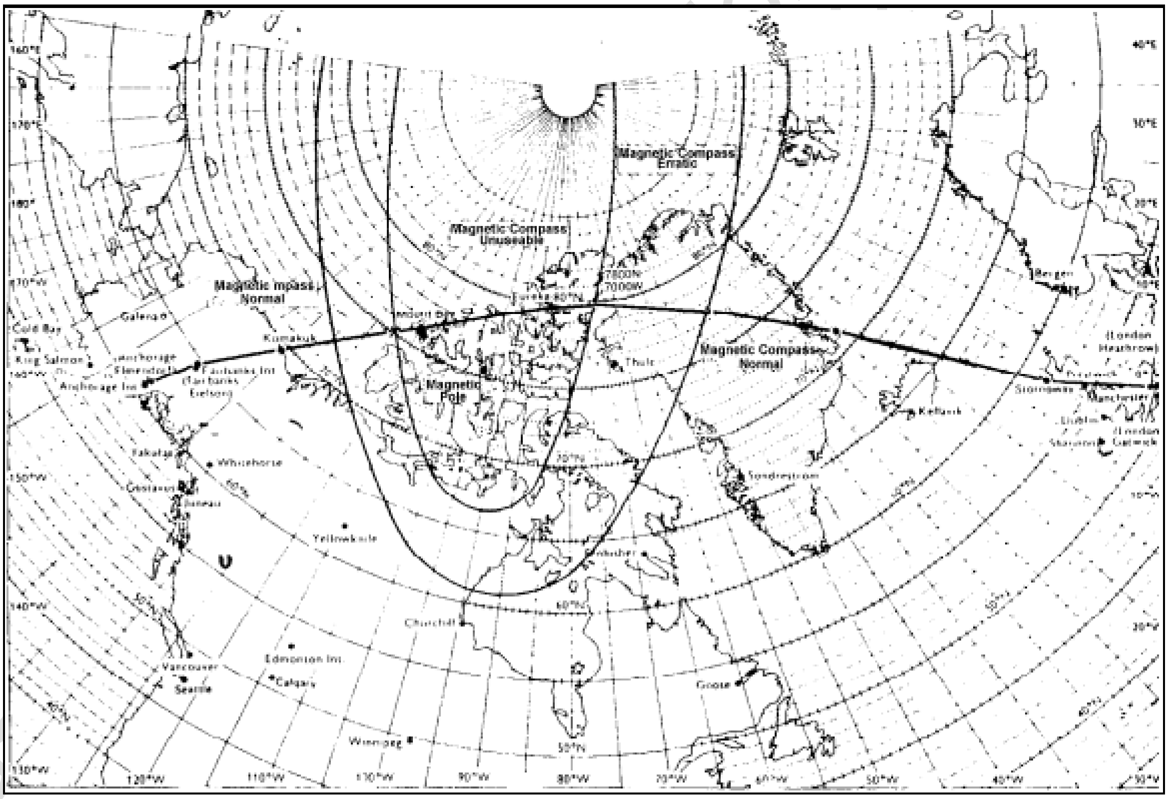
Most inertial systems fitted to the Company aircraft can be aligned up to 78° latitude. The aircraft certification will depend on the software fitted, and the AOC Regions approved.

10.6.2 CANADIAN MNPS AIRSPACE

It should be remembered that above 70° North published tracks are aligned to True North and that VORs are orientated to True North.

10.6.3 AREA OF COMPASS UNRELIABILITY

This is an area around both magnetic poles within which lies an outer area where the magnetic compass is erratic and an inner area where the magnetic compass is useless. This is due to the ever weakening horizontal component of the earth's magnetic field the nearer the magnetic pole the aircraft becomes. The diagram below illustrates the North Pole situation; a similar situation exists at the South Pole.



10.6.4 PRESSURE ALTIMETER ERRORS - COLD WEATHER APPROACH AND LANDING AT CANADIAN AIRPORTS

Pressure altimeters are calibrated to indicate true altitude under ISA (International Standard Atmosphere) conditions. Any deviation from ISA will result in an erroneous reading on the altimeter. In the case when the temperature is higher than ISA, the true altitude will be higher than the figure indicated by the altimeter and the true altitude will be lower when the

temperature is lower than ISA. The altimeter error may be significant and becomes extremely important when considering obstacle clearances in very cold temperatures.
In conditions of extreme cold weather, pilots must add the values derived from the altitude correction chart to the published procedures altitudes, including quadrantal altitudes and DME arcs, to ensure adequate obstacle clearance. Unless otherwise specified, the destination aerodrome elevation is used as the elevation of the altimeter source.

With respect to altitude corrections, the following procedures apply:

a) IFR assigned altitudes may be either accepted or refused. Refusal in this case is based upon the pilot's assessment of temperature effect on obstruction clearance.

b) IFR assigned altitudes accepted by a pilot shall not be adjusted to compensate for cold temperatures, i.e., if a pilot accepts "maintain 3000'", an altitude correction shall not be applied to 3000'.

c) Radar vectoring altitudes assigned by ATC are temperature compensated and require no corrective action by pilots.

d) When altitude corrections are applied to published final approach fix crossing altitude, procedure turn or missed approach altitude, pilots shall advise ATC how much of a correction is to be applied.

ALTITUDE CORRECTION CHART

A/D Temp	HEIGHT ABOVE THE ELEVATION OF THE ALTIMETER SOURCE (FEET)													
	200	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**	**1500**	**2000**	**3000**	**4000**	**5000**
0°C	0	20	20	20	20	40	40	40	40	60	80	140	180	220
-10°C	20	20	40	40	40	60	80	80	80	120	160	260	340	420
-20°C	20	40	40	60	80	80	100	120	120	180	240	380	500	620
-30°C	40	40	60	80	100	120	140	140	160	240	320	500	660	820
-40°C	40	60	80	100	120	1140	160	180	200	300	400	620	820	1020
-50°C	40	80	100	120	140	180	200	220	240	360	480	740	980	1220

NOTE: Values to be added to published altitudes.

EXAMPLE: **NDB Rwy 08 - Watson Lake, Yukon Territory Elev. 2262'**
AERODROME TEMP. -50°C

	Altitude	Indicated HAA	Correction	Altitude
Procedure Turn	4000’ ASL	1738’	+ 420’	4420’
FAF	3300’ ASL	1038’	+ 240’	3540’
MDA (straight in)	2840’ ASL	578’	+ 140’	2980’
MDA (circling) CAT A	2840’ ASL	578’	+ 140’	2980’

10.6.5 BASIC POLAR NAVIGATION

10.6.5.1 Introduction

Originally, a magnet was used to define North, albeit a sluggish North. Then came the gyro whose rigid properties were combined with the sensitive properties of the magnet to form the slaved compass. Nowadays, with inertial systems, True North is calculated from the angular rates measured by laser-ring gyros through an integration.

The problem arises when the gyros become free gyros and the magnetic compass is no longer reliable, i.e. the aircraft is within the compass unreliable / useless area. Free gyros remain rigid in space, and the following factors must be addressed before they can be used as a heading reference on the surface of the earth, which is a sphere or, to be concise, an oblate spheroid:

a) Real Wander, and
b) Apparent Wander, i.e.
   1) Earth Rate Wander
   2) Transport Wander

10.6.5.2 Compass Errors

a) Real Wander

   Caused by manufacturers error, but with Laser Ring gyros these are reduced to values such that they can virtually be ignored. The largest errors are caused by mirror imperfections.

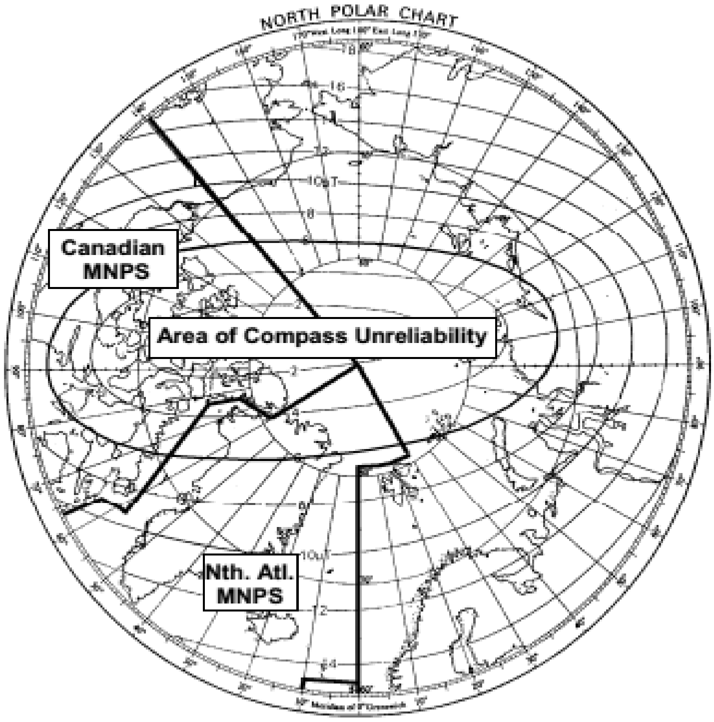
b) Apparent Wander

   Caused by:
   1) Rotation of the Earth (Earth Rate): The Earth revolves once in 24 hours, giving a minimum change of gyro direction near the equator and maximum at the pole. This rate is 15.04° sin Lat per hour but north of 70°N it can be considered as 15°/ hour and is corrected by offsetting the aircraft heading periodically.
   2) Transport Wander: When flying a Great Circle close to the Geographic Pole, the direction of True North changes appreciably due to the convergence of the meridians. This causes problems when heading is by reference to a free gyro transported across meridians. This can be overcome by using a grid projection, the grid being orientated so that Grid North is the same as True North on the Greenwich Meridian. Because Gyro / Grid techniques are not practiced, it is considered that the adoption of such techniques is likely to cause more problems than it is intended to solve so a simple contingency procedure must be established. If only the Earth were flat!

10.6.5.3 Situation

Whilst crossing the Areas of Compass Unreliability, which exist in both the Northern and Southern hemispheres, un-serviceability's of IRS because of power failure / surges or other mechanical failures will probably result in there being serviceable gyros but a loss of reference to True North. Provided there is not a catastrophic failure, i.e., all IRS totally fail simultaneously, then the problem can be minimised and the flight continued out of the Areas.

See following diagram:



10.6.5.4 Purpose

To enable the flight to continue where passengers can conveniently disembark and where maintenance is available as opposed to dumping passengers in Frobisher or Churchill on a winter's Saturday night, with possibly no maintenance or accommodation available. Westerly flights would normally continue to destination but Eastbound flights would probably return to departure point / Edmonton / Calgary, because of North Atlantic and Canadian NAT HLA restrictions.

10.6.5.5 Problem

a) There is a minimum requirement of one LRNS to operate in both Canadian MNPS and NAT HLA. In the North Atlantic HLA, flight is limited to the "Blue Spruce" route if only one LRNS is available.

b) If the final IRS fails, especially in the Compass Useless / Unreliable area which is within the Area of Magnetic Unreliability, where the magnetic standby compass cannot be used, then accepted contingency drills must be carried out to establish a heading reference.

10.6.5.6 Action to be Taken

a) Loss of One IRS
(These drills are predicated on the aircraft having only two inertial systems)

All functions of the failed IRS are automatically transferred to the remaining serviceable IRS; Air Data, IRU, GPS and DME are fed to both FMS.

The following actions are suggested:

1) Select ATT on the failed IRS selector; this now becomes a directional gyro;
2) Align heading of failed system to indicate same as serviceable system, which should be aligned to True North;
3) Realign direction gyro to IRS True heading every 10 minutes, and confirm its reliability.

b) Loss of Second IRS
In the worst case this could include loss of ADRIS in which case an immediate diversion to the nearest airfield is recommended.

However, if able:

1) Select ATT on both IRS selectors;
2) Align last failed heading to existing directional gyro using POS / INIT page;
3) Make Emergency call to ATC and request diversion to nearest suitable airport, considering maintenance and accommodation availability;
4) Obtain Military Radar Assistance if available;
5) Use GPS to monitor position. This will confirm where you have been – not where you are going;
6) outside Compass Unreliable / Useless Area, compare gyro headings with magnetic heading. If magnetic heading appears correct (a guide is gyro ± variation), then realign gyros to magnetic compass. Do not forget the existence of large values of variation;
7) Constantly monitor gyros against magnetic heading;
8) Be aware that many VORs are orientated on True North.

10.6.5.7 Conclusion

This is a simplified method of Gyro Steering designed to control the aircraft in lateral navigation until clear of the Compass Unreliable / Useless area, both in the Northern and the Southern Hemispheres.

10.7 IRS / COMPASS DEVIATION CHECK

10.7.1 During Cruise in Oceanic Airspace

Perform an IRS /COMPASS check during cruise flight prior to, or as soon as possible after entering oceanic airspace. The purpose is to obtain deviation values for the magnetic compass systems and to determine the relative accuracy of IRS heading outputs if needed later in the flight.

a) Simultaneously read and record both IRS true headings and both magnetic compass indications. To the mean of the IRS readings, apply the local variation value to obtain the magnetic heading.

b) Compare this value with the magnetic heading compass readings to obtain a deviation number *(deviation between IRS and compass only)* and retain for further use to determine if a system is faulty.

Only if a fault is found is it necessary to record these readings in the technical log.

When in doubt as to the accuracy of an IRS system, check the malfunction codes for any indications and if to no avail, perform the testing cycle (the reverse of above).

The following format will facilitate the accomplishment of the above checks:

DEVIATION RECORD TABLE

TIME	TRUE HEADING		VAR	MAGNETIC HEADING		DEV
	IRS 1				Comp 1	
	IRS 2				Comp 2	
	IRS 1				Comp 1	
	IRS 2				Comp 2	

Establishing Deviation Value.

Add West
} Dev or Var
Subtract East

Testing Accuracy of IRS.

Subtract West
} Dev or Var
Add East

10.8 EN-ROUTE ALTERNATES

10.8.1 In Flight Re-Planning

10.8.1.1 Purpose

If, at the flight planning stage, there is insufficient fuel to reach the desired destination whilst at the same time satisfying all the requirements of EASA OPS, but there is every likelihood that as the flight progresses the fuel remaining will indicate that there is sufficient fuel to reach the destination with the required reserve fuel, then the flight may be planned to that destination with reduced contingency fuel, using an en-route alternate (ERA).

10.8.1.2 Contingency Fuel

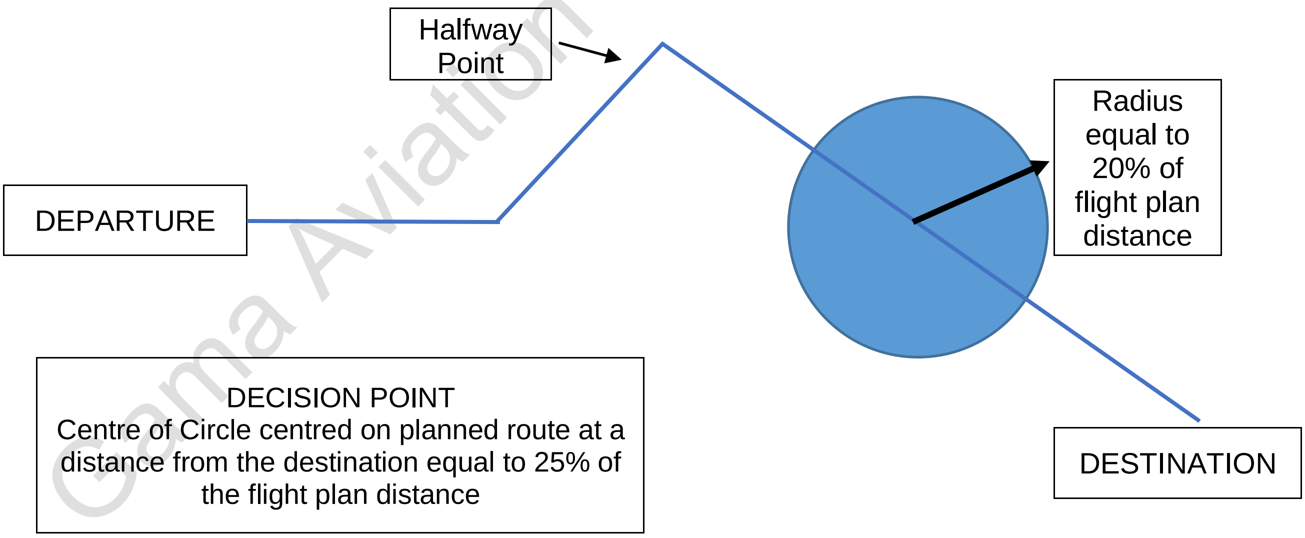
Contingency fuel in the event of in-flight re-planning is 3% of the trip fuel for the remainder of the flight from an en-route alternate decision point provided an ERA is available.

10.8.1.3 Location of En-Route Alternate

The en-route alternate should be located within a circle having a radius equal to 20% of the total flight plan distance, the centre of which lies on the planed route at a distance from the destination of 25% of the total flight plan distance, all distances calculated in still air conditions

10.8.1.4 Decision Point

The Decision Point is that position on the planned route which is the centre of the circle, described in para. 3 above, that contains the en-route alternate.



If the fuel at the Decision Point is equal to:

- Route fuel to Destination + 3% Contingency + Alternate + Final Reserve Fuel

Then: Continue to planned destination, otherwise divert to en-route alternate

10.8.1.5 Air Traffic Flight Plan

Item 18 of the flight plan should be annotated: RALT / (ICAO DESIGNATOR of ERA).

10.8.2 POINT OF NO RETURN (PNR)

The PNR is better considered as the Point of Safe Return (PSR); that is, the last point along track at which it is possible to return to the point of origin with normal reserve fuel. Whilst there is no company requirement to calculate PSR, it is useful to be able to determine it should circumstances dictate.

The PSR can be calculated using the following formula:

$$\text{Time to PSR (hours)} = \frac{EH}{O + H}$$

Where	E	=	Safe Endurance in hours (to decimal point), using total fuel remaining minus reserves.
	O	=	All engines groundspeed out, using a wind factored TAS.
	H	=	All engines groundspeed home, using a wind factored TAS.

10.8.3 EQUAL TIME POINTS

There is a requirement to calculate critical points when a Company aircraft is expected to be more than 60 minutes flying time in still air at the all engines normal operating economical cruise speed from a suitable alternate airfield.

An alternate airfield, as required above, shall be open and capable of accepting any Company aircraft and the weather shall be better than the minima required for the aids available, during the period it is designated a critical point alternate.

It is rare that airfields used in the calculation of critical points are on track, so the use of the critical point formula becomes academic. The most practical method of calculating critical points is to use the graphical method.

In the following cases, the all engine cruising speed has been used. Any other airspeed can be used by calculating the time from the still air critical point to the alternate and using this time to determine the length of the wind speed vector. For practical terms, since the difference between the all engine and one engine inoperative cruising speed is not a lot in terms of overall speed, the ultimate correction to the wind corrected critical point will be very small.

The error incurred by not correcting for this TAS difference is within the accuracy limits of a system using a constant wind velocity.

The charts used are for demonstration purposes only and must not be considered an authority on ATC boundaries and reporting points. In all cases, it is assumed that the North Atlantic Track crosses every 10° longitude at 51°N.

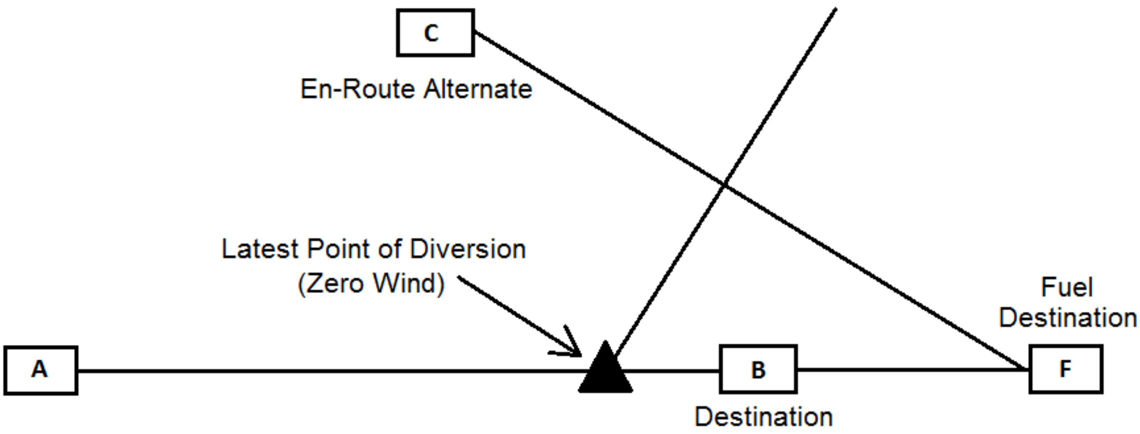
10.8.3.1 Latest Point of Diversion (Remote Airfield)

This is an extension of the Critical Point solution:

Extend the track from A beyond the destination (B) for a distance that could be flown using the fuel remaining overhead the destination less fuel for the 30 minutes' standard holding, plus approach and landing. Call this point the Fuel Destination (F).

Draw a line from the Fuel Destination to the en-route alternate airfield (C) related to the Latest Point of Diversion.
Construct a wind corrected Critical Point as described in Case 1 below, between the Fuel Destination and the selected en-route alternate. This is the Latest Point of Diversion at which the aircraft can either:

a) Arrive overhead the destination with the prescribed fuel minimum, or:
b) Divert to the selected en-route alternate, to arrive overhead at 1,500ft with fuel for 30 minutes holding, plus an approach and landing.



10.8.3.2 Critical Points

Case 1

a) Nominate suitable alternates, e.g. Glasgow and Reykjavik and draw a line joining them. (1)

b) Draw in the right-angle bisector (2)

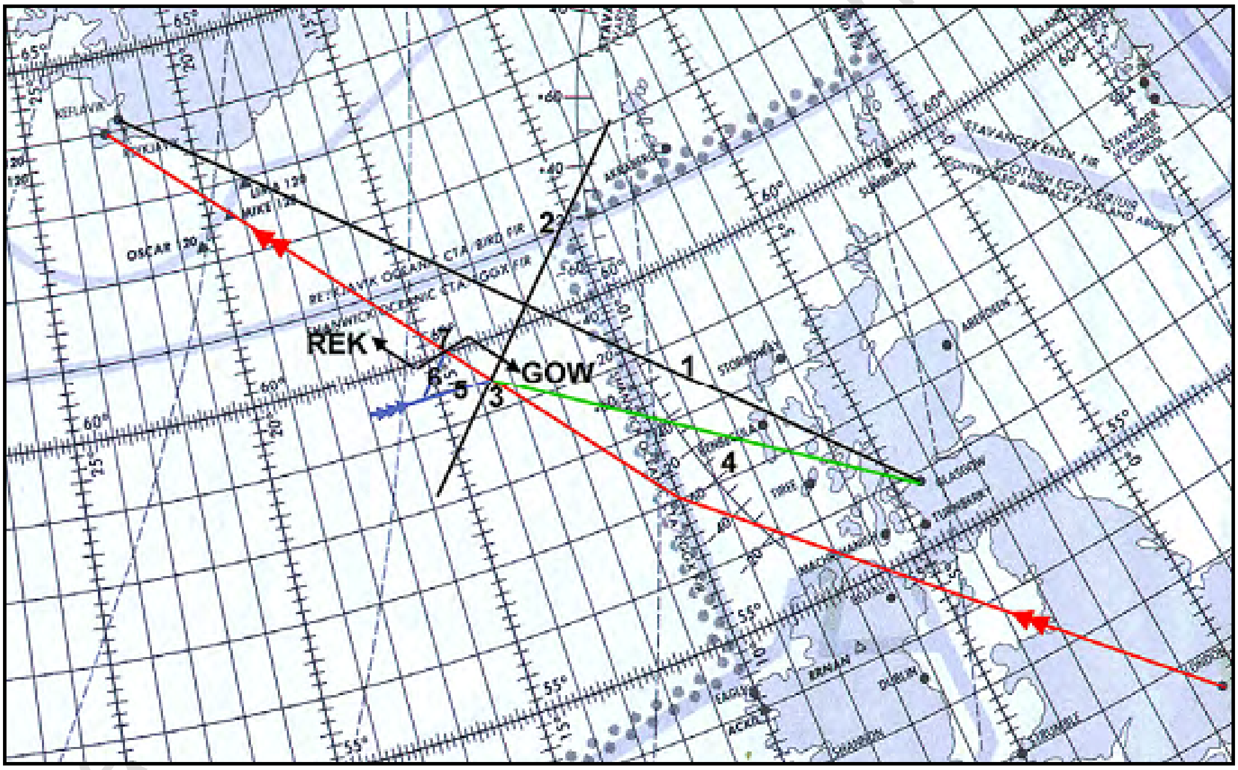
c) Where the bisector intercepts desired track is the still air critical point. (3)

d) Measure the distance from the still air critical point to the alternate (either one) and calculate the time using normal TAS, e.g. 450nm at 450 kts is 1 hr 00 mins. (4)

e) Assume a wind velocity at the critical point of 270°/60 kts. The wind speed vector for 1hr is 60nm. Draw in this vector down-wind from the still air critical point. (5)

f) Draw a line from the end of the wind vector parallel to the bisector to intercept the track. (6)

g) This point is the wind corrected critical point between Glasgow and Reykjavik on the route Stansted to Keflavik. (7)



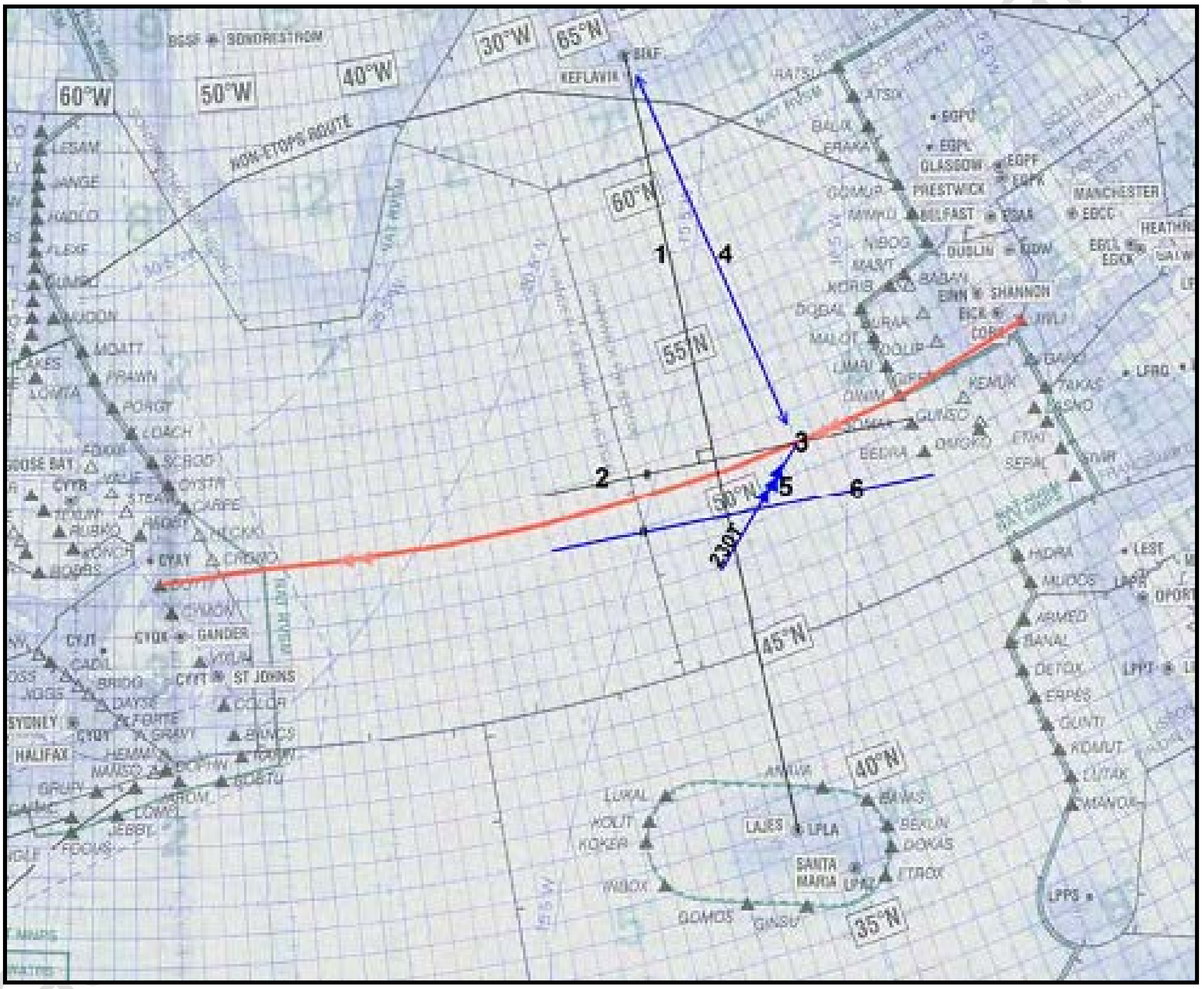
Case 2

a) Assume suitable alternates are Lajes and Keflavik.

b) Carry out steps 1 to 3 as in Case 1. It will be seen that for the majority of the flight *(after approx. 21°W)* Lajes will be closer than Keflavik.

c) Assume the wind component (230/100 kts) and TAS still 450 kts and carry out steps 4 to 7 in case 1, remembering that the distance from the still air critical point to the alternates is now 780nm and the still air time is 1 hr 44 min making the wind speed vector 174nm.

d) Having now applied the wind vector to the still air critical point and drawn the wind corrected 'Curve of Critical Points', it now becomes apparent that Lajes is never closer in time to the NAT Track than Keflavik - a reversal of the no wind situation.



Case 3

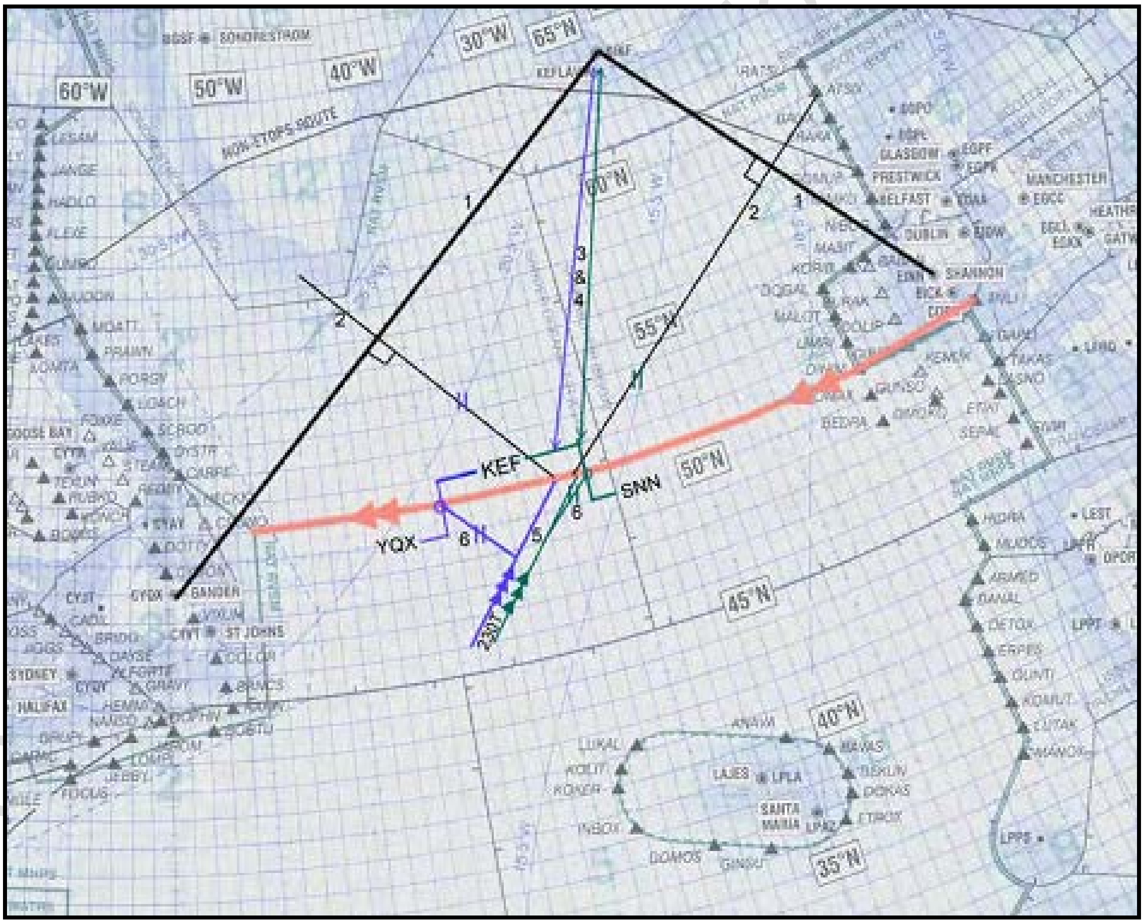
a) The most practical case is to use two alternates each end of track and one abeam track; assume Shannon, Keflavik and Gander; and a steady wind of 230°(T)/100 kts, TAS 450 kts.

b) Complete the stages 1 to 7 in Case 1 for Keflavik and Shannon and then independently for Gander and Keflavik, not forgetting that the still air distances and times will be as follows:

	KEF – SNN	YQX – KEF
Still Air Distance	810	860
Time	1 hr 48	1 hr 55
Wind Vector	180	192

c) Note that the wind vector results in little change to the still air critical point between SNN and KEF *(virtually equal tail wind component to either airfield)*, whereas it makes considerable difference to the YQX / KEF case.

d) By Inspection, the route can be broken up into 3 sectors within which different alternate airfields are closest.



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11.0 Aerodrome / Operating Site Categorisation for Flight Crew Competence Qualification

11.1 PILOT QUALIFICATION REQUIREMENTS

11.1.1 INTRODUCTION

Aerodromes are categorised 'A','B' or 'C'.

Categories 'A' are unrestricted. Category 'B' and 'C' are restricted. 'B' aerodromes normally require the reading of an aerodrome briefing and 'C' aerodromes normally require a supervised visit.

11.1.2 SUMMARY OF REQUIREMENTS

NOTE: EASA Part Ops only requires the commander to fulfil the various qualification requirements regarding operations into restricted aerodromes. It is Gama's policy to require the co-pilot in addition to fulfil certain requirements for particular aerodromes.

- All pilots are required to brief for Category 'B' aerodromes and are reminded that a re-brief is necessary if 12 months have elapsed since their last visit.
- Only Captains are required to fulfil the route and area competency and familiarisation requirements.
- Only Captains are required to undertake an initial visit *(or approved simulator equivalent training)* for category 'C' aerodromes *(e.g. Salzburg)* They must also satisfy any local procedures as published by the particular aerodrome.
- Only Captains are required to meet the applicable Category 'C' Aerodrome Qualification requirements on initial qualification and on revalidation.

  Co-pilots should brief themselves for Category 'C' aerodromes using all available means but are not required to meet the qualification requirements of the captain. Every effort will be made however to include a co-pilot in a simulator training detail for a Category 'C' aerodrome.

11.1.3 AERODROME BRIEFING REQUIREMENTS

11.1.3.1 INTRODUCTION

A full list of restricted aerodromes can be found on the IPad documentation together with initial qualification and revalidation requirements.

11.1.3.2 AERODROME CATEGORISATION

11.1.3.2.1 Aerodromes are categorized in ascending order of difficulty

From Category A to category C as follows:-

a) **Category A**
An aerodrome which satisfies all of the following requirements:
1) An approved Instrument Approach Procedure (IAP);
2) At least one runway with no performance limited procedure for take off
3) and / or landing;
4) Published circling minima not higher than 1000 ft aal; and

5) Night operations capability.

b) **Category B**
An aerodrome which does not satisfy the Category A requirements or which requires extra considerations such as:
1) Non-standard approach aids and / or procedures; or
2) Unusual local weather conditions; or
3) Unusual characteristics or performance limitations; or
4) Any other considerations including obstructions, physical layout, lighting etc.

c) **Category C**
An aerodrome that requires additional considerations, to a Category B aerodrome.

11.1.3.2.2 Where an aerodrome is not listed in the Aerodromes Categorization list, the Chief Pilot or his nominated deputy must use all available means to establish which category the airfield would be categorized as. Due to the large number of aerodromes that are to be found in the Gama AOC area it is impractical to list and categorize each one.

When determining the suitability of an aerodrome for use as a destination or alternate reference should be made to the aerodrome categorization list. If the relevant aerodrome is not listed, the matter must be referred to the Chief Pilot, or in his absence, his deputy, in order that a categorization may be obtained.

On return to base a report should be filed on the visited aerodrome to help in the event of further visits.

11.1.3.2.3 When defining aerodromes for the type of aeroplanes and operations concerned, Gama will take into account the following:

a) An adequate aerodrome is an aerodrome which Gama considers to be satisfactory, taking into account the performance requirements and the runway characteristics;

b) Gama will also take into account the availability of ancillary services such as ATS, aerodrome lighting, communications, weather reporting, navaids and emergency services.

11.1.3.2.4 When operations at an aerodrome are intended to be carried out under Visual Flight Rules, minimum operating visibilities and cloud ceilings will be clearly stated on the flight brief. Any special procedures or particular hazards such as parachuting will also be included on the brief.

11.1.3.2.5 For operations under Instrument Flight Rules, an approved instrument approach procedure must be available for each destination and alternate aerodrome, with current copies of the relevant plates available on the aircraft. The flight crew will be provided with aerodrome operating minima either in the Jeppesen Flight Guide on the aircraft or on the flight brief.

11.1.4 CREW QUALIFICATION AND REVALIDATION

11.1.4.1 Qualification to operate to an aerodrome is achieved by following the procedures outlined in the following paragraphs. The period of validity of aerodrome qualification is 12 calendar months, in addition to the remainder of the month of qualification, or the month of latest operation to the aerodrome.

11.1.4.2 Revalidation is achieved by operating to or from the aerodrome as crew or observer within 12 months, or by complying with the revalidation requirements in the restricted aerodrome list.

11.1.4.3 If revalidation is completed within the final 3 months of validity, the period of validity shall extend until 12 calendar months from the expiry date of the previous qualification.

11.1.4.4 Operations to Category ‘A’ aerodromes are conducted following the information contained in routine flight documentation such as or Jeppesen flight guides, supplemented by NOTAM’s. Note the remarks in *Para 11.1.3.2.2* with respect to the categorisation or previously unvisited aerodromes.

11.1.4.5 Prior to operating to a Category ‘B’ aerodrome, the flight crew should be briefed or self-briefed on the aerodrome concerned. The briefing may take the form of verbal instruction by a pilot who has operated to the aerodrome in the previous twelve months, or a self-briefing from written notes.

11.1.4.6 Prior to operating to a Category ‘C’ aerodrome the commander should be briefed and visit the aerodrome, either as an observer or as part of a crew commanded by a training captain who is himself current for operations at the aerodrome in question. As an alternative, instruction in a simulator approved by the authority for that purpose may be given. The co-pilot should brief himself using all available means,

11.1.5 CAPTAINS QUALIFICATION REQUIREMENTS FOR CATEGORY ‘C’ AERODROMES

11.1.5.1 To obtain qualification for some restricted aerodromes; captains must carry out an initial visit *(or approved simulator equivalent training)* and a consolidation visit. These aerodromes are known as category ‘C’ aerodromes. Other special requirements may apply and they will be listed in the notes following the restricted aerodromes list.

11.1.5.2 Initial Visit

11.1.5.2.1 If operating as a commercial air transport flight, the initial qualification visit must always be made by the captain operating as a subordinate crew member. This can include operating as a captain under the supervision of a training captain, operating as a co-pilot *(provided that the ‘right hand seat’ checks are current)* or operating as an observer.

11.1.5.2.2 If operating purely as a training flight, the captain may operate as the commander on the initial visit.

11.1.5.2.3 The initial visit must include a landing and take-off at the aerodrome in question. Before undertaking the initial visit, captains must study the aerodrome brief and if available, the audio-visual presentation. The initial visit may be replaced by an approved simulator training session. The visual and motion system must be operating for this to be valid. After 'Initial Visit Qualification' the supervising captain should ensure the Category 'C' Aerodrome Qualification is recorded.

11.1.5.3 Consolidation Visit

11.1.5.3.1 Ideally the captain should re-visit the aerodrome within 6 months of the initial visit *(or approved simulator equivalent training).* He may operate as pilot-in-command or under the supervision or a training captain. The consolidation visit may consist of a landing or a take-off at the aerodrome in question. Operating as a co-pilot or observer will not suffice for this purpose. *(If this is the case, then the flight shall be treated as an initial visit, i.e. a further consolidation flight must take place within 6 months)*. After the consolidation visit, the captain should himself sign the Category 'C' Aerodrome Qualification Certificate.

11.1.5.3.2 Should a consolidation visit not take place within the above period, the captain must study the written briefing and audio-visual presentation, if available. He must also discuss the aerodrome and its associated procedures with a captain who is currently qualified for that aerodrome. All this must take place within the 2 weeks prior to the eventual consolidation visit.

11.1.5.3.3 The procedure outlined in *Para 11.1.5.3.2* above, may only be used if the consolidation visit takes place within 12 months of the initial visit *(or approved simulator equivalent training).* Should a captain fail to consolidate within a 12 month, period the initial visit *(or simulator equivalent)* must again be carried out, followed by a consolidation visit.

11.1.5.4 Previous Experience as a Co-Pilot

The initial visit and consolidation requirements described in *Para 11.1.5.2 and 11.1.5.3* do not apply to captains who have previous experience, as a co-pilot at the particular category 'C' aerodrome within the previous 5 years. These pilots may operate in command to the aerodrome in question if it is within 5 years of their last visit. They must, however, study the written briefing and audio-visual presentation, if available, prior to dispatch to the aerodrome in question.

11.1.5.5 Revalidation

11.1.5.5.1 Revalidation is achieved by either:

a) Operating to or from the aerodrome as a member of the flight crew or as an observer within 12 months (a 'visit'); or

b) If the last visit was within the last 5 years, complying with the revalidation requirements in the restricted aerodrome list.

11.1.5.5.2 A captain does not need to ensure each Category 'C' Aerodrome Qualification is recorded, but should do so at sensible intervals, particularly if he feels that it may be some time until the next visit. The qualification remains valid for 12 calendar months from the date of the last visit, including the remainder of the month in which the visit took place. If the aerodrome is visited within the final 3 months of validity, the certificate shall be valid until 12 months after the previous expiry date.

11.1.5.5.3 IF A CAPTAIN HAS NOT VISITED THE CATEGORY 'C' AERODROME WITHIN THE LAST 5 YEARS, THE <u>INITIAL</u> QUALIFICATION REQUIREMENTS MUST BE CARRIED OUT.

11.1.5.6 Qualification for use of a Category 'C' Aerodrome as an Alternate

11.1.5.6.1 It is not permitted to nominate a Category B or Category C aerodrome as an alternate for which the Captain is not qualified. In order to ensure that this is maintained Gama will not normally nominate a Category B or C aerodrome for use as an alternate.

11.1.5.6.2 In an emergency, any aerodrome may be used if the commander considers this to be the safest course of action, subject to the application of prudent judgment appropriate to the prevailing circumstances.

11.2 ROUTE AND AREA OF COMPETANCY

11.2.1 INTRODUCTION

Gama's AOC area is large and covers a number of areas that require special consideration from the crew on a particular flight.

Aircraft commanders are required to certify on the PDC that they have either flown within the applicable area within the 12 months preceding dispatch or that they have completed the on-line procedures course for the applicable region. All commanders are being set up on the Flyco portal to complete the courses applicable to their aircraft type. These courses will remain available for completion for 12 months.

(1) If the commander has flown into or through the region(s) of the intended flight within the 12 months immediately preceding departure, they will have met this requirement and, provided the individual is satisfied they are fully familiar with the applicable route and aerodromes, they may certify this by signing the declaration on the PDC (see below).

(2) If, within the 12 months preceding departure, the commander has NOT flown into or through all of the region(s) of the intended flight, as detailed at OMD 2.1.13, - or he/she is not satisfied their knowledge is satisfactory, they must log on to the Flyco portal and complete the applicable course(s) BEFORE DEPARTURE. Only once the commander is satisfied (by either means) that their knowledge is satisfactory should they certify the declaration on the PDC.

Responsibility for maintaining route and aerodrome knowledge lies with the aircraft commander. Commanders' briefing of familiarisation or recency in any given region will not be tracked by Crew Control. It is the responsibility of aircraft commanders to certify prior to dispatch that they are compliant by completing and signing the declaration on the PDC. To avoid delay when tasked into or through an area not frequently visited, it is recommended that all regions applicable to the aircraft on which the pilot is qualified as captain are maintained within currency at all times.

Not all commanders are required to be compliant in all regions of the World. For details of which area procedures are required to be current for each aircraft type, see Table 1 at OMD 2.1.13.

If pilots receive a reminder to complete one of the Flyco Regional Procedures courses when they have flown into or through the applicable region within the past 12 months, should they feel they do not need to complete the course, they should contact Crew Control to request the course be deferred.

11.2.1.1 Operational Areas

Gama has divided the AOC area into regions of operation. Each region has been chosen bearing in mind the particular difficulties of that area.

The AOC area will be divided as follows:

Europe:	This is the base area and it is assumed that normal training and regular flying will adequately prepare crews for operation in this region;
Africa:	This region has in particular, communication problems and the adoption of the IATA in-flight broadcast procedures must be adopted to ensure safe operation. The region covers a large area and includes some areas with high MSA's. This area only relates to those parts of Africa away from the Mediterranean coastal zone.
Middle East:	This area involves operations over long distances, travelling over some very hostile environment. Local procedures can differ from that normally expected. The Haj Pilgrimage can impose particular restraints on operations over large parts of the region.
Far East:	The Far East can best be described as a land of contrast. ATC ranges from very good to very poor. Ground facilities also range from good to poor. MSA's range from low in costal zones, to very high in the interior of some countries. Language can be a big problem.
North America:	This area has a high transition level of 18,000ft, flights below this level will be conducted with QNH set. The RT terminology is different. The US uses ft for RVR and met visibility. There are high MSA's particularly on the Western Seaboard of both Canada and the USA.
Canada States:	The weather can be extreme, with cold weather over Northern in winter, and very hot conditions experienced in the US Southern in the summer. Caution should be exercised as some flight procedures are different to those commonly used by Gama pilots.
South America:	The South American continent is vast, for example Brazil is bigger than Australia. The facilities at major aerodromes are quite good however en route ATC can leave much to be desired. Language is a problem when operating in South America. Safety Altitudes can be very high and extreme caution should be observed particularly around MSA's Oxygen escape routes may need to be considered on some routes flown. The Andes are some 4,300 nm long and between 120nm and 430 nm wide. The widest area is between 18° and 20° South. The mountains reach to 13,000ft high.
Russia / Belarus:	Russia and Belarus' operations require particular training with respect to airfield operation, and general communications procedures.
North America:	This area requires particular training and qualification. The area is also deemed NAT HLA area requiring minimum levels of equipment to be fitted to aircraft and the adoption of special communication procedures.
Pacific:	The Pacific region has particular training and qualification requirements in the same way as that required for operation in the North Atlantic.

	It is a vast area with very few airfields.
Australasia:	This area again is very large with long distance between airfields. Some areas are very mountainous which results in high safety altitudes. Weather problems associated with the movement of the ITCZ can be a problem.

11.2.2 CREW QUALIFICATION AND REVALIDATION

Normally, pilots are expected to remain qualified to fly into or through all areas as specified according to aircraft type. The areas specified for each type operated by the company are detailed in Table 1 at OMD 2.1.13.1.

Except for operations within ECAC airspace, all aircraft commanders are required to complete the specified training or familiarisation prior to operating in any one or more of the above regions.

Qualification to operate on routes in a particular area is achieved by following the procedures outlined in the following paragraphs. The period of validity of route and area qualification is 12 calendar months, in addition to the remainder of the month of qualification, or the month of latest operation to the aerodrome.

The required knowledge and familiarisation may be attained through a third party training organisation such as Flyco on-line, Flight Safety or CAE SimuFlight Flyco have ‘procedures’ courses available for on-line completion and these are arranged by the crewing department. This training and familiarisation process is fully detailed at OMD paragraph 2.1.13.

Prior to operating on routes in any operational region for the first time, the commander must complete at least the on-line course for the applicable area. The commander’s knowledge of any special procedures should then be confirmed or briefed by the DFO or a suitably experienced pilot who has either operated to the region in the previous twelve months or is specifically appointed for the purpose by the DFO. The briefing may take the form of verbal instruction, or a self-briefing from written notes, including the notes contained in this manual.

Prior to operating on routes in any operational region for the first time, the commander must complete at least the on-line course for the applicable area. The commander’s knowledge of any special procedures should then be confirmed or briefed by the DFO or a suitably experienced pilot who has either operated to the region in the previous twelve months or is specifically appointed for the purpose by the DFO. The briefing may take the form of verbal instruction, or a self-briefing from written notes, including the notes contained in this manual.

The company will maintain a record of any training the commanders complete and maintain records of recency in the applicable region(s). Familiarisation or recency in any given region will not be tracked by the crewing department, however. It is the responsibility of individual aircraft commanders to ensure they are fully compliant for the intended flight when signing the declaration on the *GAL227 Pre-departure Checklist (PDC)* prior to dispatch.

Co-pilots, although not required to undertake training, are encouraged to complete the training requirements.

12.0 Special Aerodrome Site Limitations

(Refer to OMC- Appendix A)

If an aerodrome is categorised as B by the preflight risk assessment procedure *(Refer to OM A, Chapter 8.1.2.2)* for any reason that requires nonstandard procedures and no company pilot has previously visited, then the flight shall only be commanded by a Training Captain, or a Captain suitably authorized by the Director flight Operations. Any mitigation will be added to the pre dispatch checklist.*(Guide to the completion of the pre dispatch check list is available on Q-pulse as AOC.OP.022)*

If an aerodrome is categorised as C by the preflight risk assessment procedure *(Refer to OM A, Chapter 8.1.2.4)* and no company pilot has previously visited, then the flight shall only be commanded by a Training Captain who has visited the aerodrome either as an observer with another company or having completed the required training. In some circumstances the Director of Flight Operations may choose to apply more stringent mitigation or, in some circumstance alternative mitigation to ensure a safe outcome, any such instructions will be added to the pre dispatch checklist. *(Guide to the completion of the pre dispatch check list is available on Q-pulse as AOC.OP.022)*

In either case the Training Captain will review the briefing after the flight to ensure accuracy for future crews and report these inaccuracies to the Director Flight Operations.

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13 Section 13 – ADDITIONAL INFORMATION

13.1 PACIFIC OPERATIONS

The area of this brief includes the whole Pacific Ocean excluding New Zealand and Australia *(see para 13.2).*

The map below is provided for orientation purposes.

13.1.1 GENERAL

The following route structures within the Pacific Area are governed by RNP-1O requirements:

a) NOPAC- North Pacific. These fixed routes are between Alaska and Japan;

b) CEPAC - Central East Pacific. These fixed routes are between California and Hawaii;

c) CENPAC - Central Pacific. Four “flexible tracks” (FTR) between Hawaii and Japan are established daily; the day tracks (North FTR - Tracks A and B) are originated by San Francisco staffing 1900Z, and the night tracks (South FTR - Tracks 11 and 12) are originated by Tokyo staffing 0700Z. These tracks are laterally separated by at least 100nm;

d) PACOTS - Pacific Organised Track System. These flexible routes are established daily between Japan and US West Coast; they are defined using the Track Definition Message format. The 3-4 tracks, at least 100 nm laterally separated, are between Western Gateways reporting points on or near 150°E longitude and Eastern Gateways reporting points on the Eastern Oakland FIR boundary;

e) TASMAN SEA - Airways between Australia and New Zealand.

f) All track systems are discussed hereunder.

13.1.2 CENTRAL PACIFIC – CENPAC

13.1.2.1 Flexible Track System (FTS) (between Tokyo and Honolulu)

FTS is applicable for traffic at or above FL290. Four flexible track routes will be established every day;

a) 2 North FTR (Tracks A & B) as day tracks published by SF0, and

b) 2 South FTR (Tracks 11 &1 2) as night tracks published by Tokyo.

The airspace involved includes those portions of the Tokyo and Oakland FIRs between 20°N Latitude and Anchorage FIR boundary.

13.1.2.2 Time Frame (effective daily)

a) Within Oakland FIR: 1900-0600 UTC

b) Within Tokyo FIR: 2300-0600 UTC* *Crossing Time at 160°E.

13.1.2.3 Flight Level Assignments

All IFR flight levels at and above FL290 except FL330. FL330 is available only when traffic permits.

13.1.2.4 Selection of Tracks

Tokyo ACC and Oakland ARTCC will jointly develop two FTS tracks from Eastern Gateways to the Japan Gateways. These tracks are at least 100 nm laterally separated, and will depend on wind conditions on the day.

Fixed routes from 150°E to Choshi Vortac (CYC) are published by Jeppesen.

13.1.2.5 Designation of the FTS Routes

The tracks will be designated alphabetically, with the northern one being A and the southern one being B.

The North FTR will normally terminate at THOMA, the South FTR at CANON.

When THOMA is not available for flight planning, the primary FTR will be established from either RIPKI, VEPOX or MASON to SILVA. The second FTR will be established one of the two remaining Tokyo Gateways, 100nm laterally separated from the primary FTR until 170°W longitude, then to SILVA.

13.1.2.6 Notification to Users

The track message which shows whole tracks from Honolulu (PHNL) to Choshi Vortac (CVC) will be disseminated by Oakland ARTCC at approximately 1300 UTC.

13.1.2.7 Flight Planning

a) The westbound FTS tracks will be described in the daily NOTAM by Latitude and Longitude. The ATC flight plan should be filed the same way;

b) For flight planning and initial clearances, crossing between FTS tracks will not be permitted;

Once established in FTS, track changes may be approved as traffic permits;

c) Aircraft may file flight plans North of the northern FTS track and South of the southern FTS track. The filed routes must remain clear of any FTS by at least 100nm;

d) Aircraft may file to leave or join a FTS track at any reporting points. Aircraft leaving a FTS track should file routes that diverge to at least 100nm from the nearest FTS track and should remain at least 100nm from the nearest FTS track;

Altitude assignments joining the track will be based on the traffic;

e) All flights at and below FL280 can file a random route.

13.1.2.8 Eastbound Over-flight

a) All eastbound over flights intending to fly within Tokyo FIR during 2300-0600 UTC, are required to plan the route laterally separated by at least 100nm from the FTS track.

b) Eastbound over-flights filed to cross the FTS track might have to be re-routed to provide separation with the traffic on the FTS track.

13.1.2.9 ATC Procedures

a) An aircraft operating on FTS tracks has priority for flight level requests over nonparticipating aircraft;

b) An aircraft operating at and below FL280 and wishing to climb to FL290 and above on FTS track may be cleared depending on the traffic;

c) The minimum longitudinal separations between aircraft on the same track and at the same Flight Level will be 10 minutes, when using the Mach Number technique;

d) The minimum longitudinal separation between aircraft on a PACOTS track and converging traffic at the same flight level will be 20 minutes;

e) FTS tracks between Eastern Gateways near Hawaii and Japan Gateways are separated laterally by a minimum of 100 nm, using whole degrees of latitude.

f) Tracks over CUTEM will be available only to aircraft which can cross 165°E longitude at or above FL350.

13.1.3 PACIFIC ORGANISED TRACK SYSTEM – PACOTS

Japan AIP RAC 3-9-81 and NOTAM 010/90 as amended refer.

The Japan Civil Aviation Bureau (JCAB) and the FAA have established a Flexible.

Organised Track System in the North and Central North Pacific Ocean. The tracks linking Japan to the West Coasts of North America are known as the Pacific Organised Track System (PACOTS).

Westbound Flexible Track Routes (FTRs) between Tokyo and the West Coast of North America are applicable for traffic at or above FL290.

13.1.3.1 Purpose

To effect more efficient use of airspace, a flexible organised track system has been established from the Orient to Canada and the United States. Procedures have been jointly developed by operators, Tokyo ACC, Oakland ARTCC and Anchor age ARTCC.

13.1.3.2 Area Involved

The North Pacific airspace is expanded to include ATS route G344 and South to approximately 20°N latitude.

The airspace involved includes those portions of Tokyo, Anchorage and Oakland FIRs between approximately 20°N and G344, at FL290 and above. The tracks will start at Western Gateways Reporting Points on or near 150°E longitude and end at Eastern Gateways Reporting Points on the Eastern Oakland FIR boundary.

13.1.3.3 Conditions

a) Tokyo ACC and Oakland ARTCC will jointly develop three to four PACOTS tracks daily, from the Western Gateways near Japan to the Eastern Gateways near the West Coast of North America;

b) Oakland ARTCC will promulgate the tracks in a NOTAM at 2000 UTC daily.

c) The PACOTS daily Eastbound track will be effective from 0900 to 2200 and will apply to traffic crossing 150°E longitude between 0900 and 1600 UTC;

d) The PACOTS tracks, unless on G344, will be described in the NOTAM by latitude and longitude and should be filed in the same way;

e) A227 and R339 will be available as alternative routes only when laterally separated by 100nm from PACOTS tracks;

f) Portions of G334 may be included as PACOTS tracks.

13.1.3.4 Participating Aircraft

a) Aircraft operating in PACOTS have priority for Flight Level requests over non-PACOTS aircraft;

b) PACOTS Track Designations:

PACOTS Tracks	**Origin / Destination**
Track 1-4	Tokyo to West Coast North America
Track 8	Japan to Dallas
Tracks 11 &12	Tokyo to Honolulu
Tracks 14 & 15	Taipei/Hong Kong to San Francisco/Los Angeles
Tracks A & B	Honolulu to Japan
Tracks C-G	West North America to Japan
Tracks H-K	San Francisco/Los Angeles to Taipei/Hong Kong
Track L	Los Angeles to Manila
Track M	Dallas to Tokyo

Tracks A, B, 11and 12 between Japan and Hawaii are the subject of further study.

13.1.3.5 Non-Participating Aircraft

a) Aircraft should not expect to climb into PACOTS unless filed on a route corresponding to a PACOTS track. In this case, climb into PACOTS may be approved as traffic permits;

b) Random routes under PACOTS at FL280 and below are permitted;

c) Routes are permitted to be filed North of flue northern PACOTS track or South of the southern PACOTS track. The filed routes must remain clear of any PACOTS track by at least 100 nm, except that when the PACOTS track is G344, filing via R591 is permitted.

13.1.4 NORTH PACIFIC COMPOSITE ROUTE SYSTEM – NOPAC

The organised route system between Tokyo and Anchorage will be established within their respective Oceanic Control Areas or Flight Information Regions, as follows:

13.1.4.1 Applicable ATS Routes

a) R220 (East of NANAC)

b) R580

c) A590 (East of PABBA)

d) R591

e) G334

13.1.4.2 Applicable Composite Separation

Composite separation consisting of at least 50 nm lateral and 1000 feet vertical separations will be applied for aircraft operating at or above FL290 on the organised route system listed above.

13.1.4.3 Assigned Flight Levels and Direction of Flight

a) R220 - Westbound at ODD Flight Levels, 290 and above;

b) R580 - Westbound at EVEN Flight Levels, 280 and above;

c) A590 - Eastbound at ODD Flight Levels, 290 and above;

d) R591 - Eastbound at EVEN Flight Levels, 280 and above;

e) G344 - Eastbound at ODD Flight Levels, 290 and above.

NOTE 1: Eastbound aircraft on NOPAC ATS routes above FL330, planning to cross the boundary of Tokyo and Anchorage FIR between 2300 UTC and 0500 UTC, should plan to fly via R359 or G344.

NOTE 2: A590 will also be used for westbound aircraft at or above FL350 during the above mentioned period.

f) R580 will be used for eastbound aircraft planning to cross the boundary of Tokyo and Anchorage FIRs between 1000 UTC and 1700 UTC, and destined for Alaskan and European airports.

Aircraft flying on R580 during the above mentioned period should plan to fly via the following route:

- CVC, OTR 11, KAGIS, OATIS, R580
- V51, NOGAR, OGGMU, R580

13.1.4.4 ATC Procedure on NOPAC Composite Route System

The following procedure will be applied when composite separation is used:

a) An aircraft may be cleared to join an outer route of the systems at other than the normal entry point, provided:
   (i) Longitudinal or non-composite vertical separation exists between that aircraft and any other aircraft on that route; and
   (ii) composite separation exists between that aircraft and any other aircraft, on the next adjacent route.

b) An aircraft may be cleared to leave an outer route of the system at other than the normal exit point, provided its course diverges so that lateral separation increases until longitudinal or non-composite lateral, or non-composite vertical separation exists between that aircraft and any other aircraft in the system;

c) An aircraft may be cleared to change from one route to an adjacent route in the system, provided:
   (i) Longitudinal or non-composite vertical separation exists between that aircraft and any other aircraft on the route being vacated, until that aircraft is established on the route to which it is proceeding; and
   (ii) longitudinal or non-composite vertical separation exists between that aircraft and any other aircraft on the route to which that aircraft is proceeding; and

(iii) composite separation exists between that aircraft and any other aircraft on the next adjacent route.

d) An aircraft may be cleared to cross the system, provided longitudinal or non-composite lateral or non-composite vertical separation exists between that aircraft and any other aircraft in the system;

e) An aircraft may be cleared to change altitude on a route, if longitudinal or non-composite vertical separation exists between that aircraft and any other aircraft on that route; regardless of any other aircraft on adjacent routes.

13.1.5 SPECIAL PROCEDURES FOR IN-FLIGHT CONTINGENCIES

a) If an aircraft experiences navigational difficulty, it is essential that pilots inform ATC as soon as the condition is apparent, so that appropriate action can be taken as necessary, to prevent conflict with other aircraft;

b) The following procedures for in flight contingencies are intended for guidance:

NOTE: All contingencies cannot be covered, but these procedures provide for such cases as inability to maintain the assigned Flight Level due to weather, aircraft performance and pressurisation failure. They are applicable primarily when rapid descent, turn back, or both as necessary.

(i) If an aircraft is unable to continue flight in accordance with the ATC clearance, a revised clearance shall, whenever possible, be obtained prior to initiating any action, using the radiotelephony DISTRESS (MAYDAY) or URGENCY (PAN) signal as appropriate;

(ii) If prior clearance cannot be obtained, an ATC clearance shall be obtained at the earliest possible time. In the meantime, the aircraft shall broadcast its position (including the ATS route designator) together with its intentions, on frequency 121.5 MHz at suitable intervals; until ATC clearance is received;

(iii) If unable to comply with the provisions of (i), the aircraft should leave its assigned route by turning 90° to the right or left whenever this is possible.

The direction of the turn should be determined by the position of the aircraft relative to the route system; that is, whether the aircraft is outside, at the edge of, or within the system and the levels allocated to adjacent routes.

NOTE: Westbound aircraft operating on ATS route R220 should, if possible, avoid turning right to leave the route, due to its proximity to the boundary between Anchorage or Tokyo and the USSR FIRs.

(iv) An aircraft able to maintain its assigned level should nevertheless climb or descend 500 feet while acquiring and maintaining in either direction, a track laterally separated by 25 nm form its assigned route;

(v) An aircraft not able to maintain its assigned level should start its descent while turning to acquire and maintain in either direction, a track laterally separated by 25 nm from its assigned route.

13.1.5.1 Flying Routes at the West End of the Route System

Departure, arrival and over flying routes at the west end of the route system are given in the Jeppesen Manual.

13.1.5.2 Position Reporting

Significant points on ATS routes which consist of NOPAC composite route system are compulsory ATS/MET reporting points. Unless requested by ATC, MET need not to be reported over the points, if the aircraft traverses 10° within 1 hour and 20 minutes.

13.1.5.3 Procedure for Flight Altitude Assignment (on Airway R21 1 and R22)

Altitude conversion will be applied to all aircraft which fly on the airway R2 11 and R22 between Tokyo FIR and Khabarovsk FIR:

13.1.6 MACH NUMBER TECHNIQUE APPLICATION

Mach Number Technique will be applied to turbo-jet aircraft operating on the North Pacific and Central Pacific on the following ATS routes;

- R220 East of NANAC
- R580
- A590 East of PABBA
- R5 91
- G344
- A227
- R3 39
- G223
- B452
- A337
- B586 South of TEMAR
- A597 South of BULDO
- FTRs (Flexible Track Routes).

13.1.7 TERRAIN AND MINIMUM FLIGHT ALTITUDES (MFA)

The US West seaboard is mountainous in places. Inland from Los Angeles and San Francisco, MFAs rise to over 18,000 feet amsl.

Most small Pacific islands are low lying atolls with MFAs rarely above 2,000 feet amsl.

However, exceptions are Hawaii (highest MFA above 16,000 feet amsl), Tahiti (MFA nearly 10,000 feet amsl), Pago Pago (MFA over 8,000 feet amsl), Noumea (MFA nearly 8,000 feet amsl) Nadi (MFA nearly 6,000 feet amsl), Rarotonga (MFA over 3,000 feet amsl)

The highest MFA in New Zealand approaches 15,000 feet amsl, and MFAs in the region of Papua New Guinea are above 10,000 feet amsl.

In the North Pacific, MFAs over land in Alaska reach well over 20,000 feet amsl, and in the Aleutian Islands at the western end of mainland Alaska are over 10,000 feet amsl.

13.1.8 CLIMATOLOGY

13.1.8.1 Auckland – Pago-Pago

The belt of sub-tropical highs alternating with troughs of low pressure exerts the main influence on this route. These systems are furthest north in the late winter and spring, passing to the north of Auckland and further south in late summer and autumn when they pass centrally across New Zealand. Their frequency is about five per month. The intervening fronts vary in intensity, being most strongly developed in the winter. At that time, moving eastwards across the route and aligned almost parallel to it in the southern half, they can bring bad weather to a considerable portion of the route at once. They seldom become quasi-stationary here however. Further north the tendency is for the front to trail back in an east-west direction and become quasi-stationary.

In summer, the associated development and activity is less pronounced, but there is a risk of tropical cyclones on the route from January to March.

Upper winds are prevailing westerlies throughout the year, with marked jet-stream activity in winter. At this season, it is usual for an overlapping tropopause to be found over or well north of Auckland, with its associated sub-tropical jet core giving westerly winds more than 100kt.

Aircraft operating from Auckland above the 300mb level can be expected to traverse the jet-stream from the cold side quite early in the flight. At this stage its trajectory is usually west – east. As the flight progresses it most frequently veers to north – west and slackens considerably before descent into Pago-Pago.

13.1.8.2 Pago-Pago – Honolulu

This route, passing virtually right across the tropics of both hemispheres, has no adjacent land masses to complicate the weather pattern. Thus, it presents a basic and fairly symmetrical north – south cross-section of tropical wind structure and cloud formation. The following sub-division may be made:

a) Both ends of the sector, outside latitudes 15° North and South, traverse ocean stretches where the Trade Winds are deep and steady, ranging from 10,000ft to 20,000ft from winter to summer. Overlying these streams at most times are light variable winds, succeeded at jet operating heights by moderate westerlies. These latter winds, between the 500mb and 200mb levels, are considerably strengthened in winter by the outer reaches of the sub-tropical jet- streams in either hemisphere.

   Usually, at those times, the upper winds in these areas have marked westerly components and their speeds often exceed 60kt. Since Honolulu lies a little higher in latitude than Pago-Pago, the effect is more frequent and pronounced at that end.

   Associated weather, while usually good, varied with the presence and history of decaying fronts. These, on straying from temperate latitudes into the tropics, normally trail back in the form of east – west lines of vertical cloud development, gradually dissipating.

   However, a slight converging tendency in the adjacent warm, moist winds will quickly reactivate them as broken or continuously developed Cumulonimbus, swelling well above 40,000ft, with severe turbulence, precipitation, ice and electrical activity. With slight slackening of convergent flow, the system collapses, stratifying or dissipating completely in a few hours.

In late summer, particularly at the southern end, tropical cyclones sometimes cross the route with associated violent winds and cumulonimbus to 40,000ft and above. This may bring very adverse weather on occasions to Pago-Pago. The same has occurred, though very rarely at Honolulu. Worst weather here is usually associated with the on-shore southerlies of the Kona storms between October and April.

b) The equatorial portion of the route, between latitudes 15 degrees North and 15 degrees South, is dominated by the Inter Tropical Convergence Zone. The winds aloft throughout this zone are light, rarely exceeding 20kt, and variable in direction, though frequently with some easterly component.

The ITCZ, which generally follows the movement of the Thermal Equator closely, has many forms and can change its nature and location with great rapidity.

In its simplest form, the ITCZ occurs as a clearly marked boundary between the converging Trade airs of the Northern and Southern hemispheres. These streams, in the Pago-Pago – Honolulu case, both have histories of long travel over vast tropical oceans. They are thus uniformly warm, moist and unstable. When they converge, forcing some of this air upwards, the abundant condensation and associated release of latent heat trigger convection on a huge scale. The result is a continuous line of violent Cb activity, proportional to the degree of convergence and the wind speed involved. At its extreme, this band of bad weather can stretch many hundreds of miles with a solid width exceeding 100nm and cloud tops to 40,000 or 50,000ft, many carried higher still by their own momentum.

When the mass flow of air *(hence, the available heat energy)* fed into the system is less by reason of winds lighter or more parallel in direction, the ITCZ is weaker in proportion until the other extreme is reached, with a wide belt of ‘Doldrums’ weather – clear and calm, interspersed with occasional build-ups or squalls where local effects have triggered restricted activity.

Again, it is common to find two very different and active zones lying east – west, one at either boundary of this doldrums belt; on rare occasions, the whole intervening expanse can be filled with thick stratus, liberally embedded with Cb.

13.1.8.3 Honolulu – Los Angeles

On average in winter there is an extension of the Plateau high south-east wind into the Pacific. The high may remain stationary and dominate the area for long periods, but it is frequently replaced by depressions moving into the continent, but thunderstorms should be expected.

Severe storms are rare over the Hawaiian Islands, and trade winds predominate. The characteristic clouds is scatted cumulus, with mountain peaks nearly always encircled by cloud, and rainfall on exposed north-eastern slopes is generally heavy.

The most unpleasant weather occurs when the trades give way to southerly winds associated with depressions to the west *(locally called Know Storms).* These may occur from October to April, but average only two or three per year. They may bring moderate to heavy continuous rain and winds of up to 35kt. Their duration in any given location may be from a few hours to several days.

Kahului is situated on the isthmus of Maui and enjoys similar weather to that on the leeward south and west coasts, but Hilo, on the north-east coast of Hawaii, has more than five times the rainfall of Honolulu.

In summer, the Oceanic high is dominant and fronts are infrequent. Near Hawaii the trades are deeper and even more persistent than in the Pacific U.S. coast.

13.1.9 ETOPS CONSIDERATIONS

Any flight routing directly across the Pacific will come across ETOPS airspace. The requirements for ETOPS are given later in this manual however aircraft will operate on great circle tracks that may have to be rerouted to remain within range of nominated Suitable En-Route Alternates.

Inspection of the orientation chart above will show that there are relatively few adequate airfields which are open H24. Notams and opening hours for the nominated suitable en-route alternate airports should be checked carefully before departure.

The departure and destination airfields may be used as SERAs.

Use of destination as a SERA means that extra fuel is likely to be carried to avoid a Critical Fuel Shortfall at the last Equal Time Point.

A list of adequate airfields is included later in this section.

13.1.10 NAVIGATION

A special FMS Navigation Database (NDB) is required for Pacific operations.
Ensure it is loaded into the FMS before departure.

If the Navigation database is required to be updated prior to departure this may take an additional 20 to 30 minutes prior to boarding passengers and must be accounted for especially on days when duty periods may be long.

SLOP procedures are approved for Oceanic or Remote Airspace only, provided the normal separation between track / airway centrelines is not less than 30nm.

13.1.11 AIR DEFENCE IDENTIFICATION ZONES (ADIZ)

ADIZs lie to the west of the US coast and surround the Hawaiian Islands, also around Australia, Japan, Philippines, Korea, Myanmar and Thailand

- Report to ATC, any last-minute change to ETA or track before entering the ADIZ.
- Interception signals and procedures are included in the Flight Deck Brief and Jeppesen manual.

- Any revision to the flight plan must be forwarded to ATC before entering the ADIZ.
- Any revised ETA of more than five minutes of the point of penetration of the ADIZ must be reported to ATC.
- Within 10nm of a land mass area, deviation of more than 10nm from the proposed route must be reported to ATC.
- Beyond 10nm of a land mass area, deviation of more than 20nm from the proposed route must be reported to ATC.

13.1.12 COMMUNICATIONS

Language is a problem with some air traffic controllers speaking marginal English. Do not be surprised if you cannot understand each other. Allow time to speak slowly and distinctly, use standard phraseology. Be patient and alert at all times. Do not use slang or terms such as “Boundary” or “FIR”, but use the phonetic designator. Use the word “decimal” not “point” for frequencies.

A controller’s “Roger” response to a message **may not** mean he has understood the message.

The ATC unit may have a different name to the aerodrome – check carefully.

The air-to-air VHF frequency is this area is 123.45.

Except in a radar environment, report reaching any altitude assigned within RVSM airspace.

13.1.13 METEOROLOGY AND UPPER WINDS

Detailed data on route meteorology can be found in *para 13.1.8 Climatology*.

13.1.13.1 Winter Upper Winds

Within the first 10,000ft the trade winds are replaced by westerlies which occasionally exceed 100kt in the upper levels. The sub-tropical jet-stream is usually quite distinct from the polar jet-stream and it frequently appears over Hawaii in winter and spring. Strong upper level northerlies sometimes occur at Hawaii.

13.1.13.2 Summer Upper Winds

The depth of the trades increases with distance from the coast and at 140°West reaches to about 400mb. At this level the winds are normally light; above they are mainly westerly but lighter than in the winter. The jet stream has moved north, but on occasions the wind at 200mb may be very strong and westerlies exceeding 100kt have been observed at 40,000ft in July near Hawaii.

13.1.13.3 En-Route Winds

Expected 50% Wind Component (- = Headwind).

From	To	Jan	Apr	Jul	Oct
AKL	HNL	8	14	12	12
HNL	AKL	-11	-18	-18	-16
AKL	MEL	-44	-39	-47	-44
MEL	AKL	42	37	46	43
AKL	PPG	19	23	32	28
PPG	AKL	-22	-28	-42	-36
PPG	HNL	3	9	3	4
HNL	PPG	-5	-11	-4	-5
AKL	NAN	2	2	0	3
NAN	AKL	-7	-10	-16	-14
AKL	PPT	32	39	64	52
PPT	AKL	-35	-43	-69	-56
AKL	RAR	33	41	64	51
RAR	AKL	-35	-45	-70	-56

13.1.13.4 Volcanic Activity

Information about volcanic activity in New Zealand and Papua New Guinea is contained in *para 13.2, Australia and New Zealand.*

13.1.14 EN-ROUTE

13.1.14.1 Adequate En-Route Aerodromes

The following table lists adequate airfields in the Pacific / South America area.

The table is provided for orientation purposes only and may not be updated. Note that opening hours, fire cover etc. shown here may not be current. Check Notams for up to date information before operation, and Jeppesen manuals.

Airfield	Country	IATA	ICAO	H24
ACAPULCO	Mexico	ACA	MMAA	✓
ADAK	USA	ADK	PADK	✓
AGANA	Guam	GUM	PGUM	✓
ANCHORAGE	USA	ANC	PANC	✓
APIA (Faleolo)	Western Samoa	APW	NSFA	✓
AUCKLAND	New Zealand	AKL	NZAA	✓
BUKA	Pap New Guinea	BUA	AYBK	2000 - 0800
CALGARY	Canada	YYC	CYYC	✓
CANTO ISLAND	Kiribati	CIS	PCIS	RFF U
CHRISTCHURCH	New Zealand	CHC	NZCH	✓
CHRISTMAS ISLAND (Cassidy)	Kiribati	CXI	PLCH	RFF 5
CHUUK	Fed States	TKK	PTKK	2130 - 0630
ESCONDIDO	Mexico	PXM	MMPS	
FUKUSHIMA	Japan	FKS	RJSF	2330 - 1100
HAKODATE	Japan	HKD	RJCH	2230 - 1130
HAMILTON	New Zealand	HLZ	NZHN	RFF 6
HILO	Hawaii	ITO	PHTO	✓
HONOLULU	Hawaii	HNL	PHNL	✓
HUATULCO	Mexico	HUX	MMBT	1300 - 2400
KAHULUI	Hawaii	OGG	PHOG	✓
KAPOLEI (Kalaeloa)	Hawaii	JRF	PHJR	
KOSRAE	Fed States	KSA	PTSA	2100 - 0500
LAS VEGAS	USA	LAS	KLAS	✓
LONG BEACH	USA	LGB	KLGB	1530 – 0030
LOS ANGELES	USA	LAX	KLAX	✓
LOS CABOS	Mexico	SJD	MMSD	1400 - 0100
MAJURO	Marshall Islands	MAJ	PKMJ	✓

13.1.14.1 Adequate En-Route Aerodromes Cont.

Airfield	Country	IATA	ICAO	H24
NADI	Fiji	NAN	NFFN	✓
NAHA	Japan	OKA	ROAH	-
NAURU	Nauru	INU	ANYN	RFF 5
NOUMEA	New Caledonia	NOU	NWWW	✓
NUKU'ALOFA	Tonga	TBU	NFTF	
ONTARIO(California)	USA	ONT	KONT	
PAGO PAGO	Samoa	PPG	NSTU	✓
PLAYA DE ORO	Mexico	ZLO	MMZO	1400 - 0200
PONHPEI	Fed States	PNI	PTPN	2100 - 0400
PORTLAND	USA	PDX	KPDX	✓
RARATONGA	Cook Islands	RAR	NCRG	
ROTA	N Marianas	ROP	PGRO	0100 - 2100
SAIPAN	N Marianas	SPN	PGSN	✓
SAN CRISTOBAL	Ecuador	SCY	SEST	
SAN DIEGO	USA	SAN	KSAN	✓
SAN FRANCISCO	USA	SFO	KSFO	✓
SEATTLE (Tacoma)	USA	SEA	KSEA	✓
SEYMOUR	Ecuador	GPS	SEGS	
TAHITI	French Pacific	PPT	NTAA	✓
TONCONTIN	Honduras	TGU	MHTG	1200 - 0400
VANCOVER	Canada	YVR	CYVR	✓
WELLINGTON	New Zealand	WLG	NZWN	
YAP	Fed States	YAP	PTYA	2130 - 0630

13.1.15 PERFORMANCE

13.1.15.1 Computerised Performance

Computerised performance for relevant destinations and primary alternates will be provided by Operations. Should any further performance be required, contact Operations providing the details of the information you require.

13.1.15.2 Oxygen Escape Routes

Not applicable.

13.1.15.3 Altimeter Setting Procedures

Auckland Oceanic and Nadi FIRs:

Standard Company altimeter setting procedures apply except:

a) Within QNH zones or the Norfolk Island FIA, both main altimeters should be set to the appropriate zone or area QNH.

13.1.15.4 Use of Non-Standard Flight Levels

The use of non-standard flight levels may be considered for fuel conservation, when it is safe and sensible to do so.

CAUTION: Be aware that when maintaining standard flight levels in uncontrolled airspace, other aircraft on converging or crossing tracks may also be at the same standard level.

13.1.16 ARRIVAL

13.1.16.1 Destination Alternate Planning

Destination	Alternates	IATA / ICAO	Trk ºT	Nm	Remarks	Runway Distance
Auckland	Rotorua Palmerston Wellington	ROT / NZRO PMR / NZPM WLG / NZWG	133 205 180	98 170 300	No ILS, No ILS, ILS,	5321' 6240' 6352'
Honolulu	Kopolei Kahului Hilo	JRF / PHJR OGG / PHOG ITO / PHTO	270 095 110	10 90 190	No ILS, ILS, ILS,	8000' 6995' 9800'
Nadi	Page Pago Apia Nuku'Alofa	PPG / NSTU APW / NSFA TBU / NFTF	062 057 105	714 655 450	ILS, ILS, No ILS,	10,000' 9843' 8795'
Tahiti	Uturoa Bora Bora Rarotonga	RFP / NTTR BOB / NTTB RAR / NCRG	295 298 248	118 140 616	No ILS, No ILS, ILS,	4593' 4921' 7638'

13.1.17 CUSTOMS AND IMMIGRATION

13.1.17.1 General

See specific airfield requirements following:

a) Both Australia and NZ are very hot on Radio Practique (formal permission given to an aircraft to use a foreign airport upon satisfying the requirements of local health authorities).

b) Ensure the handling agent is contacted by radio in good time before arrival, and state either that there are no cases of sickness or illness on board (other than air-sickness), or give details of any such cases for onward transmission to the local health authorities.

13.1.18 AIRFIELD BRIEFINGS

13.1.18.1 General

These notes are for orientation purposes only and may not be updated. Airport Briefings are included for Cat B & Cat C airfields later in this manual.

Jeppesen and Notam information take precedence over information contained in this section.

A.) <u>APIA (Faleolo International) (APW / NSFA)</u>

General
Located on the NW coast of Upolo Island approximately 14nm west of Apia. Airport *Briefing available in OM Part C.*

Runway 08/26; 08 has a pronounced downslope.

Weather
Reported conditions are often inaccurate.

November – March: the wet season, the South Pacific ITCZ oscillates south of Samoa.

Severe thunderstorms may considerably reduce visibility.

Terrain
Rises in the centre of the island to over 3,600ft. On the adjacent island of Savaii to the NW, high ground to over 6,000ft.

B.) <u>AUCKLAND, NEW ZEALAND (AKL / NZAA)</u>

General
Runways 05/23 L/R. 05L/23R is primarily used as a taxiway.

Large concentrations of birds are common, often flying up to 1,600 feet AMSL. The bird hazard is at a maximum between January and March. Birds frequently transit the RWY05L/R thresholds.

Ardmore airfield is 8nm east and its associated training area (8nm SE up to 4,500ft) generate considerable light aircraft traffic.

Weather
October – March weather is generally fine. Occasional tropical cyclones formed near Fiji moving south affect the Auckland area.

March – September early morning for may occur, with worst conditions generally between 0000 and 0900 local.

Terrain
The airfield is 7nm south of Auckland city. Surrounding terrain is generally flat. 9nm to the WNW, terrain rises to nearly 1,700ft. Further out, the North Island is generally mountainous but the higher peaks are further south.

It is reported that there is the possibility of GPWS warnings on left hand approaches to RWY 05L/R below 4,000ft over the Waitake area, and to the south of the HD NDB below 3,000ft.

ATC
Transition altitude is 13,000ft.

Preferred runways for noise are 23 for take-off and 05 for landing.

Handling by Air New Zealand; VHF Air New Zealand Ramp 131.9 MHz.

C.) CHRISTCHURCH, NEW ZEALAND (CHC / NZCH)

General
Situated 5nm west of Christchurch city. H24 and considered the primary alternate for AKL.

Runways 02/20 and 11/29.

Taxiway may be slippery due to variable friction characteristics! The apron is not well lit at night, markings may be difficult to see.

Weather
Generally benign weather, in winter freezing conditions may occur, possible fog and/or low cloud.

Terrain
The airport lies in a flat area but high ground rises to 3,000ft at about 15nm SE.

D.) HILO, HAWAII (ITO / PHTO)

***NOTE**: ETOPS approval is required for operations to Hawaii.*

General
The airport is located about 2nm east of the city, on a small headland on the east coast of Hawaii. Airport Briefing available in OM Part C.

Runway 08/26.

The airport is a US FAA Special PIC Qualification Airport *(see OM Part C Airport Briefing)*

Terrain
Very high ground locally, Mauna Kea (25nm WNW) and Mauna Loa (35nm SW) rise to nearly 14,000ft.

Volcanoes Kilaunea and Mauna Loa are continually active and will not be mentioned in NOTAMS.

ATC
Pilot controlled lighting.

Caution – do not enter the extreme western end of taxiway A as it is not possible to access the runway due to the approach lighting structure.

E.) HONOLULU, HAWAII (HNL / PHNL)

General
The airport is located on the south coast of the island of Oahu in the Hawaiian Islands between Waikiki and Pearl Harbour. There is much military, commuter and light traffic.

Airport Briefing available in OM Part C.

Runway 04/22 L/R and 08/26 L/R. TCAS Resolution Advisories may be experienced due to close parallel approaches, consider use of TA ONLY.

Ships over 200ft high operate in the Pearl Harbour channel only 2nm west of the airport.

Terrain
Terrain rises sharply to 1,000ft to the north.

ATC
After landing once clear of the runway, advise ground of gate number. This is available from Ramp 121.8 if not known).

Caution wake turbulence when departing RWY 08R, from aircraft landing 04R

Agriculture Regulations
All crew members (operating or otherwise) arriving Honolulu form the mainland US are required to complete a Plant and Animals Declaration form.
All crew members (operating or otherwise) departing Honolulu for US mainland airports are required to:

- Prior to checking-in bags, submit their baggage for inspection, and declare all agricultural items at the Agriculture Checkpoint in the check in area. A sticker will be placed on the each checked bag which is required before the bag can be accepted by check-in staff. The stickers should be removed on arrival at destination.
- Proceed to security checkpoint behind the check-in desks. All hand baggage will be inspected there by both security and UDSA personnel.
- Ensure your name is checked off the crew list by the USDA Inspector.

F.) KAHULUI, HAWAII (OGG / PHOG)

General
Airport Briefing available in OM Part C. The airport is a US FAA Special PIC Qualification Airport *(see OM Part C Airport Briefing)*

G.) MAJURO, MARSHALL ISLANDS (MAJ / PKMJ)

General
See OM Part C Airport Briefing.

H.) NADI, FIJI (NAN / NFFN)

General
The airport is on the west coast of Viti Levu, about 3nm NNE of Nadi.
Airport Briefing available in OM Part C.

Weather
During the wet season (January – March), tropical cyclones may close the airport for prolonged periods. During the wet season, large thunderstorms may reduce visibility.

Burning off sugar cane reduces visibility due to smoke haze.

Terrain
High ground in the centre of the island rises to over 4,300ft

ATC
Night landings not permitted on RWY 20 or 27

Night take-offs not permitted on RWY 09

Handling by Air Terminal Services, VHF 131.9 MHz

Immigration
Crew members, whether operating or positioning, must clear immigration by producing their I/D card at the crew channel.

Provided their stay does not exceed 7 days in any one stopover, crew members need not complete and arrival or departure immigration card and passports will not be stamped on arrival or departure.

Security
All crew members are required to submit hand baggage for x-ray check on all turnarounds / transits.

Passing through security can take some time so allow an additional 15 minutes to clear when proceeding to aircraft.

I.) NOUMEA (TONTOUTA) (GEA / NWWW)

General
The airfield is located on the SW side of New Caledonia, 20m NW of Noumea.

RWY 11-29; 11 is the preferred runway

Weather
During the wet season (January – March) tropical cyclones may close the airport for prolonged periods. Weather generally like Nadi.

Terrain
Mount Humbolt (5,300ft AMSL) is 14nm NE. Other high ground 7nm SSE approaching 4,000ft. Mount Titerna (approaching 1,200ft) is 7nm from the threshold end of RWY 11

ATC
Local traffic may communicate in French.

J.) NUKU’ALOFA (Fua’amotu International) (TBU / NFTF)

General
Located on the island of Tongatapu about 8nm SSE of Nuku’alofa town.

Runway 11/29.

No significant terrain, the island is almost flat

Weather
Generally good. Palm trees surround the airfield and shield wind effect – caution windshear.

K.) PAGO-PAGO, SAMOA (PPG / NSTU)

General
Located on the SE coast of the island of Samoa, extending into the lagoon.

Runway 05/23

Weather
The wet season is associated with heavy rain and poor visibility.

Terrain
Continuously rising ground approaching RWY 05

L.) RAROTONGA, COOK ISLANDS (RAR / NCRG)

General
Located on the NW corner of Rarotonga Island, which is a volcanic island about 5nm in diameter. *Airport Briefing available in OM Part C.*

Runway 08/26, turning circles either end

Ramp area is restricted, marshalling available.

Weather
The island lies in the trade wind belt, winds are usually from the East.

The wet season is associated with heavy rain and poor visibility.

Terrain
Rugged terrain rises from the coast to over 2,100ft. High ground immediately south of the airport. Ships in the harbour may infringe the approach path to RWY 26

Approaching from the SW, terrain shielding may affect VHF communication until close to the ILS localiser.

ATC
ATC is not H24 but available on call-out, thus the airport may be nominated as a suitable ETOPS alternate. Tower reported weather is often inaccurate.

Customs
A completed crew search list is required for crew members who need to leave the Customs controlled area during transit or turnaround at Rarotonga.

M.) TAHITI (PPT / NTAA)

General
Airport Briefing available in OM Part C.

N.) WELLINGTON, NEW ZEALAND (WWG / NZWN)

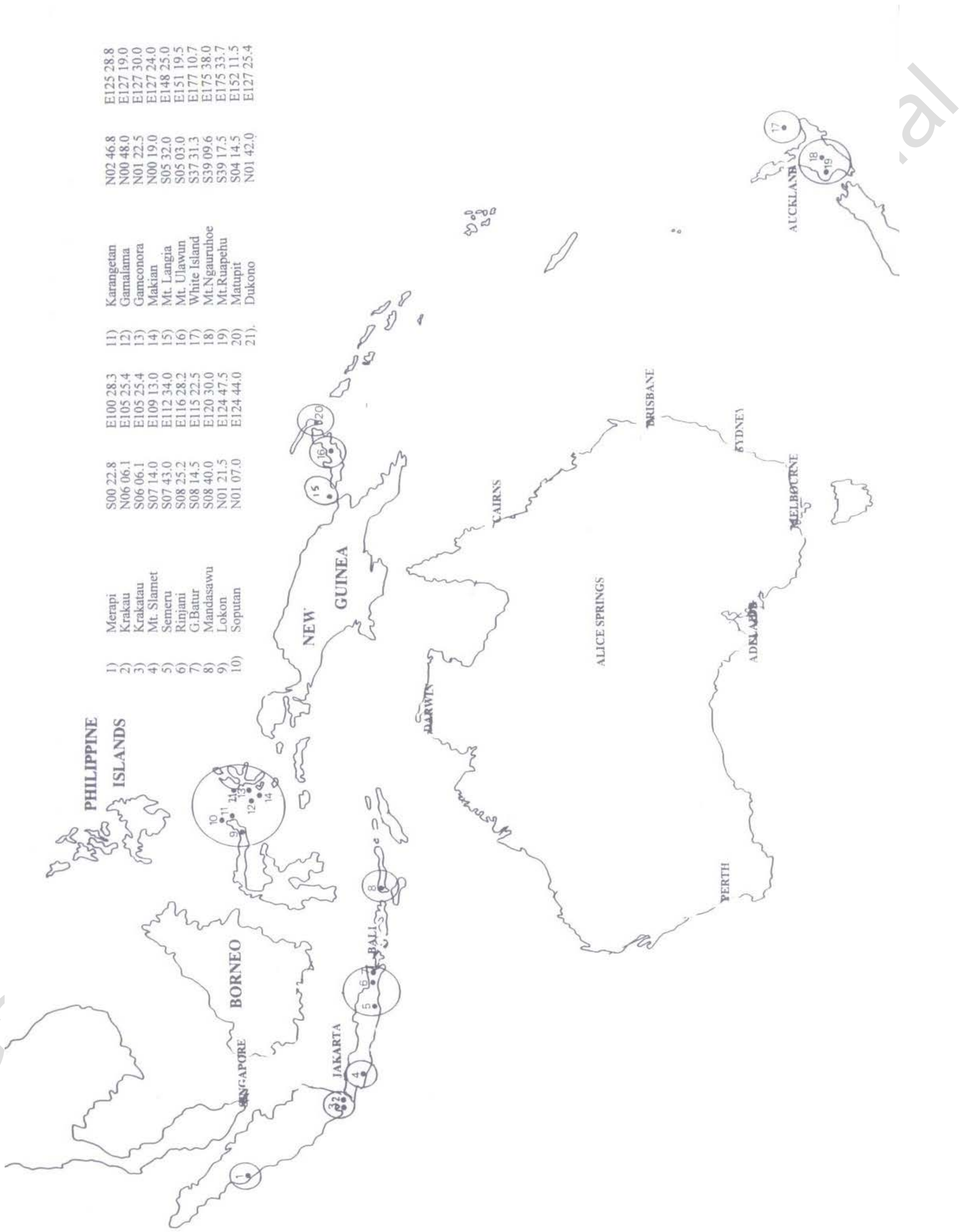
General
Airport Briefing available in OM Part C.

This airport may be used as an alternate for AKL or CHC but has restrictions – see Airport Brief.

13.2 AUSTRALIA & NEW ZEALAND

13.2.1 OVERVIEW

13.2.1.1 Area Coverage



13.2.2 TERRAIN AND MINIMUM FLIGHT ALTITUDES (MFA)

The highest terrain over Australia is between Melbourne and Sydney where the grid MORA approaches 8,000ft. However, off Cairns heading towards Papua New Guinea, the grid MORA rises well above 10,000 feet.

13.2.3 CLIMATOLOGY

13.2.3.1 General

The Far East region has an equatorial rainy climate except the North part of Australia. In January, the NE monsoon reaches the area moist and unstable after a long sea track; S of the Equator it veers to become the NW monsoon of N Australia which then lies within the equatorial trough. In July, Australia is in the belt of sub-tropical high pressure; SE trades blow from the continent and from the Pacific Ocean towards the E Indies and veer to become the SW monsoon N of the Equator. Generally, there is much convective cloud with frequent heavy showers and thunderstorms but the topography of the islands is extremely varied and there are often marked contrasts of climate between the windward and lee sides. Land and sea breezes are a regular feature. That part of the SE trade wind which originates over Australia in the S winter is dry and dusty over the continent and is associated with a period of haze and reduced rainfall in the islands S of about 5° S. Generally, the wettest periods at any place occur when the ITCZ is in the vicinity.

Tropical cyclones known as “willy willies” develop in or near the Timor Sea from January to March. They usually move at first SW and after re-curving pass into NW Australia; they are accompanied by heavy rain and strong winds or gales.

13.2.3.2 Fronts and Convergence Zones - North Australia

The Inter Tropical Front lies close to the N of Australia in the Southern Summer, but in the Southern Winter lies far to the N. Hence, the SE trades and the NW monsoon mainly control the weather, and there are two distinct seasons, namely a wet season *(November – March)* and a dry season *(April – October).*

Diffuse zones of convergence are more usual than sharply defined fronts. Such zones may form in any area where air streams have a component towards each other.

During the dry season the cold fronts which cross the Continent between anticyclones are of little importance, except perhaps for dust. During the wet season, they seldom advance much further N. than 20° S and active severe conditions exist through the entire width of the zone, which may be 50 – 70nm.

The ITF is present only in January and February. Normally it is N of Darwin but occasionally it moves S. When active it may take the form of a broach convergence. Afternoon thunderstorms are sometimes experienced; however, bad areas are generally isolated.

Conditions vary beyond the Eastern Highlands. Away from fronts *(see above)* bad weather is normally confined to certain air streams from the sea. The main ones are from the SE after a long track over the Tasman Sea, and from the S when they are moving rapidly and are unstable.

Thunderstorms are most frequent near Darwin (10-15 days of thunder each month) where they may be extensive. Those that occur in the evening may remain active until after midnight, even as far N as 20°S, and some of those over the sea may drift over the coast near Darwin just after sunrise. In the interior, thunderstorms are infrequent and amount to no more than 3 each month near 25°S. Along the east coast the frequency decreases towards the S; Brisbane has 6-7 each month until February, Sydney a little less, and Melbourne no more than 2.

Line squalls occur mainly in the S half of Australia, and inland they are often accompanied by severe dust storms. Most of them arrive from the S with the advent of a cold front. Squalls frequently follow in the airstream behind the front. A particularly vigorous line squall affects the coastal strip of New South Wales (Southerly Buster), but it is unknown W. of the Highlands. 5-6 a month are likely from November to February, two-thirds of the annual total. Turbulence near the highlands can be severe.

13.2.3.3 Flying Weather – April to October

From Darwin, as far as the Eastern Highlands the skies are often clear or cloud is scattered. Near the N. Coast there are some large Cu/Cb early and late in the season and just inland, near Daly Waters, low stratus occurs in the early morning. The SW air stream may bring cloud and showers to the W. slopes of the Highlands.

In the SE, the sky is a little less cloudy than in summer because of the greater frequency of W. winds. Thunderstorms are infrequent and occur mainly near the beginning and end of the season. In the interior, they are rare. The possibility of mountain waves near the Eastern Highlands must be borne in mind. Another favoured region is the McDonnel ranges near Alice Springs.

Dust storms occur inland, and in Queensland and Northern Territory they are frequent in this season. From May or June large quantities of smoke and ash are carried NE, and thick haze from dust and smoke is generally present. The haze extends up to a height of 6,000 – 8,000ft. Visibility may fall below 1.5nm and the sky may be obscured.

Cyclones may affect Darwin in April.

13.2.4 PLANNING CONSIDERATIONS

13.2.4.1 General

This section is intended to supplement the information contained in Ops Manual Part C Aerodrome and Route Briefings.

13.2.4.2 Airspace and Route Structure

Routes annotated as requiring RNP4, or RNP10 may be flown by Company aircraft. All controlled airspace within the Brisbane (YBBB) and Melbourne (YMMM) FIRs requires RNP4 or RNP10.

Reduced Vertical Separation Minima (RVSM) is widely used in all Australian FIRs operational between FL290-FL410.

Standard speed control 250kts maximum below 10,000ft.
Transition Altitude 10,000ft, Transition Level FL110.

13.2.4.3 Approaches

Except for a DME arrival procedure or under radar control, an aircraft approaching an airfield shall not descend below the Lowest Safe Alt (LSALT) or the MSA for the route until over the initial approach point. When LSALT is used, deviation from the prescribed track is not permitted.

If no hold is required, the approach may be commenced without entering the hold if the arrival track is within plus or minus 30 degrees of the first track of the procedure. Outside controlled airspace and within 25nm of the field, and aircraft may diverge to arrive within this sector, provided it remains at or above the MSA.

For a reversal procedures with no FAF, final approach speed should be obtained before descending on the inbound track. 80° / 250° reversal turns, as opposed to
45° / 180° turns, may be used unless specifically excluded.

13.2.4.4 Departures

SIDs in use. When changing to departure control or next agency read ONLY the SID and level climbing to, NOT the level passing. The airspace to the cleared level is protected procedurally. Give heading only if one was specified previously.

Departing aircraft are NOT cleared to maintain their own separation. Advise if unable to maintain normal flight planned climbing IAS, this is used for separation.

13.2.4.5 VMC Minima

Below 5,000ft AMSL
5km visibility, 600mtr horizontally and 500ft vertically from cloud.

At or above 5,000ft AMSL
8km visibility, 2km horizontally and 1,000ft vertically from cloud.

13.2.4.6 Flight Planning

Air Traffic Control flight plans will be prepared by Operations and up-loaded for use prior to flight.

13.2.4.7 ETOPS Considerations

Careful inspection of routes flown should be made to ensure that the aircraft operates in non ETOPS airspace, if not ETOPS approved. It is possible to plan a non-ETOPS routing but this depends upon the opening hours of several Indonesian and Australian airfields.

Sectors between Australia and New Zealand must be carefully checked to ensure non ETOPS approved aircraft remain clear of ETOPS airspace.

A list of adequate airfields is included below.

13.2.4.8 Navigation

Prior to flight a check must be made that the correct Navigation Data Base is loaded and available for the duration of the flight.

A special Long Range navigation bag will be provided by the Company to include destination, alternate and adequate aerodromes as required for the whole route.

No plotting is required so plotting charts will not be provided. Ad-hoc flights to other destinations in the region may be provided with an individual trip kit. Verify that Jeppesen coverage is appropriate to the aircraft route before departure.

13.2.5 AIR TRAFFIC SERVICES

13.2.5.1 Australian Organised Track Structure AUSOTS

Australian Organised Track Structure (AUSOTS) is a trial system of flexible tracks for aircraft operating between Singapore and the Australian International Airports of Sydney, Brisbane and Melbourne.

AUSOTS Flex Tracks will be issued by the Track master and will each will have a defined period of validity. The majority of Singapore to Australia and return routes will be 1300UTC to 0000UTC and 0000UTC to 1300UTC. AUSOTS will normally be generated once a day.

AUSOTS will be available to all aircraft meeting the minimum requirements of RNP10 or RNP4. An aircraft losing its RNP capability and unable to continue navigating on the Flex Track will be re-cleared by ATC onto the fixed route structure.

Lateral separation is typically 50nms oceanic and 30nms domestic.

13.2.5.2 Pilot Activated Runway Lighting (PAL)

PAL is a facility to activate runway lighting at airfields unmanned at night.
VHF frequency assigned (e.g. Coolangatta 120.6 MHz). Make 3 transmissions of about 3 seconds each, over not more than 25 seconds. Lights remain activated for 60 minutes and can be reactivated at any time. If a problem, keep sending 3 second pulses with about 1 second between each pulse.

In New Zealand, key mike 5 times within 3 seconds – lights stay on for 20 minutes.

The wind indicator light will flash continuously during the last 10 minutes of lighting illumination to warn users that the lights are about to extinguish. To maintain continuity of lighting, repeat the activation process.

13.2.6 COMMUNICATIONS

Air to air chat frequency is 123.45

Radar coverage is good within the Sydney, Brisbane and Melbourne CTAs. Unless otherwise instructed, position reports are not required, but it is necessary to transmit level information at frequency change points.

13.2.7 EN-ROUTE WINDS

Expected 50% Wind Component (- = Headwind).

From	To	Jan	Apr	Oct
SIN	PER	0	6	7
PER	SIN	-1	-8	-10
SIN	SYD	6	20	25
SYD	SIN	-9	-24	-30
SIN	ADE	14	24	31
ADE	SIN	-16	-27	-34
SIN	BNE	7	18	22
BNE	SIN	-7	-20	-24
SIN	CNS	-8	-2	-2
CNS	SIN	8	1	2
CNS	AKL	36	46	46
AKL	CNS	-39	-49	-50
SIN	MEL	9	18	24
MWL	SIN	-12	-22	-29
ADE	SYD	46	46	58
SYD	ADE	-48	-48	-60
CNS	SYD	2	11	8
SYD	CNS	-6	-19	-18
MEL	SYD	33	26	36
SYD	MEL	-35	-28	-39
ASP	SIN	-5	-18	-22
SIN	ASP	5	16	20

13.2.7 METEOROLOGY

Amendments to issued route and terminal forecasts will be passed to the aircraft automatically by ATC. Any other met information required should be requested from the nearest VHF station.

Sydney has an HF weather broadcast.

Australia has a Met/ATC facility providing Controllers with information of hazardous weather conditions within a radius of 60nm of all major airports. ATC will vector aircraft around adverse weather. Also, relevant information will be broadcast on the ATIS.

When a landing is made on a wet runway, advise ATC of the braking characteristics i.e. good, medium, poor. Surface contamination will be described as 'damp', 'wet', 'water patches', or 'flooded'.

Low level windshear forecast service is provided at all major aerodromes (*except Learmonth)*. Windshear information will be included in the ATIS. Windshear encountered by aircraft should be reported as light, moderate, strong or severe.

13.2.7.1 Volcanic Activity

13.2.7.1.1 **New Zealand:**

The following active volcanic areas are located in New Zealand airspace:

Mt Ngauruhoe	S3909.6	E17538.0	(Taumarunui (IM)	114R/21DME)
Mt Ruapehu	S3917.5	E17533.7	(Taumarunui (IM)	132R/25DME)
White Island	S3731.3	E17710.7	(Whakatane (WK)	007R/27DME)

Aircraft conducting Commercial Air Transport Operations under IFR shall not be flown at less than 3,000ft above the elevation of these volcanoes when within 3nm of the positions noted. For published routes affected by Mt Ngauruhoe or Mt Ruapehu where navigational tolerances infringe the 3nm protective margins, Ohakea Radar may be utilised for avoidance tracks. Should this service be inoperative then compliance with 3nm / 3,000ft must be observed.

13.2.7.1.2 **Papua New Guinea:**

The following active volcanic areas are located in Papua New Guinea airspace:

Mt Ulawun	S0503.0	E15119.5	Active GND - 10,000 ft
Mt Langia	S0532.0	E14825.0	Active GND - 20,000 ft
Matupit	S0414.5	E15211.5	Active GND - 40,000 ft

13.2.8 EN-ROUTE

13.2.8.1 Adequate En-Route Aerodromes

The following table lists adequate airfields in the Australia and New Zealand areas. The table is provided for orientation purposes only and may not be updated. Check Ops Manual Part C, Jeppesen and Notams for up to date information before operation.

Airfield	Country	IATA	ICAO	H24
ADELAIDE	Australia	ADL	YPAD	✓
ALBANY	Australia	ALH	YABA	?
ALICE SPRINGS	Australia	ASP	YBAS	✓
AUCKLAND	New Zealand	AKL	NZAA	✓
AYERS ROCK	Australia	AYQ	YAYE	2300 - 0700
BRISBANE	Australia	BNE	YBBN	✓
BROOME	Australia	BME	YBRM	2300 - 1000
CAIRNS	Australia	CNS	YBCS	✓
CANBERRA	Australia	CBR	YSCB	✓
CHRISTCHURCH	New Zealand	CHC	NZCH	✓
DARWIN	Australia	DRW	YPDN	✓
GOLD COAST	Australia	OOL	YBCG	✓
KAITAIA	New Zealand	KAT	NZKT	?
LEARMONTH	Australia	LEA	YPLM	✓
MACKAY	Australia	MKY	YBMK	2100 - 0730
MELBOURNE	Australia	MEL	YMML	✓
PALMERSTON	New Zealand	PMR	NZPM	?
PERTH	Australia	PER	YPPH	✓
PORT HEDLAND	Australia	PHE	YPPD	2330 – 1100
ROCKHAMPTON	Australia	ROK	YBRK	2100 - 0900
ROTORUA	New Zealand	ROT	NZRO	?
SYDNEY	Australia	SYD	YSSY	✓
TOWNSVILLE	Australia	TSV	YBTL	✓
WELLINGTON	New Zealand	WLG	NZWN	✓

13.2.9 PERFORMANCE REQUIREMENTS

All performance data will be provided for destination airfields and alternates that are applicable. Should any further performance be required, contact Operations.

NOTE: Oxygen escape routes are not required over the land mass of Australia or New Zealand.

13.2.10 ARRIVAL

13.2.10.1 Destination Alternate Planning

Destination	Alternates	IATA / ICAO	Trk °T	Nm	Remarks
Adelaide	Melbourne	MEL / YMML	120	346	
	Canberra	CBR / YSCB	095	522	
	Sydney	SYD / YSSY	088	624	
Melbourne	Adelaide	ADL / YPAD	296	346	
	Canberra	CBR / YSCB	057	252	
	Sydney	SYD / YSSY	056	382	
Canberra	Melbourne	MEL / YMML	234	252	
	Sydney	SYD / YSSY	050	128	
	Adelaide	ADL / YPAD	270	522	
Sydney	Canberra	CBR / YSCB	238	128	
	Gold Coast	OOL / YBGC	019	365	
	Melbourne	MEL / YMML	232	382	
Gold Coast	Sydney	SYD / YSSL	198	365	
	Brisbane	BNE / YBBN	336	51	
	Mackay	MKY / YBMK	324	478	
Brisbane	Gold Coast	OOL / YBGC	156	51	
	Mackay	MKY / YBMK	329	435	
	Sydney	SYD / YSSL	194	403	
Mackay	Brisbane	BNE / YBBN	151	435	
	Gold Coast	OOL / YBGC	151	478	
	Cairns	CNS / YBCS	323	323	
Cairns	Mackay	MKY / YBMK	144	323	
	Darwin	DRW / YPDN	285	899	
	Port Moresby	POM / AYPY	011	452	
Darwin	El Tari	KOE / WATT	287	450	
	Broome	BME / YBRM	236	596	
	Alice Springs	ASP / YBAS	164	704	
Broome	Darwin	DRW / YPDN	058	596	
	Port Hedland	PHE / YPPD	235	250	
	Learmonth	LEA / YPLM	239	526	
Port Hedland	Broome	BME / YBRM	055	250	
	Learmonth	LEA / YPLM	245	278	
	Karratha	KTA / YPKA	259	106	

Destination Alternate Planning Cont.

Destination	Alternates	IATA / ICAO	Trk °T	Nm	Remarks
Learmonth	Karratha Perth Broome	KTA / YPKA PER / YPPH BME / YBRM	059 171 061	176 595 528	
Perth	Learmonth P Headland Ayers Rock	LEA / YPLM PHE / YPPD AYQ / YAYE	350 013 067	595 713 888	
Ayers Rock	Alice Springs Perth Adelaide	ASP / YBAS PER / YPPH ADL / YPAD	063 247 148	180 888 695	
Alice Springs	Ayers Rock Adelaide Broome	AYQ / YAYE ADL / YPAD BME / YBRM	242 162 296	180 729 743	
Auckland	Wellington Rotorua Palmerston	WLG / NZWW ROT / NZRO PMR / NZPM	180 133 169	258 98 203	
Rotorua	Auckland Palmerston Wellington	AKL / NZAA PMR / NZPM WLG / NZWW	313 193 199	98 136 205	
Palmerston	Wellington Rotorua Auckland	WLG / NZWW ROT / NZRO AKL / NZAA	211 013 349	71 136 203	
Wellington	Palmerston Rororua Auckland	PMR / NZPM ROT / NZRO AKL / NZAA	031 019 000	71 205 258	
Christchurch	Wellington Dunedin Invercargill	WLG / NZWW DUD / NZDN IVC / NZNV	038 213 224	165 177 249	
Dunedin	Christchurch Invercargill Wellington	CHC / NZCH IVC / NZNV WLG / NZWW	033 249 038	177 83 341	
Invercargill	Dunedin Christchurch Wellington	DUD / NZDN CHC / NZCH WLG / NZWW	069 044 045	83 249 415	

13.2.11 AIRFIELD BRIEFINGS

13.2.11.1 General

These notes are for orientation purposes only and may not be updated. All information should be checked with Airfield Briefings Maintained within the Q-Pulse system, Jeppesen's and Notams prior to departure.

A.) BRISBANE (YBBN / BNE), Australia

Mean temperatures are 28°C maximum and 21°C minimum in summer and 19°C and 10°C respectively in winter.

Rainfall is more frequent in the summer months reaching 7ins in January. Much of the rainfall occurs in showers and thunderstorms, the latter reaching a peak of about 6 a month October to February, which are more frequent than at Sydney. From November to April there is also a risk of a tropical cyclone from the Pacific Ocean affecting the coast of Queensland.

Some early morning mist or fog occurs, mainly in April to August, but less than at Sydney.

B.) DARWIN (YPDN / DRW), Australia

The temperature lies in the range of 20 - 32°C all year.

The aerodrome has two distinct seasons:

- DRY SEASON: May – October. Dry SE winds from the interior prevail, with speeds up to 20Kt. Strong sea breezes from the N – NW are also frequent in the afternoon. The only significant feature of the weather is dust haze, which may persist for some days and reduce visibility to 1.5nms. A temporary improvement can occur in the afternoon with a strong sea breeze.
- WET SEASON: November – April. The summer rainfall is heavy reaching 40cm in January. The frequency of thunderstorms is high at about 13 a month up to March. Conditions below 1nm and/or 500ft are almost entirely due to poor visibility and rain. Large isolated Cu often drift across the aerodrome, and night thunderstorms are particularly violent, especially near Melville and Bathurst islands just N of Darwin, where they occur with great regularity. Some drift over the land during the early hours of the morning. Deteriorations may be both rapid and severe, with visibility of only a few hundred metres in heavy rain. Although most restrictions are temporary, occasionally they are prolonged in cyclonic rain.

C.) SYDNEY (YSSY / SYD), Australia

Sydney International operates a curfew period 0500-0600 local time.
Sufficient fuel must be carried to allow for holding until the end of the curfew period and in the event of adverse weather.

Outbound aircraft are required to advise Sydney ground of destination and flight number before start.

A departure slot is required.

Local time UTC +10.

Prevailing winds are Westerly May to September, and Easterly October to April.

D.) PERTH (YPPH/ PER), Australia

Perth is situated in South Western Australia and the international airport YPPH is remote from suitable diversion airfields. Isolated Airfield Reserve fuel will be planned, this fuel provides for 2hrs holding. The last point of diversion will also be planned and presented on the plog.

Local time UTC+8

In the event of emergency, Pearce Airfield YPEA (military only) may be available but may not be filed as a diversion. Pearce does not operate 24hrs.

E.) MELBOURNE (YMML, MEL), Australia

Melbourne operates night curfew hours.

13.3.0 SOUTH AMERICA & CARIBBEAN AREA

13.3.1 EUROPE TO CARIBBEAN

Normally aircraft routing to this area have two choices of routes.

- First route – Europe to Newfoundland to Caribbean.
- Second route – Europe to Azores to Caribbean.

The route chosen will depend upon the aircraft type operating the route and the equipment carried. The route to Newfoundland and down to the Caribbean is through NAT HLA and WATRS + airspace.

South west bound aircraft will need to request crossing clearance from Shanwick as soon as possible after take-off. A full read back of the oceanic clearance including track co-ordinates is always required Aircraft can expect level restrictions until clear of the OTS.

Adams radar at Barbados operates a long-range radar service which should be used when approaching the Caribbean.

Returning aircraft will receive all their clearances on the ground prior to departure. Once more, a full read back should be made of the crossing clearance.

13.3.1.1 Communications

HF communications will be via networks or ‘families’ of frequencies, i.e. NAT-A. Note that participating stations share common frequencies, hence messages sent to one unit may be copied to others.

Communications can sometimes be difficult over the whole area due to the limitations of HF use.

13.3.1.2 Met Reports

These are required on all routes to the Caribbean It basically consists of adding wind and temperature information to the end of the message. If Met reports are required to be sent that information will be passed to the crew with the initial crossing clearance.

13.3.1.3 Transponders

Standard Oceanic procedures should be applied. Squawk A2000 30 minutes after entry into Oceanic CTA.

13.3.1.4 Cuban Airspace

Caribbean arrivals from the North will involve over flying Cuba. If needed HF Communications with Havana is through ‘BOYEROS RADIO’.

13.3.1.5 Volcanoes

Mexico – (Popocatepetl) 35 nm SE of Mexico City. Note all warnings about volcanic ash and activity will be disseminated by NOTAM.

13.3.2 EUROPE TO RECIFE (BRAZIL)

13.3.2.1 Routing

The route to South America lies either across Portugal then out over Madeira or the Canary Islands making landfall near Recife. Alternatively, aircraft will be routed towards Dakar in Senegal, crossing over to Recife.

13.3.2.2 Reduced Vertical Separation Minimum (RVSM)

RVSM airspace is now established between Europe and South America in the EUR / SAM Corridor. Vertical separation will be reduced to 1,000ft between FL290 and FL410 inclusive. "W" will be entered in item 10 of flight plans to indicate an aircraft is approved to operate in RVSM airspace. In addition, entry and exit points and requested flight level within the corridor are to be included in item 15 of the flight plan.

13.3.2.3 Longitudinal Separation

The application of 10 minutes' longitudinal separation using the Mach No Technique will be applied to aircraft operating at or above FL250 within the Canaries, Dakar Oceanic, Recife and SAL Oceanic FIRS *(EUR/SAM Corridor).* This may be reduced to 5 minutes if the preceding aircraft arriving at the OCEANIC entry point is flying at speed of Mach .06 greater than following aircraft.

Requirements when using the Mach No Technique:

(i) The planned True Mach Number for each portion of the route shall be specified in item 15 of the Flight Plan.

(ii) The Mach number approved by ATC shall be adhered to and approval shall be requested before making any change. If immediate temporary change is essential *(e.g. due to turbulence)*, notify ATC as soon as possible and advise adjacent aircraft using 121.5. Clearance for a prolonged reduction in Mach number may not be possible if the 10-minute separation is compromised.

13.3.2.4 Interception Procedures and Signals

Procedures and signals relevant to aircraft interception can be found within the Jeppesen manuals – section ATC.

13.3.2.5 ATC Procedures

When crossing FIR/Oceanic CTA boundaries S of 30ºN, except those between domestic FIRs, contact the onward ATC Unit 15 - 20 mins before entry into their airspace and request onward clearance.

Canaries Control has extended range VHF and Radar with a range of 300 - 400 nm from Las Palmas.

Sal should be contacted 15 mins prior to entry, normally on VHF, but this is not always possible. Sometimes Flight Plan details will not have been received.

After Sal FIR, Dakar Control should be contacted, normally on HF. Recife Radio and Dakar Control share the same family of frequencies, SAT. On approaching the South American coast, the flight will be handed over to Recife Centre on VHF.

13.3.2.6 EUR / SAM Corridor (RNP-10 Airspace)

RNP-10 compliance is required to transit the EUR/SAM corridor along the four main airways from Grand Canaries to the South American coast around Recife. The lower limit for RNP-10 varies with each airway.

RNP-4 may be imposed for suitably approved aircraft to operate with 30nm longitudinal separation. The Corridor remains clear of the NAT HLA area.

13.3.3 SOUTH AMERICA

13.3.3.1 Operational

The South American continent covers a vast area. For example, Brazil is bigger than Australia. Study of an elementary atlas of this area is useful.

13.3.3.2 Aids

The facilities at major aerodromes are generally good, although Radar assistance is somewhat hampered by the language problem. Un-serviceable navaids may not be correctly notified by NOTAM.

13.3.3.3 Safety Altitudes

The safety altitude around most of the destinations is high. Any departure from the designated holding areas, or specified procedures can lead to a rapid degradation of terrain clearance. Safety altitudes need to be carefully monitored when diverting, especially in the event of an engine failure.

There have been numerous instances of flights being cleared by ATC to an altitude below the MSA. In a Non-Radar environment, the controllers assume that the crew know their position, and when they can descend. Hence, prior to descent, check the MSA, and keep track of position.

When Radar is not available, a published or assigned altitude will be given which must be reached before continuing past a specified fix. It may be necessary to enter a hold to climb or descend as necessary to achieve this.

13.3.3.4 Air Traffic Control

SOUTH AMERICAN ATC CONTROLLERS IN GENERAL UNDERSTAND THE TERM “DIRECT” TO MEAN TO PROCEED WITHOUT DELAY ALONG THE FLIGHT PLANNED ROUTE.

PILOTS RECEIVING A “DIRECT” CLEARANCE IN S.AMERICA SHOULD VERIFY THE INTENDED MEANING CHECKING MSA IF NECESSARY.

A call to ground control prior to start is expected at most aerodromes. ATC clearance is not normally given until the aircraft is taxiing.

Due to traffic and terrain, many SIDs involve multiple turns and altitude requirements.

Do not rely on Radar monitoring to pick up any errors.

ATC coordination is not always efficient, so re-confirm clearances when given a frequency change.

VFR traffic will be controlled in local language and traffic information may be poor; a good look out is required. Such traffic may be encountered at high altitude (10,000ft) due to the high terrain. Most Latin American airlines turn their landing lights on in the aerodrome area.

13.3.3.5 Communications

Language is a major problem in South America; English comes a very poor second to Portuguese or Spanish. Hence do not be surprised if you cannot understand a controller, or him you. Allow plenty of time to negotiate, use standard phraseology, speak slowly and distinctly and be patient and alert always. Do not use slang or such terms as "Boundary" or "FIR", use the correct phonetic designator.

Use the word "decimal" rather than "point" for frequencies etc.

Listen carefully; transmissions are sometimes weak and garbled. If a controllers response to a message is a simple "Roger", be careful as he may not have understood.

Blanking of signals by high ground is a problem.

Note the correct name for the ATC unit especially when calling an aerodrome. The latter may not be the same as the aerodrome name.

13.3.3.6 Take-off

Due to terrain, and numerous crossing restrictions, SIDs must be followed carefully. Basically, the most prudent philosophy is to climb as quickly as possible.

13.3.3.7 General

Crime is a major problem at most destinations in South America.

Full use should be made of safes at hotels. Be prepared to give money away if challenged.

Aircraft security seals must be applied at all times when the aircraft is left unattended including for overnights.

13.3.3.8 Water

Only upload water when absolutely necessary. Always check that water uploaded to the aircraft is potable. Bottled water can usually be relied upon both for drinking and for aircraft use.

13.3.3.9 Terminology

- The term "Latin America" is preferred to "South America".
- Use the name of the destination aerodrome, and not just the city name, e.g:
  - "El Dorado International Airport, Bogota".
- Generally: Temperature - centigrade
  Altitude - metres
  Speed - Km/hr.

13.3.3.10 Customs

To ensure as speedy clearance as possible please ensure that at least 2 copies of the "General Declaration" form are completed prior to landing.

General rules!

a) Do not argue, they probably will not understand.

b) Obtain advice from the local handler, and if necessary ask him to accompany crew through Customs.

c) It may be expedient to wear uniform through Customs.

13.3.4 BRAZIL

Brazil is a vast area – it is larger than Australia

Air traffic control in the upper airspace is by Recife and Brasilia centres, and is generally good. Brasilia will identify the flight on initial contact and then pass the message "under Radar surveillance". This indicates that position reports may be omitted. ATC will occasionally confirm that the flight is passing a reporting point to indicate that surveillance is maintained. Most of the population live along the coast, and hence most aerodromes and air traffic is in this area. Brazilian territory extends 200nm from the coast.

Large BALLOONS and balloon type objects may be encountered over Brazil. They are a religious tradition; the activity reaches a peak from mid Jun to Aug. Aircraft have, in the past, been forced to take avoiding action; ATC are unlikely to warn the aircraft.

Descent
ATC may clear aircraft to set the QNH and descend to an altitude which is above the Transition Level. This procedure is used when a continuous approach is anticipated without long periods of level flight following initial descent from cruising level.

This procedure is used at Rio.

Magnetic variation in N and E Brazil is more than 20ºW.

Emergency
When an aircraft is in an emergency condition within the Brazilian FIR ATC shall be informed using the following classifications:

WHITE ALERT	Possibility of an accident are remote but there are signs of danger that may require a warning to ATC. Example: Aircraft in emergency due to low fuel status.
YELLOW ALERT	There is a good chance of an aeronautical accident, and the rescue services are required to attend.
RED ALERT	An aeronautical accident is unavoidable or it has already happened.

All emergency messages will be preceded by MAYDAY, MAYDAY, MAYDAY or PAN, PAN, PAN in case of urgency.

13.3.5 CHILE

Semi-circular cruising altitudes are non-standard - see Jeppesen Charts.

Crews of flights which cross the ANDES MOUNTAINS need to be aware of the possibility of VERY SEVERE TURBULENCE due to mountain waves and rotors.

The crossing between Mendoza, Argentina and Santiago, Chile is particularly prone to this phenomenon but it is easily forecast when the QNH between the two airfields differs by 10mb or more. When these conditions exist, it is prudent to consider a more southerly routeing.

Ensure cabin is secure and the seat-belts signs are on before commencing a crossing of the Andes Mountains.

13.3.6 COLUMBIA

Much of Columbia is at very high altitude, and the aerodromes far apart. Hence it is as well to plan ahead for engine or pressurisation failure. Review ‘Oxygen Escape Routes provided by operations in the Trip Folder.

Apart from Bogota, few aerodromes have good facilities. Cb build ups are common, up to very high altitude, and the use of weather Radar essential.

Carefully brief the cabin staff regarding seat belt warnings. Mountain waves off the Andes may give very severe clear air turbulence.

13.3.7 VENEZUELA

Apart from Caracas, few aerodromes have good facilities.

Traffic between Maiquetia ACC and Piarco ACC is co-ordinated.

ATC understanding of English is limited – use standard vocabulary, and expect a hesitation before replies from ATC.

At some smaller aerodromes ATC, will be conducted in English by a translator brought in for the arrival. This person is only a translator with no formal ATC training.

You will be required to provide at least one copy of a General Declaration form and we have been asked to provide as many as twenty.

Order fuel early as it can take considerable time to arrive. Bowser’s must be loaded for each flight.

13.4 NORTH AMERICA

13.4.1 GENERAL

Please also refer to the sections of this manual that deal with NAT HLA procedures.

13.4.2 CANADA

13.4.2.1 Airspace Description

13.4.2.2 High Level Airspace

Within Southern Control Area Controlled Airspace - At and above 18,000ft.

Within Northern Control Area Controlled Airspace - At and above FL230.

Within Arctic Control Area Controlled Airspace - At and above FL280.

Airways referred to as Jet Routes.

13.4.2.3 Low Level Airspace

Low Level Airways up to but not including 18,000ft.

Airways referred to as Victor Routes.

13.4.2.4 CMNPS Airspace

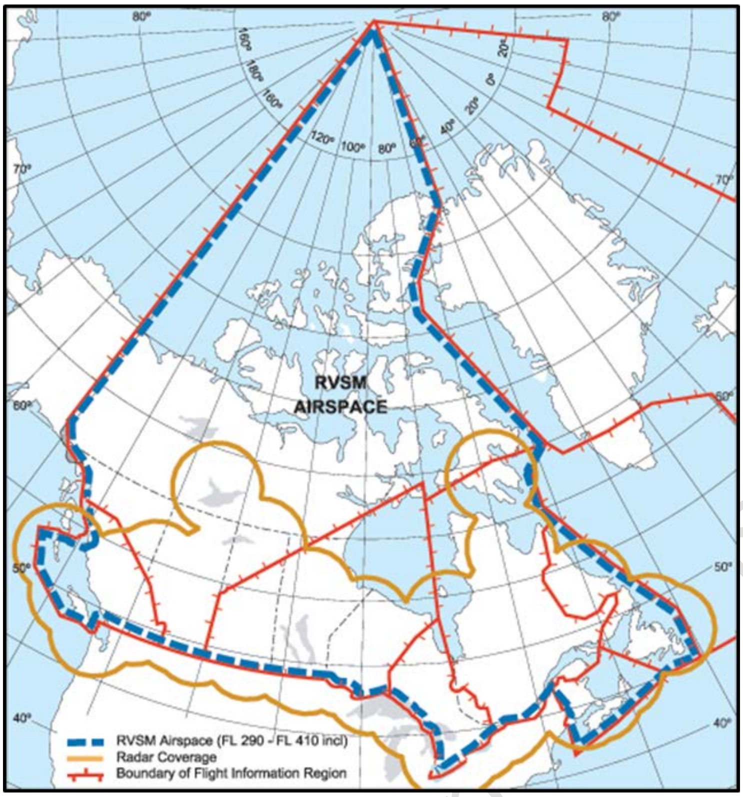
Canadian Minimum Navigation Performance Specification Airspace. Canada has implemented MNPS in the areas shown following.

13.4.2.5 RVSM

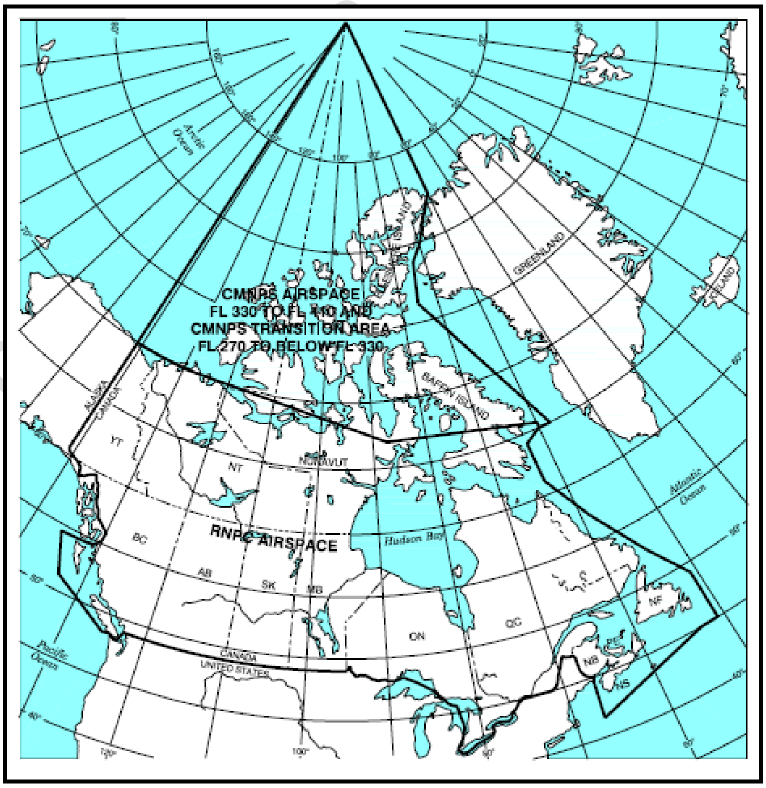
Within Northern Canadian airspace Reduced Vertical Separation Minimum (RVSM) is used; vertical separation may be reduced from 2,000ft to 1,000ft. There is a minimum equipment requirement and an associated altimeter check before flight into RVSM airspace – see relevant manual for aircraft type. "W" is entered in Item 10 of the Flight Plan to indicate an aircraft is approved to operate in RVSM airspace.

Transition Area - see below. The RVSM Transition Area comprises parts of Gander, Moncton and Montreal ACCs and extends Westwards between 52°N and 57°N.

13.4.2.6 Canadian RVSM Airspace



13.4.2.7 Canadian MNPS Airspace



13.4.2.8 Northern Track System

A Northern Track System in the Northern Control Area interacts with the established Airway System in the Southern Control Area. This system consists of Primary Tracks and a number of secondary Laterals. Position reports are given using the track code letter and longitude, e.g. BRAVO 80(W) (TIME). FLIGHT LEVEL. LATERAL 3 90(W) (TIME) etc.

13.4.2.9 Southern Control Area Track System - Winnipeg/Montreal FIRs

To expedite traffic flow, a system of commonly used routes has been designated from 18,000ft amsl and above, for use by traffic between the Mid-West / Western USA and Europe. Each route has been assigned a code letter.

13.4.2.10 VORs in Northern Canada

NOTE: Many VORs are orientated on True North. These are generally in the magnetic compass unusable or erratic areas. The charts are marked to indicate this.

13.4.2.11 Altimeter Setting Procedures

Canadian airspace is divided into two regions for altimeter settings:

a) **Altimeter Setting Region** - QNH up to 18,000ft. Aircraft use the altimeter setting of the nearest station along the route of flight.

   Above 18,000ft altimeter is set to 29.92 inches (1013.2 mbar).

b) **Standard Pressure Region** - Aircraft in uncontrolled airspace within the Standard Pressure Region set Standard Pressure, except for take-off and landing.

The Standard Pressure Region is the sparsely inhabited area of Canada where pressure data is generally not available.

Altimeter settings given in inches.

13.4.2.12 Runway Heading

When cleared to "fly or maintain runway heading", pilots are expected to FLY THE RUNWAY HEADING WITH NO DRIFT CORRECTION applied.

13.4.2.13 Cruising Levels

Pilots may request flight levels not appropriate to the airway or direction of flight but should make the reason for the request known to ATC e.g. icing, turbulence or fuel considerations.

13.4.2.14 MACH No.

Advising ATC prior to any change of Mach No is particularly important in Canadian Domestic Airspace; this includes the change to economy Mach No after a N Atlantic crossing at a fixed Mach No.

13.4.2.15 Cruising Levels in The Northern Control Area

In this airspace, TRUE track is used to determine cruising altitude for direction of flight.

13.4.2.16 Temperature Correction to Minimum Operating Altitude

Very low air temperature causes an altimeter to over-read. The error is approximately 4% of height per 10ºC drop below ISA of the mean temperature of the air layer beneath the aircraft.

e.g. Indicated Altitude - 10,000ft.
OAT (of layer beneath) - ISA Minus 30º.
Altimeter OVERREADS by 1,200ft. (FCO 1026)

The AIPs of Canada and the USA suggest that in cold conditions pilots should operate at least 1,000ft above the published minimum en-route altitude.

See - Altitude Correction Chart, Pressure Altimeter Errors. This chart is reproduced from the Canadian AIP.

13.4.2.17 In-Flight Contingencies

The Jeppesen Manual – ATC Canada section contains in flight contingency procedures for Canada which call for turns away from track to be made to the RIGHT if possible.

13.4.2.18 SCATANA

Security Control of Air Traffic and Air Navigation Aids. When SCATANA Rules are in effect aircraft must comply with ATC instructions to change course, altitude, or land.

Full details can be found in Jeppesen Manuals for Canada.

13.4.2.19 Interception Procedures

Procedures and signals relevant to aircraft interception can be found within the ATC section of the Jeppesen Manuals.

13.4.2.20 Reduced Position Reports

In areas of Radar coverage, position reports may be discontinued when authorised by ATC. Pilots will be informed when to resume normal reporting procedures.

13.4.2.21 Aerodrome Operating Minima (AOM) in CANADA and the USA

Special rules apply. See Jeppesen Manuals.

13.4.2.22 Flight Planning Minima for Alternate Aerodromes

These are published in the Jeppesen Manuals however once a diversion is in progress normal minima apply to the aerodrome that is chosen for the diversion.

13.4.2.23 Communications

Over Canada monitor 121.5 without Selcal.

VHF is used whenever possible supplemented by HF facilities.

13.4.2.24 Holding

Right Hand adjusted to achieve 1min at or below 14,000ft or 1½min above 14,000ft inbound to the fix. Speeds are:

- Up to 14,000ft 230kts or less
- Above 14,000ft 265kts or less

13.4.2.25 Speed Control

Aircraft flying in controlled airspace and below 10,000ft amsl are limited to maximum speed of 250kts. Below 3,000ft amsl and within 10nm of an airport speed is limited to 200kts for jets. Aircraft unable to manoeuvre safely at these speeds should operate at minimum safe speed.

Aircraft may operate at more than 250kts below 10,000ft when:

a) Climbing from 3,000ft to an altitude or FL exceeding 10,000ft.

b) In level flight between 3,000ft and 10,000ft when the climb is interrupted by ATC.

13.4.2.26 Other Traffic Information

Radar Control advises aircraft of unidentified traffic in the near vicinity; they will also, on request, provide vectors to avoid this traffic.

13.4.2.27 Visual Approach

A "visual approach" is an approach by an IFR flight in which all or part of the instrument approach is not completed. Whenever the cloud ceiling is at least 500ft above the maximum radar vectoring altitude and the visibility at least 5 statute miles, IFR aircraft may be vectored to the airport traffic circuit and asked to complete a visual approach provided:

a) The pilot has the airport in sight.

b) The pilot reports sighting preceding IFR or VFR traffic.

Radar service is terminated when the pilot is told to contact Tower.

13.4.2.28 Weather Reports

In N America / Canada visibility and RVR are recorded using statute miles and feet *(for detail of more subtle differences Jeppesen Manuals.*

13.4.2.29 Flight Service Station - (FSS)

A network of Flight Service Stations exists in Canada to provide weather and NOTAM information. It is particularly useful after a North Atlantic crossing for updates to weather information. Relay of IFR position reports and ATC clearances is also available.

Initial contact is on 126.7 VHF, 5680 HF; the request can then be directed to the station coming in with the greatest clarity. The call should be something like:

"Any Flight Service Station this is Gama 123" and then in the case of Moncton FSS responding first and with greatest clarity, the subsequent transmission would be:

"Moncton Flight Service, Gama 123 requesting …………"

FSSs usually operate H24 but may be difficult to raise during the 10mins before each hour - at this time the operator is probably outside taking weather observations and then typing them into the network computer.

13.4.2.30 ATIS

Wind direction, as usual, will be ºM. If true is used this will be declared at the start of the message.

13.4.2.31 Braking Co-Efficient - (JBI)

JBI of Runways contaminated with snow or ice, at selected aerodromes is appended to weather reports, and given by the control tower at controlled aerodromes. A numerical scale is employed, details of which are to be found in Part A of the OM.

13.4.2.32 En-Route Diversion Aerodromes N. CANADA

The following are well equipped airfields N of about 50ºN:

CYQX Gander	48 56N 54 34W	CYYT St Johns	47 37N 52 45W
CYYR Goose	53 19N 60 25W	CYXE Saskatoon	52 10N 106 42W
CYFB Iqaluit	63 45N 68 33W	CYEG Edmonton	53 19N 113 35W
CYYQ Churchill	58 44N 94 04W	CYYC Calgary	51 06N 114 01W
CYWG Winnipeg	49 55N 97 14W		
CYZF Yellowknife	62 28N 114 27W	*(Limited Hrs)*	

NOTE: Iqaluit is also known as Frobisher Bay or Fro Bay.

13.4.3 USA

13.4.3.1 Airspace Description

Aeronautical Information Manual (AIM) - published by the FAA; it is a pilot's guide to procedures in the USA. AIM references below are paragraph numbers or pilot / controller glossary (PCG) page numbers.

Airways/Route Systems - US airspace is divided into a two-level structure:

a) **Federal Airways** - (Victor Routes) up to, but not including 18,000ft

b) **Jet Routes** - From 18,000ft to FL 450 inclusive.

Clearances are often given direct from present position over long distances.

National Route Program (NRP) enables more flexible use of US airspace. At the flight planning stage, the number of reporting points is reduced to a minimum over long distances using published guidelines; the abbreviation NRP is added to Item 18 of the ATC Flight Plan.

Uncontrolled VFR Traffic operating below 18,000ft is a problem for IFR flights in US airspace. The aircraft are not necessarily Transponder equipped and traffic information from ATC may be very late. AIM 4-4-1(*Transponders are not mandatory below 10,000ft outside TMAs).*

ATCAA - ATC Assigned Airspace - is temporary reserved airspace for military activity, which is not published internationally by Notam but is controlled by ATC.

As these temporary areas are not published flight planning cannot take account of them so ‘on the day tactical’ re-routes may be required which will be managed by the ARTCC controlling the area. Deviations will be minor with some level capping or vectors provided, dependent on the use or need of the military.

13.4.3.2 Procedures

13.4.3.2.1 **VFR Traffic in TMAs**

Expect such traffic to be separated from your aircraft by as little as 500ft vertically and 1½ miles laterally (thus, expect relatively frequent TCAS warnings). AIM 3-2-3

Traffic Advisories - below 18,000ft and outside TMAs ATC **will give information on VFR traffic but will not necessarily give radar vectors around the traffic unless requested**. AIM 5-5-10

A British aircraft passing 10,500ft out of Chicago (1998) received a warning of VFR traffic at 12 o’clock, 12 miles and 11,000ft. No vectors around the traffic were offered and an airprox incident resulted.

During an arrival, an aircraft may be vectored outside the TMA for spacing. ATC should *(but might not)* advise the aircraft that it is leaving Class B airspace; the inference is that vectors should probably be requested following a Traffic Advisory.

13.4.3.3 Altimeter Setting Procedures

a) For cruise below 18,000ft - Altimeter to be set according to the reported altimeter setting of a station along the route (QNH).

ENSURE DESTINATION QNH IS SET ONCE IN CONTACT WITH APPROACH CONTROL;

THEY MAY NOT ISSUE A SPECIFIC INSTRUCTION TO DO SO.

b) For cruise at or above 18,000ft - Altimeter to be set to 29.92 ins/1013.2 mbs.

Altimeter settings are given in inches.

See under Canada, above, for low temperature altimeter errors.

13.4.3.4 Speed Control

In accordance with Federal Aviation regulations:

a) Aircraft speed shall not exceed 250kts IAS during flight below 10,000ft asl, unless otherwise authorised. Note that maintaining a speed above 250kts, level at 10,000ft, is acceptable. The practice of (a) maintaining high speed on arrival

or

b) increasing speed above 250kts on departure, while the aircraft is below 10,000ft and more than 12nm off the coast (e.g. JFK) **MUST** be co-ordinated with ATC.

c) Airport Traffic Area *(4.34nm radius of an airport, ground level to, but not including 3,000ft).* Aircraft speed shall not exceed 200kts.

d) If the minimum airspeed for safe manoeuvrability is greater than the above, the aircraft may be operated at that speed *(controllers advise that this should be coordinated with ATC).*

The 250kt restriction below 10,000ft on departure is waived at some USA airfields; check AIS and Jeppesen Departure Plates.

13.4.3.5 Maintain Clearance

The altitude / FL instructions in an ATC clearance will normally require that a pilot "MAINTAIN" an altitude / FL.

When ATC has not used the term **"AT PILOTS DISCRETION"** nor imposed any climb or descent restrictions, pilots should initiate climb or descent promptly on acknowledgement of the clearance to the level specified in the MAINTAIN instructions. Descend or climb as rapidly as is practicable to 1,000ft above or below the assigned altitude, and then at 500 - 1500ft/min until the assigned altitude is reached. AIM 4-4-9.

13.4.3.6 Descend Via

Clearance - authorises pilots to vertically and laterally navigate in accordance with a depicted procedure, e.g. “Descend via the Civit One Arrival.”
AIM 5-4-1.

13.4.3.7 Vacating Altitudes / FLs

Vacating any previously assigned altitude / FL for a newly assigned altitude / FL must be reported to ATC. Reaching an assigned altitude / FL is not subject to a report.
AIM 5-3-3.

13.4.3.8 Cruise Clearance

The term CRUISE may be used instead of maintain to assign a block of airspace, to a pilot, from the minimum IFR altitude up to and including the altitude specified in the cruise clearance. The pilot may level off at any intermediate altitude within this block of airspace. Climb / descent within the block is to be made at the discretion of the pilot.

However, once the pilot starts descent and verbally reports leaving an altitude in the block, he may not return to that altitude without additional ATC clearance.

AIM 4-4-3.

13.4.3.9 Transponders

Code 7777 is reserved for use by military aircraft and must NOT be used by civil operators.
AIM 4-1-19

13.4.3.10 Communications

On first contact with a US ATC Centre, give altitude / Flt Level. Subsequently, advise ATC altitude / Flt Level each time a frequency change is made.
AIM 5-3-1

13.4.3.11 Call-signs

Call-signs - are spoken using group form for the numbers:

Assume in Hawker aircraft

Gama 0866 is transmitted as **HAWKER GAMA EIGHT SIX SIX**
(not Zero Eight Six Six).

Gama 11 is transmitted as **HAWKER GAMA ELEVEN**
(not One One)

Gama 178 is transmitted as **HAWKER GAMA ONE SEVENTY EIGHT**
(not One Seven Eight)

Gama 8663 is transmitted as **HAWKER GAMA EIGHTY SIX SIXTY THREE**
(not Eight Six Six Three).

AIM 4-2-4.

13.4.3.12 Reduced Position Reports

When informed by ATC that their aircraft is in "RADAR CONTACT", pilots will discontinue position reports over compulsory reporting points. Pilots must report when vacating any previously assigned altitude / flight level for a newly assigned altitude / flight level.

Pilots must resume normal position reporting when ATC advise "RADAR CONTACT LOST" or "RADAR SERVICE TERMINATED".
AIM 5-3-2

13.4.3.13 Holding

RH adjusted to achieve 1 min at or below 14,000ft or 1½min above 14,000ft inbound to the fix. Speeds are:

- Up to 6,000ft 200kts or less
- Above 6,000ft to 14,000ft 230kts or less, 210kts or less when published as an exception
- Above 14,000ft 265kts or less

AIM 5-3-7.

13.4.3.14 Minimum Fuel Advisory

Advise ATC when fuel has reached a state where any undue delay at destination is unacceptable. This call does not declare an emergency and does not imply a need for traffic priority. On initial contact the term "MINIMUM FUEL" should be used after your call-sign, e.g. Philadelphia Approach, GAMA 123, Minimum Fuel, ---- .

IF TRAFFIC PRIORITY IS REQUIRED YOU MUST DECLARE AN EMERGENCY, reporting fuel remaining in minutes.

AIM 5-5-15.

13.4.3.15 Cleared for Approach

Aircraft is released from previous speed controls unless the controller advises otherwise.

AIM 4-4-11

It is important to maintain speed (usually 250kts) during the final stages of the let down below 10,000ft; slowing down before cleared to do so by ATC may give rise to an instruction to increase or maintain speed, which may lead to a rushed approach.

13.4.3.16 High Density Altitude - (HDA) Operations (“Hot and High Operations”)

Vigilance is required when operating to an Airfield with a High Density Altitude or an Airfield with an Ordinary Elevation but High Temperatures, due the increase to TAS.

See notes included in this manual.

13.4.3.17 ILS Critical Area Protection

At or above ceiling 800ft and / or visibility 2sm:

a) No critical area protective action is provided under these conditions.
b) A flight crew under these conditions should advise the tower that it will conduct a COUPLED approach to ensure that the ILS critical areas are protected when the aircraft is inside the ILS MM.

AIM 1-1-10

Pilots are cautioned that vehicular traffic not subject to ATC may cause momentary deviation to ILS course or glide slope signals.

AIM 1-1-10

Thus, the reasonable expectation that, once cleared for an ILS approach in moderate weather conditions, the ILS would be protected, does not hold good in the USA.

Crews should therefore be cautious of localiser and glide path signals during an ILS approach in weather conditions of ceiling 800ft and / or 2sm or better.

13.4.3.18 Parallel ILS Approaches

Airports having parallel runways separated by at least 2,500ft may operate parallel ILS approaches to both runways. Aircraft will be given staggered separation from aircraft on the adjacent localiser.

AIM 5-4-12

13.4.3.19 Simultaneous Parallel ILS Approaches

Airports having parallel runways separated by at least 4,300ft may operate a system of simultaneous ILS approaches to both runways. The 4,300ft limit may be reduced with increased ATC monitoring of aircraft on final approach; the term ILS Precision Runway Monitor (ILS PRM) may be used. SIMULTANEOUS CLOSE PARALLEL APPROACH is the term used to describe this reduced separation.

AIM 5-4-12

Gama Aviation is NOT APPROVED for CLOSE SIMULTANEOUS PARALLEL APPROACHES.

13.4.3.20 DME ARC Procedures

The procedure is to fly at the DME range as specified on the chart or as given by ATC to intercept the relevant approach, eg "Gama 123 Arc 10 to RWY 07R".

The requirement is to fly a constant DME range of 10nm until intercepting the final approach to RWY 07R.

AIM PCG A-9

13.4.3.21 Simultaneous Converging Approaches

Airports may conduct simultaneous approaches to converging runways. Straight in approaches and landings must be made. Pilots will be informed on initial contact or via the ATIS.

AIM 5-4-16

13.4.3.22 Side – Step Manoeuvre

ATC may authorise an approach procedure which serves either one of parallel runways that are separated by 1,200ft or less followed by a straight-in landing on the adjacent runway *e.g. "Cleared for ILS runway 07 left approach, side-step to runway 07 right".*

Pilots are expected to commence the sidestep manoeuvre as soon as possible after visual contact with both runways has been made.

AIM 5-4-17.

13.4.3.23 Land and Hold Short Operations (LAHSO)

Landing and holding short of an intersecting runway, taxiway or designated point on a runway. Yellow, parallel hold-short lines will be painted across the runway and in-pavement lighting may be included. AIM 4-3-11

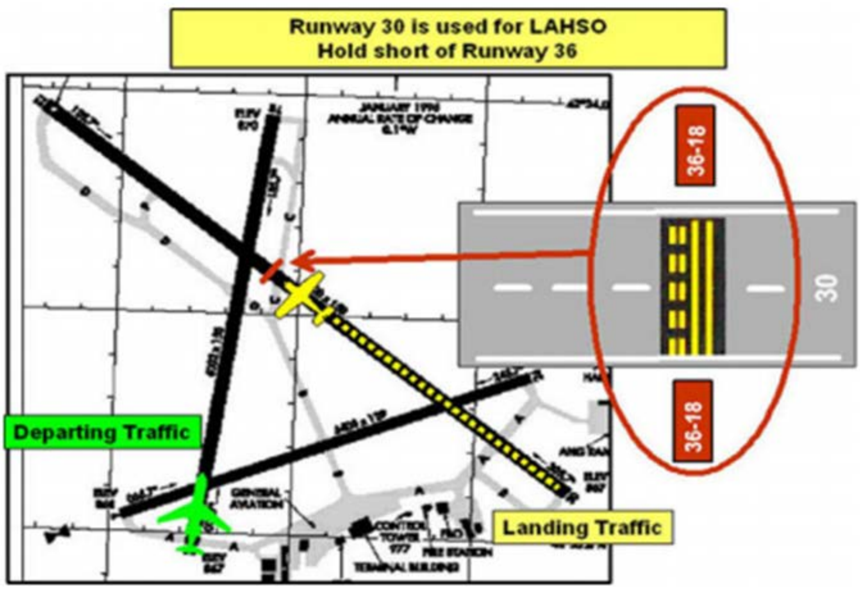
Gama's policy is NOT TO PARTICIPATE in LAHSO for landing or departure, neither actively (cleared to land and hold short), nor passively *(other aircraft cleared to land and hold short).* If ATIS advises LAHSO in use, advise ATC "UNABLE TO PARTICIPATE" on first contact.

Crews should refuse any LAHSO offered by ATC.

If in doubt confirm with ATC that other aircraft will not carry out LAHSO on any intersecting runway that may be in use for your arrival or departure.

It should be born in mind that, if LAHSO are underway at an airport, an aircraft landing on another runway may fail to 'hold short'.

Example LASHO



13.4.3.24 Visual Separation

Acceptance of instructions to follow another aircraft or to maintain visual separation from it, is an acknowledgement that the pilot will avoid the other aircraft or maintain in-trail separation and accept responsibility for wake turbulence separation, *(visual separation instructions are used at night).*

AIM 5-5-12.

13.4.3.25 Lost Visual Reference

The missed approach for the instrument let down just flown should be carried out. To establish on the missed approach course, make a climbing turn towards the landing runway and then continue the turn until established on the missed approach course. This ensures that the aircraft remains within the circling area while climbing to a safe altitude.

AIM 5-4-19

13.4.3.26 Visual Approach

May be conducted on an IFR Flight Plan and authorises a pilot to proceed visually to the airport, often reducing track miles to landing. The pilot must have either the airport or the preceding aircraft in sight. If the pilot has the airport in sight but cannot see the aircraft to be followed, ATC may clear the aircraft for a visual approach; however, ATC retains both separation and wake vortex separation responsibility.

When visually following a preceding aircraft, acceptance of the visual approach clearance constitutes pilot acceptance of separation and wake vortex separation responsibility.

AIM 5-4-20

If not familiar with an airfield, be certain the correct airfield is identified before accepting a visual clearance, and be aware of the consequences of doing so.

13.4.3.27 Visual Approach Go Around

A visual approach has no missed approach segment. If a Go Around is necessary, instructions from ATC should be given.

However, IF ATC FAIL TO GIVE INSTRUCTIONS THEN THEY MUST BE IMMEDIATELY REQUESTED; do not follow an instrument missed approach published for the same runway.

AIM 5-4-20.

See ‘Go-arounds’ below.

13.4.3.28 Go-Arounds

The go around to be flown in the event of a missed approach depends on the clearance given by ATC. If ATC say, for example, “Cleared ILS approach Runway 13L”, anticipate flying the procedural missed approach procedure published for ILS 13L, if necessary *(even if visual with the runway).*

If, possibly during the same approach, ATC say “*Cleared visual approach Runway 13L”*, anticipate climbing straight ahead and calling for ATC instructions if unable to complete the landing. In this latter case the crew are responsible for separation from other traffic.

See *‘Visual Approach’* and *‘Visual Approach Go Around’* above.

13.4.3.29 Landing Clearance

Expect to receive landing clearances with one or more aircraft still ahead of your aircraft. The clearance you are receiving is to land in sequence if it is safe to do so. This sort of landing clearance requires special vigilance at night.

13.4.3.30 Taxying after Landing

After landing call ground control only when instructed and remain on the taxiway used to clear the runway until clearance is received to continue.
(Controllers in the USA are particularly sensitive over this issue).

AIM 4-3-20

13.4.3.31 Ground Movement

Movement of aircraft or vehicles on non-movement areas is the responsibility of the pilot, the aircraft operator, or the airport management.

AIM 3-7-2

CREWS ARE REMINDED OF THE IMPORTANCE OF STRICTLY ADHERING TO ALL TAXI CLEARANCES AT US AIRPORTS. ALL RUNWAY HOLD SHORT INSTRUCTIONS SHOULD BE READ BACK TO ATC WHEN REQUESTED. THE FAA WILL LEVY SUBSTANTIAL FINES ON PILOTS VIOLATING TAXI CLEARANCES ESPECIALLY ANY RUNWAY INCURSION. EXTRA CARE MUST BE TAKEN DURING PERIODS OF REDUCED VISIBILITY SUCH AS FOG, HEAVY RAIN OR SNOW.

IF IN DOUBT ABOUT ANY TAXI CLEARANCE STOP AND REQUEST CLARIFICATION FROM ATC.

13.4.3.32Taxi to Clearance

In the absence of holding instructions a clearance to "taxi to" an assigned take off runway *(or other point)* **is a clearance to cross all runways that intersect the taxi route.**

AIM 4-3-18

13.4.3.33 ILS Critical Area Holding Signs

'ILS' in white on a red sign confirms the hold markings on the taxiway, indicating the proximity of the ILS critical area.

AIM 2-3-8

13.4.3.34 Runway Centreline Lighting System (RCLS)

Installed on some precision approach runways. Lights are spaced at 50ft (15.24m) intervals.

AIM 2-1-5

13.4.3.35 Changing to Tower Frequency before Take Off

Unless otherwise instructed, remain on ground control frequency until ready to request take-off, then change *(without being instructed)* to tower frequency.

AIM 4-3-14

Do not enter active runway until specifically cleared to do so by ATC. This will either be as an instruction to 'taxi into position and hold' or 'cleared for take-off'.

13.4.3.36 Use of Landing Lights Prior to and for Take-Off

Pilots are encouraged to turn on their landing lights when taxiing on, across, or holding in position on any runway and either after take-off clearance has been received or when beginning the take-off roll.

AIM 4-3-23

13.4.3.37 Wake Turbulence Separation

Timed OR radar distance separation is applied between departing aircraft.

AIM 7-3-9

If a timed separation is to be insisted upon rather than accepting radar distance separation, ATC must be informed before the aircraft enters the runway for take-off.

13.4.3.38 Runway Heading

When cleared to "fly or maintain runway heading", pilots are expected to FLY THE RUNWAY HEADING WITH NO DRIFT CORRECTION applied.

AIM PCG R-5

13.4.3.39 Omission of Departure Control Frequency

Controllers may (*and normally do*) omit the departure control frequency if an assigned departure procedure has a published frequency. Use the departure frequency shown on the Jeppesen departure plate.

AIM 5-2-5

13.4.3.40 Runway Distance Remaining Signs

A white numeral on a black sign indicates the number of thousands of FEET remaining to the end of the runway, e.g. 3 indicates 3,000ft remaining. These signs may be installed along one or both sides of the runway.

AIM 2-3-13

13.4.3.41 Abbreviation of Frequencies

Ground frequencies may be abbreviated to the decimal number e.g. 121.7 becomes “point seven”.

AIM 4-3-14

13.4.3.42 Delay / ATC Flight Plan

To ensure that a flight plan remains active pilots, whose actual departure time will be delayed by more than 1 hour, should inform ATC of the new ETD.

AIM 5-1-11

13.4.3.43 Airways Clearance Read-Back

At most USA airfields, it is not necessary to read back the full airways clearance **IF** the route is as flight planned. Read back only the assigned transponder code.

13.4.3.44 EFC *(Expect Further Clearance)* Time

The time a pilot can expect to receive clearance beyond a clearance limit.

AIM PCG - E2

At an approach holding point this is equivalent to an EAT.

13.4.3.45 Diversions from New York ATC

ATC advise that it takes 10 - 15 minutes to process a diversion clearance. Aircraft should therefore make their request early so that clearance is readily available should it be required.

13.4.3.46 Windshear

Pilots are requested to volunteer reports to controllers of windshear conditions they encounter. Avoid the use of "negative" or "positive" windshear. Report loss / gain of airspeed and the altitude(s) at which it was encountered,

EXAMPLE: "Kennedy Tower, Gama 123 encountered windshear, loss of 20kts at 400ft".

AIM 7-1-21.

13.4.3.47 Weather Reports

In N America visibility and RVR are recorded using statute miles and feet *(for detail of more subtle differences see Jeppesen Manuals Meteorological section)*.

13.4.3.48 Automated Weather Observing

The onset of automation in N America has added new groups to forecasts and actuals.

The important data remains in the recognisable format.

IM 7-1-10.

13.4.3.49 ATIS

Wind direction, as usual, will be ºM.

13.4.3.50 Interception Procedures and Signals

Procedures and signals relevant to aircraft interception can be found within the Jeppesen Manuals

13.4.3.51 HIWAS *(Hazardous In-flight Weather Advisory Service)*

Continuous broadcast of hazardous weather forecasts through selected VORs.

AIM 7-1-9

13.4.3.52 LLWS (Low Level Windshear Alert System)

Through ATC, provides pilots with details of hazardous windshear and microburst activity near the airport.

AIM 7-1-23

Experience has shown that it may be necessary to ask ATC for information they have available on Cb and microburst activity, for instance while assessing conditions for a take-off.

13.4.3.53 En-Route Flight Advisory Service - (EFAS)

An En Route Flight Advisory Service exists to provide weather information. It is divided into a Low Altitude and a High Altitude service.

The High Altitude service is for aircraft flying at 18,000ft and above. A discrete frequency is allocated to area outlets within each ATC area e.g. BOSTON CENTRE OUTLETS - Bangor, Hyannis, Utica 133.925.

The Low Altitude service is provided on a common frequency of 122.0.

Initiate initial contact by calling "Flight Watch" with call-sign and the name of the nearest VOR.

AIM 7-1-4

For further details see MET Section in Jeppesen Manuals.

13.4.3.54 SCATANA - See entry in the Canada section.

13.4.3.55 Near Mid-Air Collision

AN AIRPROX IN THE USA IS REFERRED TO AS A "NEAR MID-AIR COLLISION" (NMAC). REPORTS SHOULD BE MADE IMMEDIATELY ON THE FREQUENCY IN USE, USING THE TERM "NEAR MID-AIR COLLISION". THIS ENSURES THAT THE FAA RECORD THE INCIDENT AND TAKE FOLLOW UP ACTION.

IF THE REPORT HAS NOT BEEN MADE OVER THE R/T THEN REPORT BY TELEPHONE TO THE NEAREST FAA ATC FACILITY.
(See Jeppesen Manuals for more detail).

AIM 7-6-3

13.5 RUSSIA / SIBERIA

13.5.1 Commonwealth of Independent States (C.I.S)

Members include: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Lithuania, Latvia, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

This briefing sheet is not intended to supersede information provided in the relevant Operations Manuals and NOTAMS. This information is provided to assist crews in operating in areas that require specific procedures which might not be familiar to the crew.

13.5.2 Air Traffic Incidents C.I.S Airspace

The authorities retain tape recordings of ATC communications for only three days. It is therefore important that crews submitting a Flight Crew Report which may justify a request to review RTF recordings should additionally complete an AIRPROX / AIR TRAFFIC INCIDENT report.

This report should be handed to the AIS staff at the next aerodrome of landing, and a copy sent to the Farnborough office as soon as possible.

13.5.3 Metric Units

Height, elevation, FL:	Metres.	Surface wind:	metres per sec.
Speed & Upper wind:	Kph.	Cloud:	tenths or octas.
Distance:	Km and metres.	QFE:	(mmHg) mb to foreign perators.

Approximate conversions:
SPEED (Km / hr) / 2 = knots
WIND (m / sec) x 2 = knots
ROC / ROD (m / sec) x 200 = ft/min

See conversion tables in Jeppesen manuals.

NOTE: Conversions should be crosschecked by **all** pilots.

13.5.4 Altimetry

C.I.S (excluding member countries listed below)

a) At or above TL: Flight Levels in feet
b) At or below Trans Height:
   - Height in metres (i.e. QFE)

QNH available on request. It may be included on the ATIS (e.g. Moscow) and on HF broadcasts.

Jeppesen Aerodrome Charts gives:
1. Ht in ft and metres (QFE).
2. Equivalent altitude in ft (QNH)
3. FL in feet and metres (1013.2)
4. Trans Ht and a derived Trans Alt

BALTIC STATES (ESTONIA, LATVIA, LITHUANIA) - As Western Europe.

BELARUS - FL290-410 ICAO RVSM FL System will be used and at crew's request expressed in meters or as a FL.

BULGARIA	At or above Transition Level,	Flight Levels in feet.
	At or below Transition Height,	Height (QFE) in metres.

However, ATC now often give clearances below Transition in feet on QNH as opposed to metres on QFE.

CZECH & SLOVAK REPUBLICS - As Western Europe.

GEORGIA - As Western Europe.

HUNGARY - As Western Europe.

MOLDOVA - As Western Europe.

POLAND - As Western Europe.

ROMANIA - As Western Europe but metres may be used below Transition Altitude.

UKRAINE - FL290-410 ICAO RVSM FL System will be used and at crew's request expressed in meters or as a FL.

13.5.5 RVSM

RVSM in this region is operated between FL290-410.

The following East European states participate in this programme:

- Belarus,
- Bulgaria,
- Czech Republic,
- Estonia,
- Finland,
- Hungary,
- Latvia,
- Lithuania,
- Moldova,
- Poland,
- Romania,
- Slovak Republic
- Ukraine.

ATC will apply 1,000ft separation between 'Approved' aircraft.

Item 10 of the ICAO flight plan should contain 'W' to indicate RVSM approved aircraft.

13.5.6 Minimum Safe Altitudes

C.I.S determined MSAs are as follows:

1. In the take-off and landing area at least 1,000ft (300m)
2. In the approach area and along airways:
   - Over relatively flat terrain at least 2,000ft (600m)
   - In mountainous areas at least 3,000ft (900m) above the highest obstacle located within 13.5nm (25km) of the airway centre line.

13.5.7 Low Temperature Corrections

Pressure altimeters are calibrated to indicate true altitude under ISA conditions. Any deviation from ISA will result in an erroneous reading on the altimeter. In a case when the temperature is higher than the ISA, the true altitude will be higher than the figure indicated by the altimeter, and the true altitude will be lower when the temperature is lower than the ISA. The altimeter error may be significant, and becomes extremely important when considering obstacle clearances in very cold temperatures.

In conditions of extreme cold weather, pilots should add the values derived from the Altitude Correction Chart to the published procedure altitudes, including minimum sector altitudes and DME arcs, to ensure adequate obstacle clearance. Unless otherwise specified, the destination aerodrome elevation is used as the elevation of the altimeter source.

With respect to altitude corrections, the following procedures apply:

1. IFR assigned altitudes may be either accepted or refused. Refusal in this case is based upon the pilot's assessment of temperature effect on obstruction clearance.
2. IFR assigned altitudes accepted by a pilot shall not be adjusted to compensate for cold temperatures, i.e. if a pilot accepts "maintain 3000", an altitude correction shall not be applied to 3000feet.
3. Radar vectoring altitudes assigned by ATC are temperature compensated and require no corrective action by pilots.
4. When altitude corrections are applied to a published final approach fix crossing altitude, procedure turn or missed approach altitude, pilots should advise ATC how much of a correction is to be applied.

13.5.8 Altitude Correction Chart

A/D Temp	HEIGHT ABOVE THE ELEVATION OF THE ALTIMETER SOURCE (FEET)													
	200	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**	**1500**	**2000**	**3000**	**4000**	**5000**
0°C	0	20	20	20	20	40	40	40	40	60	80	140	180	220
-10°C	20	20	40	40	40	60	80	80	80	120	160	260	340	420
-20°C	20	40	40	60	80	80	100	120	120	180	240	380	500	620
-30°C	40	40	60	80	100	120	140	140	160	240	320	500	660	820
-40°C	40	60	80	100	120	1140	160	180	200	300	400	620	820	1020
-50°C	40	80	100	120	140	180	200	220	240	360	480	740	980	1220

NOTE: Values should be **added** to published altitudes
EXAMPLE**:** Aerodrome Elevation 2262ft, Aerodrome Temperature -50º

	ALTITUDE	HAA	CORRECTION	INDICATED ALTITUDE
Procedure Turn	4000 feet	1738 feet	+420 feet	4420 feet
FAF	3300 feet	1038 feet	+240 feet	3540 feet
MDA Straight-in	2840 feet	578 feet	+140 feet	2980 feet
Circling MDA	2840 feet	578 feet	+140 feet	2980 feet

13.5.9 Border Crossing

CHINA:
Border crossing only allowed within a specified air corridor or over a specified entry/exit point. ATC must be contacted 15-20mins prior to the border giving call sign, ETA for border and FL. Border crossing clearance should then be issued.

The border must not be crossed without ATC permission. A position report must be made when crossing the border and the change to metric cruising levels for China coordinated.

INDIA:
Call 10 mins prior to the FIR boundary.

PAKISTAN:
Call 15 mins prior to the FIR boundary.

UZBEKISTAN:
Call 10 mins prior to FIR boundary.

C.I.S:
See Jeppesen Manual, ATC Russia. However, if there are direct ground communications between ATC units then aircraft will receive clearance to enter C.I.S airspace on the frequency in use. This procedure applies to the commonly used routes from Western Europe; the change in cruising level system is also coordinated.

The phrase "ADJUST TO FLIGHT LEVEL ......"
or "ADJUST TO LEVEL...... METRES" will probably be used.

TOKYO / C.I.S - N-Bound - Call KHABAROVSK CONTROL on HF requesting clearance to cross the C.I.S border and enter KHABAROVSK FIR, also the requested FL.

There may be difficulty establishing contact with KHABAROVSK CONTROL on both HF and VHF when N-bound over the SEA OF JAPAN. SAPPORO CONTROL may be able to relay entry clearance.

S-Bound - Call KHABAROVSK CONTROL and request relay to SAPPORO of estimate for the FIR boundary and requested FL. If unsuccessful call TOKYO CONTROL on HF.

Commence change between JAPANESE and C.I.S cruising level systems not less than 45nm prior to the FIR boundary and complete by 15nm prior to the FIR boundary. Cruising Level changes should be made in accordance with the tables in the Jeppesen Manuals, ATC Russia and ATC Japan.

13.5.10 Interception Procedures and Signals

Procedures and signals relevant to aircraft interception can be found within the Jeppesen Manuals.

13.5.11 Strategic Lateral Offsets Procedures (SLOP)

In non-radar environments, it is the pilot's decision whether to offset 1 or 2 nautical miles to the RIGHT of the centre line. Within radar airspace lateral offsets, of 1 mile to the RIGHT of centre line, require approval from ATC.

13.5.12 Communications

In the C.I.S care should be taken to adhere to standard phraseology as understanding of English is limited. Communications sometimes take place through an interpreter rather than direct with the controller, thus requests for further descent etc. should be made early. There is often an apparent lack of awareness among the controllers of deteriorating situations.

ATC may ask: "Request your flying conditions", which means information as to whether you are flying over/in/below cloud, wind and ground speed in Km/Hr. A conversion table is given in the Jeppesen Manuals.

VHF is satisfactory and is used over practically the whole of the C.I.S except for part of KHABAROVSK FIR and on the Oceanic portion of the ARCTICA route, where HF is required. On W-bound flights there is sometimes difficulty establishing contact with KHABAROVSK ATC on both VHF and HF when over the SEA of JAPAN. In such case SAPPORO CONTROL may be able to relay entry clearance.

The standard ICAO phonetic alphabet is used throughout the C.I.S. However, reporting points are sometimes given using their Russian name instead of the phonetic call sign.

SELCAL is not usually available.

The control frequency in use must be closely monitored. In case of no direct contact with the appropriate control / centre, try a sub-centre / relay.

Direct routeings are not normally available, but deviations due to weather may be permitted with ATC permission and will probably be with Radar assistance.

121.5 is available at all ACCs.

Transponders are used as normal, including emergency codes. A discrete code should be given by ATC, otherwise squawk A2000.

13.5.13 Flight Plan

A Flight Plan must be filed and clearance received for all flights.

In the Flight Plan indicate:

a) Cruising levels, on standard setting, in tens of metres with 4 digits and prefixed with S, e.g. 8,850m = S0885.

b) Speed in Km/Hr as 4 figures with the prefix K, e.g. 600Km/Hr = K0600.

13.5.14 Speed Control

There is a 270kts speed restriction below 3000m / FL98 down to transition level.

13.5.15 TCAS

Not all aircraft operating in the C.I.S have standard transponders, so nearby traffic may not show as TCAS targets. The ability of TCAS to resolve a conflict with some C.I.S aircraft is limited, even when targets are shown on the display - so an RA generated on our aircraft may not have a co-ordinated manoeuvre on the other aircraft.

13.5.16 Diversion

The former USSR authorities were secretive about aerodromes along the route over Siberia particularly military aerodromes some of which would be suitable in an emergency. This has eased somewhat over the last few years with more information becoming available.

If an emergency landing becomes necessary, ATC will provide Radar assistance for an approach and landing at a suitable aerodrome. The approach details will be given by the Approach Control Unit concerned and the approach itself will, if possible, be assisted by PAR. Information may be given as deviation from the centre line and glide path in m, corrective action being left to the crew.

If using an emergency aerodrome and QNH is not available OR a PAR approach is to be carried out, set the local QFE at the appropriate time and make a QFE approach, in accordance with the aircraft Part B supplement.

An SAS 767 from Tokyo to Stockholm was forced to seek a diversion following an engine shut down. A Mayday call was made and ATC efficiently vectored the aircraft for an ILS at Syktyvkar, 61 38N 50 50E. Using standard phrases there were no language problems. The landing QFE was at first given in mm but on request both QFE and QNH were given in mb. The time from the Mayday call to touchdown was some 50 minutes.

In the case of a normal diversion to a civil aerodrome, the diversion should be requested from ATC in the usual way.

13.5.17 Alternates

Over Siberia the number of adequate civil en-route alternates is limited.

The route to the SE towards the Himalayas is rather better served.

Ground handling services at en-route airfields may be limited and diversion to such airfields should be for emergency only.

The following aerodromes lie along, or are close to the main airways routes. However, note that some have low bearing strengths and would only be suitable for use in an emergency. This may be a problem for some of the larger aircraft operated by the Company.

Aktyubinsk	(UATT)	5015N 5712E	
Almaty	(UAAA)	4321N 7702E	
Arkhangelsk	(ULAA)	6435N 4043E	
Bardufoss	(ENDU)	6903N 1832E	
Bodo	(ENBO)	6716N 1422E	
Bratsk	(UIBB)	5622N 10142E	
Igarka	(UOII)	6726N 8637E	
Irkutsk	(UIII)	5215N 10423E	
Khabarovsk	(UHHH)	4832N 13512E	
Khatanga	(UOHH)	7158N 10229E	
Krasnoyarsk	(UNKL)	5610N 9229E	
Kyiv	(UKBB)	5021N 3054E	
Mirny	(UERR)	6232N 11402E	
Moscow DME	(UUDD)	5524N 3754E	
Moscow SVO	(UUEE)	5558N 3725E	
Moscow VKO	(UUWW)	5534N 3716E	
Murmansk	(ULMM)	6847N 3245E	
Neryungri	(UELL)	5654N 12454E	
Norilsk	(UOOO)	6918N 8720E	
Novosibirsk	(UNNT)	5501N 8240E	
Novy Urengoy	(USMU)	6604N 7631E	
Orenburg	(UWOO)	5148N 5527E	
Polyarny	(UERP)	6625N 11203E	
St. Petersburg	(ULLI)	5949N 3018E	
Salekhard	(USDD)	6635N 6637E	
Samara	(UWWW)	5330N 5010E	
Samarkand	(UTSS)	3942N 6659E	
Surgut	(USRR)	6120N 7324E	
Syktyvkar	(UUYY)	6138N 5050E	
Tashkent	(UTTT)	4115N 6915E	
Tiksi	(UEST)	7142N 12854E	
Tromso	(ENTC)	6941N 1855E	
Ulan Ude	(UIUU)	5148N 10726E	
Vladivostok	(UHWW)	4323N 13209E	
Yakutsk	(UEEE)	6206N 12946E	*(Coldest civil airport in the world)*
Yekaterinburg	(USSS)	5645N 6048E	
Yerevan	(UGEE)	4009N 4424E	

13.5.18 Minima for Alternate Aerodromes

When flight planning certain aerodromes as the nominated alternate, the forecast weather at the alternate must be above specified limits which are much higher than those for use of the aerodrome as a destination. Before accepting the nomination of an alternate, crews, should *refer to section 2* of this manual for the minimums required for Alternate Aerodromes.

13.5.19 Terrain

Note the high Safety Altitudes around Almaty (24,000ft) and Kabul (over 19,000ft). This is of particular significance in case of an engine / pressurisation failure.

Across Siberia, the terrain is rather lower. The Urals reach 6,300ft ASL but there are further mountains to the East. On the Arctic route the terrain on the island of Novaya Zemlya is believed tonot exceed a maximum of 6,700ft ASL with a lower range of mountains on the mainland to 2600ft ASL just beyond the coast in point Narki on B483.

At about 118°E there are mountains to 10,200ft ASL South of R22 and nearer the coast there is much high ground up to 8,800ft ASL.

13.5.20 Miscellaneous Information

- De-icing is not generally an issue; however, anti-icing can give rise to concern as there may be no published hold over times for the fluids available. In this case apply fluids at the last minute to ensure that the fluids used remain workable.
- FUEL - Low En Route Temperatures
  At the flight planning stage, consideration should be given to the forecast en route temperatures and the freeze point of fuel in tanks. Consult the Flight Manual for your aircraft type bearing in mind that extra fuel may be required to carry out the recommended procedures to keep fuel temperatures above limits.
- Fuel grade TS-1 (written TC-1) is the Russian equivalent of Jet-A1 and available at all the airfields.
- From Maten, 7230N 3205E to Narki, 7527N 8726E on B483 is classified as an Oceanic leg and all normal Oceanic procedures should be followed. Clearance for this leg will be passed by BODO Oceanic when Eastbound and by Khatanga Control when Westbound. MET reports at En-Route reporting points may be requested during the Oceanic leg.

13.5.21 Carriage of Polar Survival Equipment

If flights are to be undertaken to cold weather regions – suitable equipment will be provided and carried to allow for survival of the crew and passengers.

The nature and amount of equipment to be carried will be decided by the Chief Pilot after consultation with the Operating Crew.

13.6 MIDDLE EAST

13.6.1 RVSM

RVSM is now in force across many FIRs within the Middle East region and is being implemented in stages throughout the Asia region. For further updated information, on Flight levels and routes refer to AIS and Jeppesen Manuals.

13.6.2 Interception Procedures and Signals

Procedures and signals relevant to aircraft interception can be found within the Jeppesen Manuals.

13.6.3 The Middle East

There are pre-planned routes across the Middle East towards the Persian Gulf which are used as the political situation dictates. They are, a Southern route via Egypt and Saudi Arabia, a Mid route across Syria and Jordan, and a Northern route via Turkey and Iran. The suitability of routes changes like the tide. Routes must be checked by operations on a daily basis to ensure the Political and Security concerns along the route have not changed.

13.6.4 FIR Boundaries

Some ATC units require contact to be made at least 10 minutes before arrival at their boundary. This is highlighted on Jeppesen charts. At times, it is difficult to make such contact and use of relays by other aircraft or through other ATC units may be necessary.

13.6.5 Operations in the Red Sea, Saudi Arabia & Gulf Areas.

This area of the world is subject to political tension. During periods of heightened security several measures may be invoked by Gama Operations and brought to the attention of crews by use of NTS.

13.6.6 HAJ Pilgrimage Season

During the HAJ Pilgrimage Season, the timing of which is variable, the number of flights and particularly E-W flights entering Saudi airspace from North and Central Africa increases dramatically and with it the associated risk of ATS incidents.

13.6.7 Customs Procedures and Requirements for Islamic States.

Seek advice from local handlers and agents.

Drugs have recently caused big problems in some Arabic countries. To avoid any problems, take no drugs *(even Aspirin)* into these states. If medication is required, then seek local advice prior to disembarking the aircraft.

13.6.8 Turkey

Airway closures for missile firing occur; check NOTAMS for information and flight plan against AIS information.

13.6.9 Eastern Med

In the Eastern Med ATC co-ordination is poor and several VHF frequencies need to be monitored at one time. It is strongly recommended that all/both crew members be on the flight deck for this portion of the flight.

The area carries much Europe to MID / FAR EAST traffic and is extremely busy. Along the route between Nicosia and Bahrain changes in flight level are extremely difficult to obtain.

When routing through Turkey *(via MUT-VESAR-NIKAS),* at MUT, control will be passed to ERCAN *(another Turkish unit pronounced "ERJAN")* who will require position reports at VESAR and NIKAS even though these points are in Nicosia FIR. However, this portion of the airway is in fact controlled by Nicosia and conflicting clearances may be given. In such cases, it is important to check any clearance from ERCAN with Nicosia before it is followed. Nicosia have long-range VHF and should be contacted as early as possible to ensure optimum levels and co-ordination through their airspace.

Procedures for contacting Nicosia ACC are given on the Jeppesen charts for this area and in the Special Nicosia Briefing at the front section of the Manual.

Damascus should be contacted *(via Latakia Radio for relay if necessary)* 10 minutes prior to NIKAS, although co-ordination between Nicosia and Damascus is good.

The same procedure in reverse will be required when flying westbound.

SEE NICOSIA FIR SPECIAL PROCEDURES IN JEPPESEN MANUAL.

NOTE: Owing to various wars and civil conflicts in the area all routes around the Eastern end of the Mediterranean must be checked by Operations prior to dispatch into this area for security.

13.6.10 Jordan

There is a mandatory speed restriction of 250 kts max below 10,000ft.

13.6.11 Saudi Arabia

Usually there are route and flight level restrictions over Saudi Arabia, see AIS for current situation.

VHF contact with Jeddah ATC, while en route to airports in the Gulf area, is sometimes at extreme range; loss of VHF communication does occur. Relays of messages may be required

Aircraft bound to / from Israeli aerodromes are not permitted to operate in Saudi Arabian airspace.

There is a mandatory speed restriction of 250kts max below 10,000ft.

There are large flights of migratory birds *(up to 1 metre wing-span)* in the periods March to May and September to November. Jeddah shows a statistically high likelihood of a bird strike.

Saudi Arabia has developed SCATANA *(Security Control of Air Traffic and Air Nav Aids)* procedures; details are in the Jeppesen Manuals. They are designed for use during militarily sensitive periods.

13.6.12 Iraq

Don't even think about it !!

13.6.13 Iran

Diversion to airfields in Iran should be avoided if possible. Aircraft overflying certain airfields are required to call at 50nm range. The full list is in the Jeppesen Manual but the most notable are Tehran, Shiraz and Esfahan.

ATC services are good for this area, with direct routing being offered.

13.6.14 Bahrain

Restrictions to route and FL are detailed in the Jeppesen Manual.
Aircraft bound to / from Israeli aerodromes are prohibited from Bahrain airspace.

13.6.15 Gulf of Oman – India

If routeing over the C.I.S see E. Europe - Siberia Area Brief.

13.6.16 General

The area contains its share of politically sensitive borders. This gives rise to restrictions near the India / Pakistan borders which are under military control. Air Defence Clearance Numbers may be allocated. Adherence to promulgated routes and procedures (*e.g. obtaining onward clearance)* is essential. Failure to do so will risk interception by military aircraft. There are several advisory routes and ATC coordination over this area is poor. Lack of radar coverage means only procedural service is offered in many areas, with its accompanying limitations.

Aircraft are frequently held down at low levels and occasionally en route holding is required.

Communications are a mix of VHF and HF. Reports are often passed to ATC via en-route airport VHF installations as highlighted on Jeppesen charts. HF is often extremely difficult due to inadequate equipment and poor RT standards; frequencies are very cluttered. This has the effect of making Selcal less useful than normal.

13.6.17 FIR Boundaries

Contact 10 minutes before arrival at FIR boundaries is usually required *(15 minutes before Karachi & Lahore FIRs)* and is highlighted on Jeppesen charts.

13.6.18 121.5 MHz

A listening watch on 121.5 MHz. should be maintained.

13.6.19 Customs

Whilst customs are generally "friendly" it is essential that all necessary paperwork is completed and filed with the correct officials. This can be tedious and seemingly complicated. Local agents and handlers normally will assist in this process.

13.6.20 Blind Broadcast Procedure

This procedure should be used as detailed in the Jeppesen Manuals It should be used over the Indian Ocean in FIR's Antananarivo, Beira, Dar es Salaam, Mauritius, Mogadishu and Nairobi.

If in any doubt a blind call may be heard by the controlling agency so may assist in the safe passage of the aircraft.

13.6.21 India

	SFC to FL140	FL 150 and above
Applicable Rules	Quadrantal	Semi-Circular

Details of procedures for transition between Quadrantal and Semi Circular rules can be found in the Jeppesen manuals.

13.6.22 Pakistan

There is significant mountainous terrain towards the western and northern borders of Pakistan.

13.6.23 Areas of High MSA's

Where required the company will provide details in the trip pack should "Oxygen Emergency Escape Routes" be required.

Details of this system can be found in the part B's for each aircraft that might require its use.

13.6.24 India & Hong Kong

Routes to Malaysia, Indonesia, Bangkok, Hong Kong, China and the Philippines but not including Australasia.

13.6.25 General

Generally, en-route communications are good using VHF with HF as a back-up.

Part of Calcutta FIR lies E of Dhaka and just North of Chittagong. If this is entered without prior permission from Calcutta ATC, due weather avoidance etc., a violation may be filed.

Hong Kong control on 127.1 MHz has an extended range of about 350 nm beamed to the SW (*with operational SELCAL).*

When communicating with Chinese controllers it is essential that standard phraseology is strictly adhered to. Accents are very strong and can be difficult to understand at times, however communications are good. Initial contact is on HF well before the border.

In-Flight broadcast procedures on frequency 126.9 are in use within the Kunming FIR (China) for both East and West bound flights. The Jeppesen manuals for the area concerned has more information as to the format and content of the in-flight broadcasts.

Reporting points are normally referred to by the Navaid ident, e.g. KILO MIKE GOLF for Kunming.

When routing towards Hong Kong across China, ATC Hong Kong should be contacted as soon as possible on HF and the forward estimate monitored closely. On the route via Kunming ATC Hong Kong can usually be contacted by Lashio (LSO). Jeppesen charts for the area show communications required.

En-route radar coverage is sparse until approaching the Hong Kong area.

13.6.26 Volcanic Activity

Volcanic activity is fairly likely over the South-East Asia region. When this is expected to be a factor for over flying aircraft NOTAM's will be issued. For guidance if volcanic ash is encountered see OM A, section 8.

13.6.27 China

Within China airways vary in width from 8 ~ 20 km. Deviation off airways is prohibited. The maximum deviation allowed over China is 20 Km either side of the airway centre line.

13.6.28 Border Crossing

This is only allowed within a specified air corridor or over a specified entry / exit point. ATC must be contacted at least 15 to 20 minutes prior to the border giving the call sign, ETA, and flight level. Border crossing clearances will be issued - however the border must not be crossed without ATC permission. A position report must be made when crossing the border. This equally applies for entry and exit.

13.6.29 Forced to Return

If it becomes necessary, an aircraft is permitted to return by its original route, air corridor or entry / exit point. ATC should be informed of the following:

a. Call sign

b. Reason for forced return

c. Altitude

d. Aerodrome of intended landing

If no instructions are received from ATC, the return flight over China shall be at a flight level immediately below the originally flown. If this is found to be below the MSA then the flight level above that originally flown shall be used.

13.6.30 Altimetry

13.6.30.1 General

13.6.30.2 At Aerodromes where Transition Altitudes and Transition Levels are Established

Before take-off, the aircraft altimeter subscale should be set to QNH of the aerodrome. After take-off, upon reaching the transition altitude the altimeter subscale should be set to 1013.2hPa. When an aircraft is passing through a transition level during descent, the altimeter subscale should be set to QNH of the aerodrome.

13.6.30.3 At aerodromes where Transition Heights and Transition Levels are Established

Before take-off, the aircraft altimeter subscale should be set to the atmospheric pressure at the aerodrome elevation. After take-off, upon reaching the transition height the altimeter subscale should be set to 1013.2hPa. When an aircraft is passing through a transition level during descent, the altimeter subscale should be set to the atmospheric pressure at the aerodrome elevation.

13.6.30.4 At Aerodromes where Transition Altitudes or Transition Heights and Transition Levels are not established

Before take-off, the aircraft altimeter subscale should be set to the atmospheric pressure at the aerodrome elevation. After take-off, when the aircraft has reached a height of 600m, the altimeter subscale should be set to 1013.2hPa. During the process of descending in the aerodrome tower control area, the aircraft shall start altimeter setting by the instruction of air traffic controller.

13.6.30.5 At Aerodromes of High Elevation

When the aircraft altimeter subscale cannot be set to the atmospheric pressure at the aerodrome elevation, it will then be set to 1013.2hPa before take-off, with the indicated altitude interpreted as zero altitude. When the aircraft altimeter subscale cannot be set to the atmospheric pressure at the aerodrome elevation, landing is to be made with the assumed zero altitude notified by the air traffic controller before landing.

13.6.30.6 Zhuhai TMA

- Aircraft entering the Zhuhai TMA at or above the transition level should set the altimeter to 1013.2hPa;
- Aircraft entering the Zhuhai TMA below the transition level or descending from or passing through the transition level should set the altimeter to the Zhuhai TMA QNH;
- Aircraft approaching an airport, and intercepting the intermediate approach segment, should set the altimeter to the local QNH of the airport;
- Prior to take-off, the altimeter should be set to the QNH of the take-off airport;
- After take-off, the altimeter should be set to the Zhuhai TMA QNH by ATC instruction;
- Aircraft operating flight exercise at an airport within the Zhuhai TMA should set the altimeter to the airport QNH or Zhuhai TMA QNH according to ATC instructions.

13.6.31 RVSM

Metric RVSM is implemented in the Shenyang, Beijing, Shanghai, Guangzhou, Kunming, Wuhan, Lanzhou, Urumqi FIRs and Sector AR01 (Island airspace) of the Sanya CTA between 8900m (FL291) and 12500m (FL411) inclusive.

The airspace between 8900m (FL291) and 12500m (FL411) is defined as RVSM airspace. In China RVSM airspace is exclusive airspace, that is aircraft that are not RVSM compliant may not operate into China RVSM airspace.

13.6.32 Flight Level Allocation Scheme (FLAS)

China Flight Level Allocation Scheme (FLAS) is based on Metric Flight Level.

ATC will issue the Flight Level clearance in meters, the aircraft shall be flown using the flight level selected in feet unless aircraft equipment allows for metric heights to be set. There will be no change in flight level allocations and operations at 8400m (FL276) or below in non RVSM airspace.

Crews should be aware that due to the rounding differences, the metric readout of the onboard avionics will not necessarily correspond to the cleared Flight Level in meters; however, the difference will never be more than 30 meters.

Where aircraft are equipped with metric and feet altimeters, use the feet altimeter within RVSM flight level band.

180° - 359°		000° - 179°	
m	**ft**	**m**	**ft**
15,500	50,900	14,900	48,900
14,300	46,900	13,700	44,900
13,100	43,000	12,500	41,100
12,200	40,100	11,900	39,100
11,600	38,100	11,300	37,100
11,000	36,100	10,700	35,100
10,400	34,100	10,100	33,100
9,800	32,100	9,500	31,100
9,200	30,100	8,900	29,100
8,400	27,600	8,100	26,600
7,800	25,600	7,500	24,600
7,200	23,600	6,900	22,600
6,600	21,700	6,300	20,700
6,000	19,700	5,700	18,700
5,400	17,700	5,100	16,700
4,800	15,700	4,500	14,800
4,200	13,800	3,900	12,800

3,600	11,800	3,300	10,800
3,000	9,800	2,700	8,900
2,400	7,900	2,100	6,900
1,800	5,900	1,500	4,900
1,200	3,900	900	3,000
600	2,000		

13.6.33 EGPWS

Please refer to Aircraft POH.

13.6.34 DIMENSIONAL UNITS

Horizontal distances	Km
Upper wind speeds	Km / hr(Km/hr) /2 = knots
Aircraft speed	Km / hr
Surface wind speed	m / sec(m/sec) x2 = knots

The Jeppesen manuals contain details of flight rules and special procedures for flights operating in Chinese airspace.

13.6.35 ROUTES FROM CIS ACROSS CHINA

MSA's over much of Northern China are very high, some over 21,000 ft. This necessitates careful pre-flight planning for engine failure and decompression and the use of Oxygen escape routes.

13.6.36 HONG KONG TO TOKYO

This area is served by good ATC and co-ordination between centres is good.

13.6.37 JAPAN

Japanese controllers have a pronounced accent and a tendency to talk very quickly which can lead to difficulty in understanding clearances. Crews should prepare in advance for clearances, listening to other issued clearances may help. En-route navaids will be referred to by their names rather than their call sign.

Transition altitude - 14,000 ft.

Altimeter setting in inches.

Max speed at or below 10,000 ft – 250 kts

Volcanic activity – common over Japan

13.6.38 RADAR ADVISORY SERVICE

This is an Air Defence service around Japan but will provide assistance if required. Full details are given in the Jeppesen manuals for the use of Radar advisory services.

13.6.39 INDONESIA

250 kts maximum at or below FL100 in most of Indonesia airspace

13.6.40 SINGAPORE – JAKARTA

There are special level assignments for aircraft flying between these FIR's, details can be found in the Jeppesen manuals. Some communication difficulties have been experienced when routing from Singapore to Jakarta.

13.6.41 PHILLIPINES

Aircraft entering Manila FIR from the South are to report at 2°North giving flight level and estimate for 4°North.

Speed Control – 250 kts maximum within 30 nm of Manila below FL100

13.7 AFRICA

13.7.1 IATA IN-FLIGHT BROADCAST PROCEDURES

This procedure is mandatory and applies to all FIRs within the AFI region with the exception of Bloemfontein, Canaries, Cape Town, Casablanca, Dakar Oceanic, Durban, Harare, Johannesburg, Port Elizabeth, Sal Oceanic, and Tunis. Cairo FIR is also excluded from the IATA In Flight Broadcast Area and the use of the procedure is not officially recognised. If, however crews choose to use the procedure in the Cairo FIR it should be remembered that there is no requirement for other traffic to maintain a listening watch. The standard IATA procedure is as follows:

1) Crews will maintain a listening watch on 126.9 MHz from 10 mins before entering the defined area until leaving the area.
2) Ensure transponder is operating for TCAS purposes; squawk A2000 if no specific code is assigned.
3) When using accurate navigation systems aircraft should fly 1nm right track, except where indicated on Jeppesen charts that Centreline Navigation is required.
4) In addition to norma1 ATS reporting procedures for the route being flown, flight crews will broadcast position data as follows:
   a) 10 mins before entering the area or as soon as appropriate after taking-off in the area.
   b) 5 mins prior to reporting points.
   c) 5 mins prior to crossing or joining an ATS route.
   d) At 20 min intervals between distant reporting points.
   e) 2 - 5 mins where possible, before a change in flight level.
   f) At the time of a change in flight level.
   g) At any other time considered necessary by the crew.

Example - "All stations, this is GAMA-866, Flight Level 390, Northbound, Nairobi to Cairo on A10, Position ALPHA at 0428, estimating position TENBI at 0523, GAMA-866, Flight Level 390, Northbound, Nairobi to Cairo on A10".

It is a very good idea, particularly in W Africa, to plot the blind position reports of other aircraft. Any conflicts that cannot be resolved through ATC, perhaps because of communication difficulties, must be resolved between the individual aircraft.

See Jeppesen (Africa 1) for full details of In-flight broadcasts and conflict resolution)

13.7.2 HAJ PILGRIMAGE SEASON

During the Haj Pilgrimage Season, the timing of which is variable, the number of flights and particularly E - W flights in the N and central part of the AFI region increases dramatically and with it the risk of ATS incidents. The in-flight broadcast procedure then assumes increased significance. However, many of the crews involved are not used to the ATC situation and procedures in Africa.

Extreme caution must be exercised as ATC units will be overwhelmed by the number of flights and situational awareness may be lacking with some controllers. Off-setting will aid flight safety.

13.7.3 GENERAL

Note that many routes are in Advisory Airspace, and hence only an advisory service and not a control service will be offered. This means that separation will only be provided from known traffic; 15 or 10min longitudinal separation is not unusual. As communications are notoriously bad throughout Africa (with the exception of South Africa), both between ATC Units and R/T between ATC and aircraft, flight plans may not have been received and aircraft may not have been able to contact ATC. This also applies to a lesser extent in controlled airspace. As Radar coverage is negligible except in South Africa, there is likely to be unknown traffic. Hence:

a) Keep a good look-out and listening watch. Even with aircraft operating at the correct cruising levels conflictions have occurred between traffic converging almost head on, as semi-circular rules are generally used and traffic is mainly N - S.

b) Do not accept non-standard clearances (e.g. levels). As most of the routes are N - S and semi-circular rules are used, a small change of track may necessitate a level change. However, note that some N - S airways/advisory routes use the mean direction to determine the appropriate FL - see Jeppesen Charts.

c) Direct routeings may be offered, however, some countries prohibit foreign registered aircraft from operating outside controlled or advisory airspace.

   See Air Traffic section of Jeppesen.

d) Use the IATA In-Flight Broadcast Procedure (see above) when appropriate. But do not assume that all aircraft will use the facility. If it is apparent that there is a confliction with another aircraft, inform ATC as soon as possible and insist that they resolve the situation. Apparent conflict situations should be voyage reported.

   NOTE: If ATC do not answer – take action.

e) When approaching an FIR boundary attempt to contact the onward ATC Unit well in advance, as coordination will probably not have been carried out.

f) In the event of an Interception, procedures and signals relevant to the situation can be found within the General section of the Jeppesen Binders.

13.7.4 WEST AFRICA

Radio aids, airfield lighting, VASIs etc. are frequently unreliable or unserviceable at West African airports. HF communications are often difficult, particularly with Lagos, Kano and Accra. Maximum use should be made of VHF relays.

All W African stations require total persons on board and endurance on arrival and departure.

Many MSAs on charts are unreliable due to incomplete surveying.

Aircraft water tanks should be full ex UK as drinking water uplift is often not available, and if it is available, undrinkable.

Aircraft APU should be serviceable ex UK as air starts and ground power are often unavailable.

Accurate weather information may not be available before departure.

Obtaining Wx information en route is extremely difficult due poor communications. Full use should be made of AFIS if fitted and operational. If all else fails call using Satcom to the company for updated information.

IT IS VERY IMPORTANT TO TAKE ANTI MALARIAL PRECAUTIONS.

DRINKING WATER is suspect at all W African destinations. Use bottled water where possible.

13.7.4.1 Algeria

Difficulty contacting Algiers on HF occurs. Aircraft unable to maintain direct contact with Algiers ACC may be able to pass messages via Tamanrasset.

13.7.4.2 Ghana / Ivory Coast

See under Nigeria for operations between Accra and Lagos.

13.7.4.3 Niamey

Aircraft Northbound from Nigeria may be kept low due 15min separation requirement in Niamey FIR.

There have been reports *(1999, 2000, 2001, and 2002)* of flight level conflictions, some serious, with other aircraft while in Niamey FIR.

13.7.4.4 Nigeria

For aircraft routeing between Lagos and Accra it is usual to establish radio contact with Accra before being released by Lagos and vice versa.

There were several airprox incidents involving Lagos and Accra during 1996.

13.7.4.5 Tchad

Difficulty has been experienced contacting N'Djamena before their FIR Boundary for onward clearance. N'Djamena shares some AFI 2 HF frequencies with Algiers.

There have been several reports *(1998, 2000, 2001 and 2002)* of flight level conflictions, some serious, with other aircraft while in the N'Djamena FIR.

A North/South route just to the West of N'Djamena takes the aircraft into the Kano FIR; contact Maiduguri Twr on VHF before the Kano FIR Boundary.

13.7.5 EAST AFRICA

Terrain information is incomplete over some of the area.

13.7.5.1 Ethiopia (Addis Ababa FIR)

MSA's in the Addis Ababa FIR are high, the highest being over 17,000 feet.

13.7.5.2 Libya (Tripoli FIR)

Difficulty contacting Tripoli on HF occurs.

Kufra ADIZ in the Tripoli FIR - The appropriate authority must be contacted at least 15 mins before entry. The Jeppesen charts gives details. Contact can be hard to achieve.

Flight Levels - The Jeppesen manual gives details of flight level changes required if unable to contact Tripoli Info in the SE part of the FIR.

Foreign registered aircraft must not fly outside ATS routes and controlled airspace.

Over-flight of oil installations is prohibited.

13.7.5.3 Sudan (Khartoum FIR)

Reports have been received of conflicting opposite direction traffic of which Khartoum ATC were totally unaware. The situation was resolved with the aid of TCAS although the conflicting traffic was not TCAS equipped.

Caution during Haj season due to high East - West traffic density. See Haj Briefing earlier this section for further Info.

Haj traffic from Khartoum FIR to Jeddah routes Port Sudan - BOGUM - Jeddah and traffic from Jeddah to Khartoum FIR routes Jeddah – DUNGU - Port Sudan.

Traffic departing Jeddah should attempt to contact Khartoum on HF immediately after departure, but remain in contact with Jeddah until released.

Prohibited Area P1 (To the NW of VOR KTM.) - Any aircraft infringing this airspace may be subject to interception by the Sudan Air Force and indefinitely detained.

Flights cleared along UA10 must be at FL 280 or above. Do not deviate from the airway centre line.

Contact with Khartoum ACC is always difficult. On occasions contact cannot be established until virtually overhead KTM VOR.

13.7.6 SOUTHERN AFRICA

Mt Kenya 17,058ft is 50nm E of Lodwar-Nakuru-Nairobi track.

Mt Meru 14,978ft is 38nm E of LOSIN (121nm SW of Nairobi along A405).

Mt Kilimanjaro 19,340ft is 20nm SW of GABSO (100nm SE of Nairobi along UB533).

Many Safety Altitudes on Charts are unreliable due to incomplete surveying.

13.7.6.1 Angola

There have been reports of flight level conflictions with other aircraft while under Luanda Control, but few in recent years.

13.7.6.2 Central African Republic

Crews have reported conflicting crossing traffic, not advised by ATC between Bangui and Lubumbashi; the situation was resolved by the two aircraft crews using the In-Flight Broadcast frequency 126.9.

Routing from Bangui to Nairobi aircraft have experienced the same problem as above. In-flight Broadcasts have been used to ensure separation. Inform ATC if possible of the action taken.

13.7.6.3 Madagascar (Antananarivo FIR)

The following IFR levels are available in Antananarivo FIR/UIR.

Mogadishu - Mahajanga	Odds to 290,330,370 etc.
Mahajanqa - Mogadishu	Evens to 280,310,350,390 etc.
Seychelles - St Denis	Evens to 280,310,350,390 etc.
St Denis - Seychelles	Odds to 290,330,370 etc.

13.7.6.4 Mauritius

In order to facilitate the issue of descent clearances to aircraft approaching Mauritius from Antananarivo FIR above FL 250 the following procedures are used:

a) Aircraft approaching from the SW shall call Mauritius over St Denis VOR.

b) Aircraft approaching from the W shall call Mauritius when abeam St Denis VOR.

c) Aircraft approaching from the NW shall call Mauritius at the FIR boundary.

Aircraft proceeding to Antananarivo FIR from Mauritius are requested to contact Antananarivo FIC as soon as convenient after take-off, but shall remain in contact with Mauritius until the FIR boundary or until released by Mauritius, whichever is later.

13.7.6.5 Republic of South Africa

Speed Control - Within a CTR, ATZ or aerodrome traffic area, 200 kts maximum unless authorised by ATC. If unable to comply advise ATC.

Aircraft operating off the West coast of South Africa, outside controlled airspace, are to broadcast position reports blind on the FIC frequency if two-way contact cannot be established. Contact can be established with Johannesburg Oceanic on HF

13.7.6.6 Zambia/Mozambique

Aircraft using A405 between Harare and Mbeya need to monitor for conflicting traffic on A400 between Chileka and Lusaka. This traffic should be at FL 320 or below.

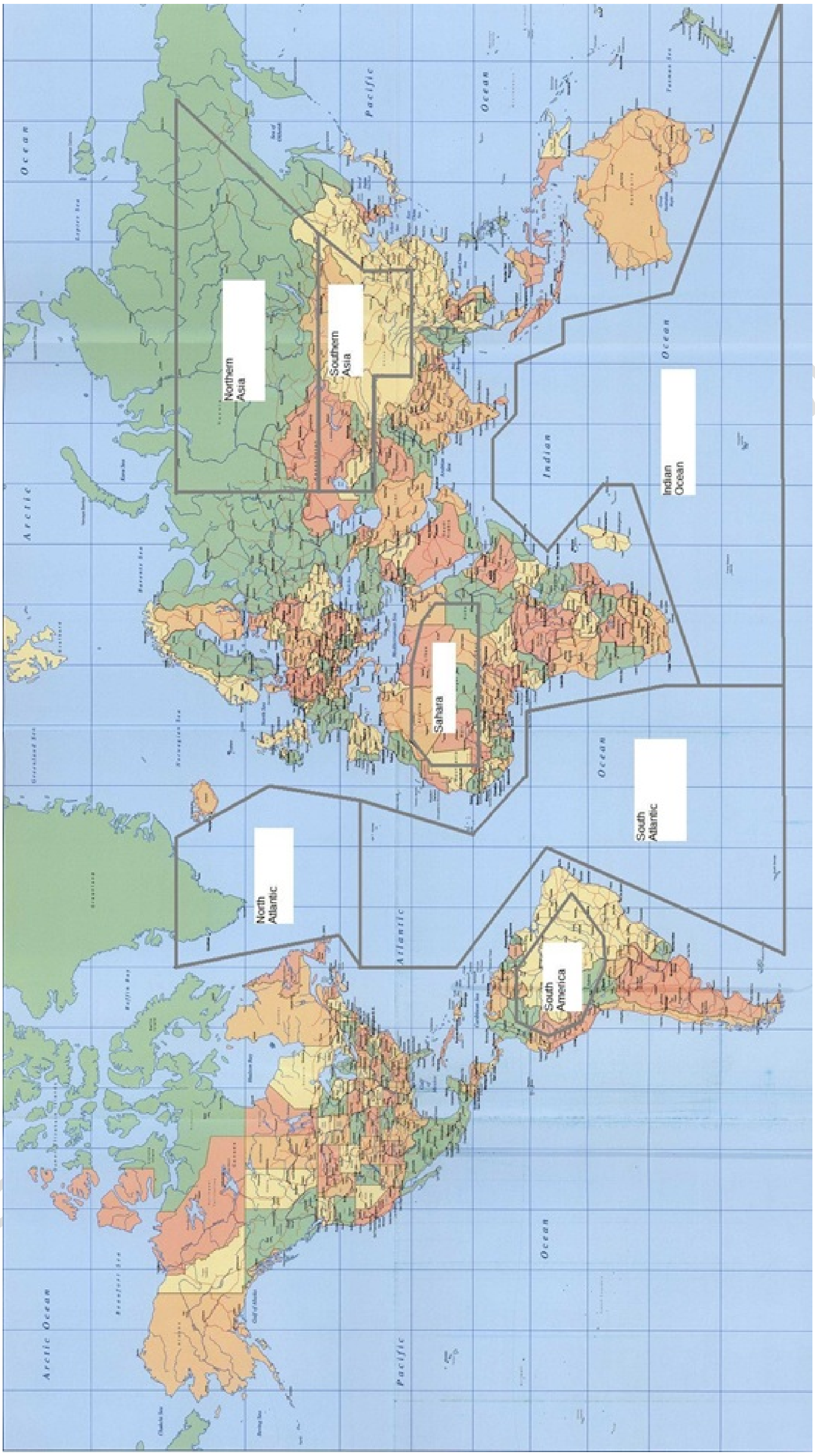
There may be restrictions on entry/exit points to the South - see ATC Briefing in the Jeppesen Manual.

13.8 SCHEDULED NAVIGATION AREAS

The Scheduled Navigation Areas that affect the normal operation of **Gama's** aircraft are listed below. Each area is enclosed by Rhumb lines joining successively the points listed for each area.

A - ARTIC	**B - ANTARTIC**	**C – SAHARA**
(All North of 68º North, excluding the following part). 68ºN 00ºE/W 73ºN 15ºE 73ºN 30ºE 68ºN 00ºE/W	All South of 55º South	30°N 05°W 24°N 11°W 14°N 11°W 14°N 28°E 24°N 28°E 28°N 23°E 30°E 15°E 30°N 05°W
D – SOUTH AMERICA	**E - PACIFIC**	**F – AUSTRALIA**
04°E 72°W 04°N 60°W 08°S 42°W 18°S 54°W 18°S 60°W 14°S 72°W 05°S 76°W 04°N 72°W	60°N 180°E/W 20°N 128°E 04°N 128°E 04°N 180°E / W 55°S 180°E / W 55°S 82°W 25°S 82°W 60°N 155°W 60°N 180°E / W	18°S 123°E 30°S 118°E 30°S 135°E 18°S 123°E
G – INDIAN OCEAN	**J – NORTHERN CANADA**	**K – NORTHERN ASIA**
35°S 110°E 55°S 180°E / W 55°S 10°E 40°S 10°E 25°S 60°E 20°S 60°E 05°S 43°E 10°N 55°E 10°N 73°E 04°N 77°E 04°N 92°E 10°S 100°E 10°S 110°E 35°S 110°E	68°N 130°W 55°N 115°W 55°N 70°W 68°N 60°W 68°N 130°W	68°N 56°E 68°N 160°E 50°N 125°E 50°N 56°E 68°N 56°E
L – SOUTHERN ASIA		
50°N 56°E 50°N 125°E 40°N 110°E 30°N 110°E 30°N 80°E 35°N 80°E 35°N 56°E 50°N 56°E	**NOTES**: 1)The WATRS + area has been omitted for clarity. For details of operations in this area see following section.	

13.8.1 Normally Crossed Specified Navigation Areas



13.9 RNP 4

RNP 4 is a requirement for Remote / Oceanic areas, where GNSS is the primary navigation sensor to support RNP4 either as a stand-alone system or as part of a multi-sensor system.

There is only one airspace (WATRS) where it is currently required (2013) and that is only for 30 mile longitudinal separations, 50-mile separation routes are available for non RNP4 approved aircraft i.e. RNAV-10.

The Airspace Concept will be limited to aircraft that can comply with a Performance Based Navigation capability of RNP 4, and Communications by Controller-Pilot Data Link Communications (CPDLC) together with Surveillance utilizing Automatic Dependent Surveillance (ADS).

The final element of the Airspace Concept is achieved through submission of the 2012 Air Traffic Flight Plan. Therefore, to proceed with RNP 4 Approval it will be necessary to obtain CPDLC / FANS 1A / ADS-C approval concurrently from the Regulatory Authority.

The appropriate training for crews will be required as will, documented normal and contingency procedures. Also the MEL will probably need to be reviewed with respect to CPDLC failure. Operators holding RNP-4 Approval do not require an additional Approval for RNAV-10.

During operations in airspace or on routes designated as RNP 4, the lateral total system error must be within ± 4nm for at least 95% of the total flight plan. The on board navigation system must have the following functionalities:

- a) display of navigation data;
- b) track to fix (TF);
- c) direct to fix (DF);
- d) direct to function;
- e) course to fix (CF);
- f) parallel offset;
- g) fly-by transition criteria;
- h) user interface displays;
- i) flight planning path selection;
- j) flight planning fix sequencing;
- k) user defined course to fix;
- l) path steering;
- m) alerting requirements;
- n) navigation database access;
- o) WGS-84 geodetic reference system;
- p) automatic radio position updating.

Whilst the Air Traffic Flight Plan is normally compiled by a service provider it is the responsibility of the Pilot-in-Command to monitor it.

The Company will use the appropriate ICAO flight plan designation specified for the RNP route. The letter "R" should be placed in Block 10a of the ICAO flight plan to indicate the pilot has reviewed the planned route of flight and determined the RNP requirements and the aircraft and operator approval for RNP routes. Additional information should be displayed in Block 18 indicating the accuracy capability (PBN/…), such as RNP 4 versus RNP 10.

It is important to understand that additional requirements will have to be met for operational authorisation in RNP 4 airspace or on RNP 4 routes. Controller-pilot data link communications (CPDLC) and automatic dependent surveillance – contract (ADSC) systems will also be required when the separation standard is 30nm lateral and / or longitudinal; details must be included in Blocks 10b and 18 of the Flight Plan.

At dispatch, or during flight planning, the Company will ensure that adequate GNSS capability is available en-route to enable the aircraft to navigate to RNP 4, and to include the availability of FDE, if appropriate for the operation.

13.9.1 WATRS / WATRS Plus

An extensive network of routes linking points in the United States and Canada with Bermuda, the Bahamas and the Caribbean area are defined in the New York OCA to the west of 60°W.

This network is known as the Western Atlantic Route System (WATRS).

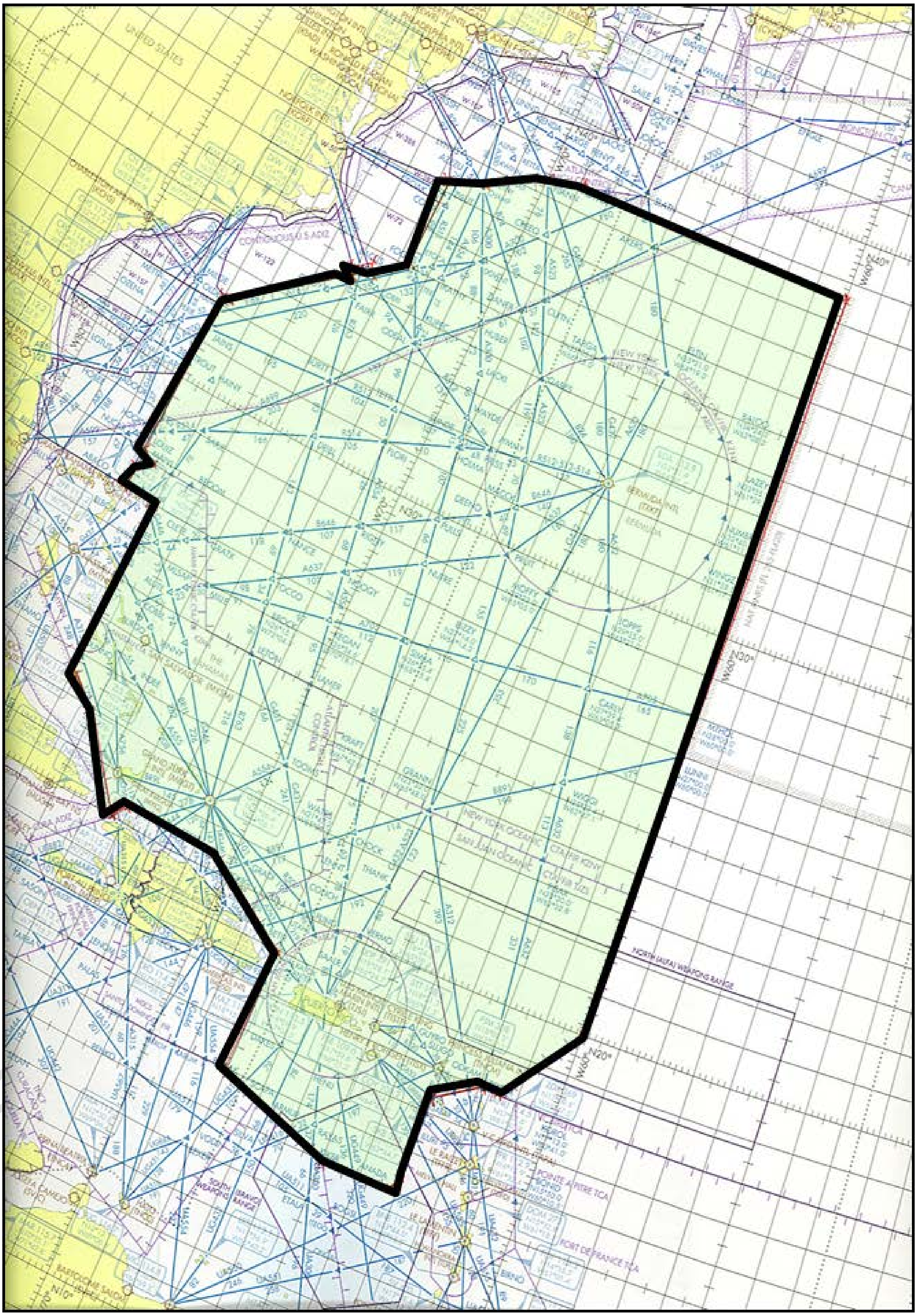
The route structure will be upgraded to WATRS Plus on the 5th June 2008. This will require all aircraft that operate in its boundary to be RNP-10 certified. This will require all operating aircraft to be fitted with two operational LRNS. Standard Nav failure drills should be exercised in the event of system failure.

See Navigation section and contingencies.

NOTE: This area remains RVSM airspace

The WATRS Plus area is shown below:

13.9.2 WATRS Plus Area of Operation



13.10 ATC

13.10.1 GENERAL

In specified areas where the standards of Air Traffic Services (ATS) may be deficient use of **IFBP** *(In Flight Blind Broadcast)* procedures are required and Flight Crew should fly a lateral off-set of 1NM right of track. When required these procedures will be shown on the appropriate Jeppesen charts.

It is important that crews adhere to these procedures and report any incidents, so that factual data can be available for use in industry activity, aimed at improving standards of ATS. The published IFBP areas may be revised based on crew / operator experience, co-ordinated and agreed within IATA.

13.10.2 AIRPROX / INCIDENT REPORTS

It is important that crews notify ATC via R/T and submit an Air Safety Report (ASR) form as soon as possible. Use of the Company occurrence reporting system available on the Q-Pulse platform will allow concerns to be raised and tracked.

Completion of all relevant items is essential, especially as ATC require these in order to conduct an investigation.

R/T tapes are required to be kept for up to 30 days maximum (*although in Russia it may be as short as 36 hours!)*.

Radar recordings, where available, are normally kept for 15-20 days. *(Except Russia).*

13.10.3 CALLSIGN CONFUSION

In order to reduce the potential confusion associated with similar flight numbers, it is Gama's policy to use ATC call signs that do not sound like any other flying Gama aircraft.

In some cases, out of sequence call signs may be used so that confusion should be kept to a minimum.

13.10.4 RTF COMMUNICATIONS FAILURE

Procedures are contained in Jeppesen Manuals. In addition, consideration of use of alternative or adjacent ATC frequencies should be made, in addition to use of 121.5.

Use of SATCOM numbers are encouraged where available.

13.10.5 AREAS OF AVOIDANCE

Gama currently does not use the airspace over the land territory of **Angola** and **Iraq**. This is based on UK government advice and is subject to review. For the latest details contact Operations who will be able to confirm areas to be avoided.

13.10.6 AFRICA

Areas where IFBP are required are published. Traffic has increased on the north / south flows and areas of concern include Brazzaville / Chad FIRs.

The Hadj season operates January - April where east / west traffic increases significantly. *(Dates are published in advance)*

Separation standards - Most of the airspace is advisory (Class F) where either 10 or 20 mins longitudinal separation is used. *(This generally equates to the IFBP areas).* In some of the TMAs and South Africa, separation standards vary depending on use of radar.

Airspace classification is depicted on Jeppesen charts.

13.10.7 MIDDLE EAST

Nicosia FIR - due to the occupation of the Turkish Federated State of **Ercan** in the northern part of Cyprus, within the Nicosia FIR, specific procedures apply as contained in the Jeppesen Europe and Middle East Supplement. Whilst the **responsible ATS authority remains as Nicosia**, **information** is required to be given to **Ercan.**

See the briefing in the Jeppesen Manual for the full details of the procedures to be carried out.

13.10.7.1 The problems around Cyprus are further compounded by the Israeli Air Defence zone which requires crews to contact Tel Aviv whilst still communicating with Ercan, Nicosia and Ankara.

13.10.8 ASIA PACIFIC

RVSM *(Reduced Vertical Separation Minima)* is used in various parts of the region. Details are included in the Jeppesen Manuals for the Pacific Area.

ATC Separation Standards vary according to weather radar or procedural separation is provided. On the traffic routes, to/from BKK, SIN, HKG, **10 mins. longitudinal separation** is provided. This applies eastwards from the Ankara border commencing with Iran.

13.10.9 RUSSIAN FEDERATION

Separation standards are as follows:

a) **Longitudinal Separation** with continuous radar Monitoring

- On airways at same FL - 30 Km.
- In approach area - 20 Km.
- In approach area using ATC automated systems - 10 Km.
- When crossing opposite FL occupied by another aircraft -30 Km at moment of crossing *(observing 10 Km lateral separation).*
- When crossing same direction FL - 20 Km in approach area, 10 Km at moment of Crossing
- Between aircraft on crossing tracks *(with angles of crossing of not less than 70°)* at the same FL - 40Km at the moment of crossing.

b) **Lateral Separation** under continuous radar control

- When crossing the FL occupied by same direction traffic - 10Km at moment of crossing *(within airway, corridor).*
- When crossing the FL occupied by opposite traffic - 10Km at moment of crossing (within airway, corridor, observing 30Km longitudinal separation).

c) **Radar Failure**

- In event of radar failure or loss of radar blip, instructions will be issued to crew to increase Separation up to values prescribed for flights without radar control i.e. procedural:
- At least 15min at moment of crossing an airway at same FL with crossing tracks.
- At least 10mins. for aircraft proceeding at same level along same route.
- While crossing same direction or opposite FL occupied by another aircraft, en-route or in approach area:
- at least 20min while crossing the FL occupied by another aircraft in take-off and landing area.
- At least 3min. while manoeuvring under approach landing pattern.

13.10.10 SSR COVERAGE IN C.I.S (*Commonwealth of Independent States)*

SSR Points		SSR Type	MaxRadius of Coverage (km)	Upper Limit (m)
1.	Moscow *(Vnukovo)*	En-route and terminal area	700	12100
2.	Kiev *(Borispol)*	En-route and terminal area	400	12100
3.	Mineralnyye Vody	Aerodrome	120	6000
4.	S-Peterburg *(Pulkova)*	En-route and aerodrome	400	12100
5.	Sochi *(Adler)*	En-route and aerodrome	400	12100
6.	Samara *(Kurumoch)*	En-route and aerodrome	360	12100
7.	Khabarovsk *(Novy)*	Aerodrome	120	6000
8.	Simferopol	En-route and aerodrome	400	12100
9.	Yerevan *(Zvartnots)*	Aerodrome En-route	120 400	6000 12100
10.	Minsk2	Terminal area En-route	200 360	10000 20000
11.	Lvov	En-route	400	12100
12.	Odessa	En-route	400	12100
13.	Tashkent *(Yuzhny)*	En-route and aerodrome	400	12100
14.	Almaty	Aerodrome	120	6000
15.	Baku (Bina)	En-route	400	12100
16.	Tbilisi *(Novoalekseyevka)*	Aerodrome	120	6000
17.	Kazan	Aerodrome	120	6000
18.	Irkutsk	En-route and aerodrome	350	12100
19	Ashkhabad	En-route	400	12100
20.	Bishkek *(Manas)*	En-route	400	12100
21.	Yekaterinburg *(Koltsovo)*	En-route and aerodrome	400	12100
22.	Volgograd *(Gumrak)*	En-route and aerodrome	400	12100
23.	Chelyabinsk.*(Balandino)*	En-route	400	12100
24.	Gomel	En-route	400	20000
25.	Krasnodar *(Pashkovsky)*	Aerodrome	120	6000

13.10.11 NORTH AMERICA

USA - classification of airspace and the mix of IFR / VFR – see the US entry area brief.

13.10.12 NATIONAL ROUTE PROGRAMME (NRP)

This applies to flights operating at or **above FL290** regardless of city pair or stage length where operators can select, file and fly minimum time/cost (random) routes within continental USA airspace. CIRRUS is currently limited in use of NRP but is under development.

13.10.13 SOUTH AMERICA

IFPB are used over various parts of the South American Continent. The relevant Jeppesen charts give the latest areas for broadcasts. ATC services vary depending on the country being over flown and the height of transit. Generally high altitude routes are provided with a good service however IFPB broadcasts should still be made.

At lower levels the ATC service can deteriorate. Be very careful with unexpected clearances – English language is not the normal spoken, and some pronunciations are difficult to understand.

When being re-routed be sure of the point cleared to and check the MSA's for the route given. If there is any doubt check with ATC and request a different routing or level.

13.10.14 PACIFIC & AUSTRALASIA

The Oceanic Control Areas covering the Pacific are:

- Tokyo and Anchorage CTA's to the North.
- Oakland CTA covering the central Pacific, including the area South of the Tokyo CTA. Brisbane, Auckland, Nadi and Tahiti CTA's to the South.

If unable to maintain assigned flight level or if a turn-back is required:

a) Attempt to obtain re-clearance from ATC.
b) Keep ATC and other aircraft informed of intentions by the use of 121.5 MHz transmissions.
c) Leave assigned track at 90° (turning in the direction most suitable to keep clear of adjacent routes) to establish a track laterally separated by 25nm from the original and select a level 500ft separated from those normally in use.

The USAF maintains a Radar Advisory Service over a large part of the central Pacific region. This service has the call sign STARGAZER. It is contacted by the use of 121.5MHz *– details are located in the Jeppesen briefs that cover this area.*

Families of HF frequencies are used, e.g. CEP 1-2-3 for the Hawaii / US Mainland routes.

On all flights monitor 121.5 MHz.

Over Australia ATC services are good but in bad weather some communications can be disrupted. In all cases a good listening watch should be maintained on 121.5MHz.

13.11 HIGH DENSITY ALTITUDE (HDA) OPERATIONS *("HOT and HIGH OPERATIONS")*

At high density altitude airfields aircraft energy levels, during an approach, are very similar to the energy of an aircraft under the conditions of a 'rushed approach' to an airfield in ISA conditions. There is the additional 'trap', of a higher TAS in hot and high conditions that potentially masks the problems ahead even more. E.g. Phoenix in summer can rise to 45 degrees (ISA +32), however, with an ordinary elevation of 1,135ft do alarm bells ring? They should do, the density altitude is 5,000ft!!

To calculate Density Altitude a rule of thumb is:

"Density Altitude = Airfield Altitude + 1,000ft per 8 degrees above ISA"

e.g. Johannesburg, elevation 5,500ft. With an OAT of 28 degrees (ISA +24) the density altitude is 8,500ft.

PRESSURE ALT (ft)	ISA / OAT (Deg C)
0	15
1000	13
2000	11
3000	9
4000	7
5000	5
6000	3
7000	1
8000	-1
9000	-3
10000	-5

Appreciation of the environmental conditions and the impact they can have is the key to avoiding a poor approach.

Awareness of Aircraft Energy (*Groundspeed)*

Vigilance is required to manage the energy of the aircraft to maintain a desired profile when making an approach to a HDA airfield. An intermediate approach speed, *(e.g. 250kts)* would be expected to be a good speed from which to manage an approach.

However, at a HDA airfield 250kts IAS gives a TAS of 330kts which requires a descent rate of 1,650fpm to maintain a 3° profile. If not planned for, it is easy to get high and fast if not recognised and acted upon early.

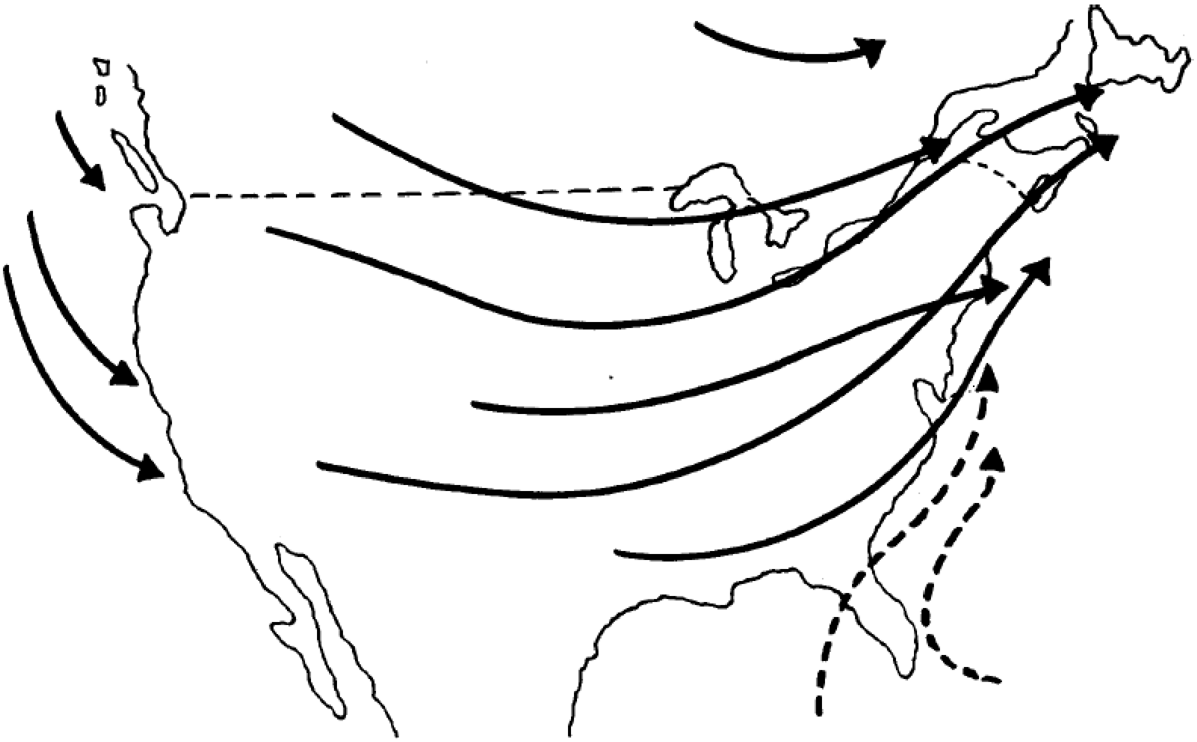
13.12 WEATHER

13.12.1 NORTH ATLANTIC & NORTH AMERICA WEATHER

January - frequent travelling frontal depressions associated with the Polar Front which lies from Florida towards southern England.

July - the Polar Front lies from Newfoundland towards Scotland; associated travelling frontal depression activity is about half the winter rate.

Some typical tracks of depressions over North America are shown below; actual paths vary widely and lie further north in summer than in winter.



The frequency of depressions that form over western Canada and north western USA shows little seasonal variation, whereas the frequency is much less over southern USA in summer than in winter.

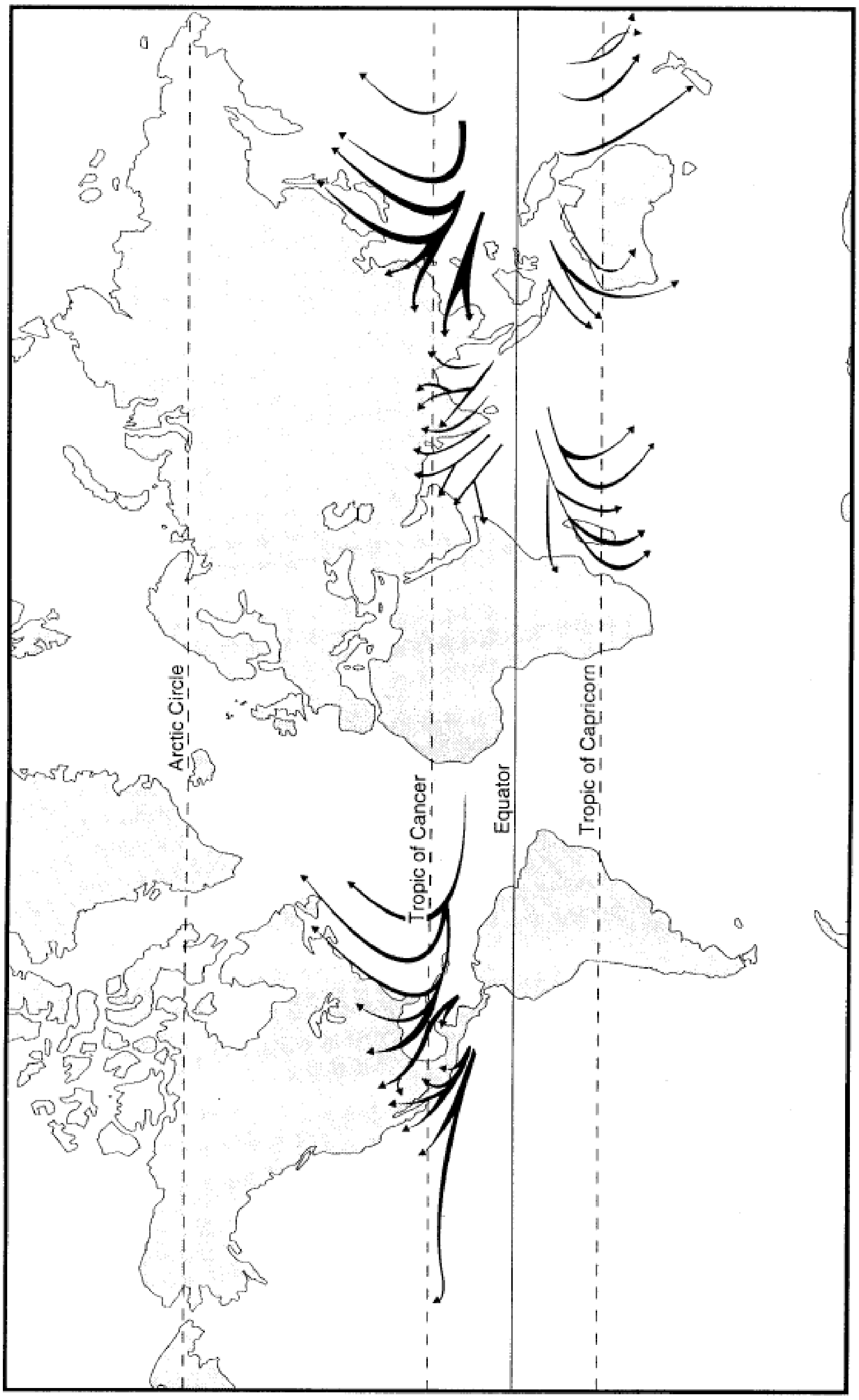
Winter warm fronts often slow down near New York and Boston giving persistent poor weather over a wide area.

Persistent advection fog may form off the coasts of Nova Scotia and Newfoundland from May to August when warm moist southerly air passes over the cold water of the Labrador current. Similarly banks of advection fog form off the California coast during the northern summer months.

It is not unusual for a marked temperature inversion to exist during anti-cyclonic conditions over North America in winter. On take-off from Toronto a BA crew reported experiencing a temperature inversion coupled with windshear due to an increasing tailwind component during the latter stages of the take-off roll and initial climb out. There were no warnings promulgated by ATC.

13.12.1.1 **Tropical Cyclones *(Hurricanes)***

June to October - Caribbean to Mexico. Southern and eastern coasts of the USA affected during Hurricanes north to north easterly track.



13.12.1.2 **THUDERSTORMS**

Heavy thunderstorm activity is common in the USA during summer. It is particularly violent when warm moist air from the Gulf of Mexico interacts with cold northerly air. The mid-west and south are particularly affected. *(American radar controllers are adept at assisting aircraft through thunderstorm activity).*

13.12.1.3 **TORNADOES**

Often associated with thunderstorms, tornadoes are a feature of the plains to the east of the Rocky Mountains, particularly the Mississippi central plain.

13.12.1.4 **JET STREAMS**

Jet streams, associated with the Polar Front, are frequent between Europe and North America during winter. There are markedly fewer during the summer months.

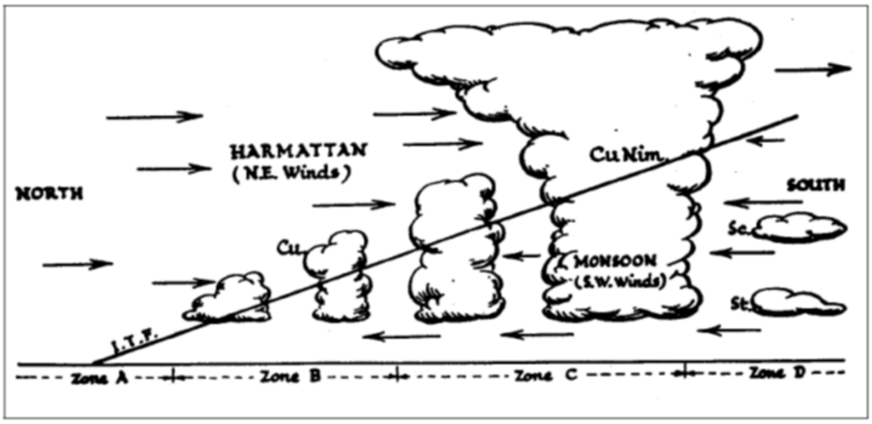
The sub-tropical jet stream is often present over North America during winter at about 30ºN at a height near 40,000ft. Further north, jet streams, often associated with travelling depressions, occur frequently in winter but less so in summer.

13.12.1.5 **MEAN HEIGHT (FT) OF TROPOPAUSE 90ºW**

	January Polar	Tropical	July Polar	Tropical
70°N	27,000		32,000	
60°N	27,000		35,000	
40°N	35,000	57,000	43,000	51,000
20°N		56,000		53,000
0°		56,000		54,000

13.12.2 AFRICA

13.12.2.1 **WEST AFRICA WEATHER**



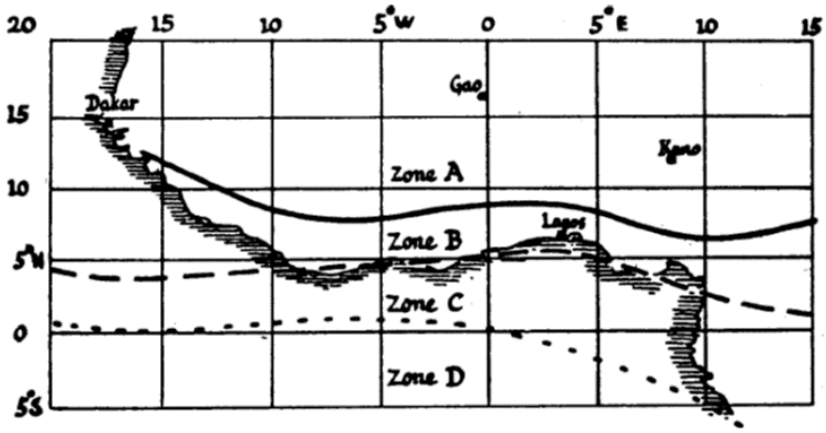
ZONES A, B, C AND D OF IDEALISED NORTH/SOUTH SECTION OF ITCZ OVER WEST AFRICA

Zone A
Dry north easterly air flow called Harmattan. This term is also applied to the accompanying dust haze; visibility may occasionally fall below 1,000 metres.

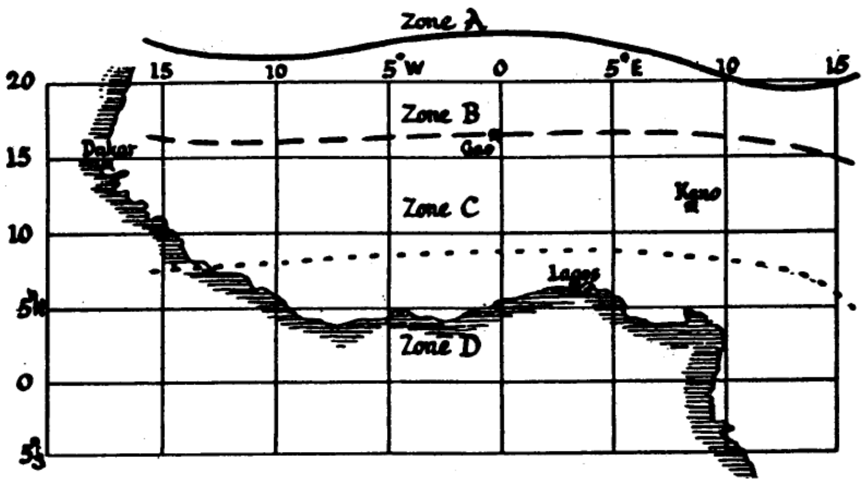
Zone B
Shallow layer of moist air giving some cumulus and occasional cumulonimbus. When Zone B lies near the coast (December to February) fog and low stratus often form at night.

Zone C
Deep layer of moist air enabling intense cumulonimbus activity. Line squalls, orientated north/south, may extend over more than 100 nautical miles.Surface wind speeds at the base of the cumulonimbus may reach 100 knots.

Zone D
Some cumulus develops during the day.



MEAN POSITION OF ITCZ JANUARY

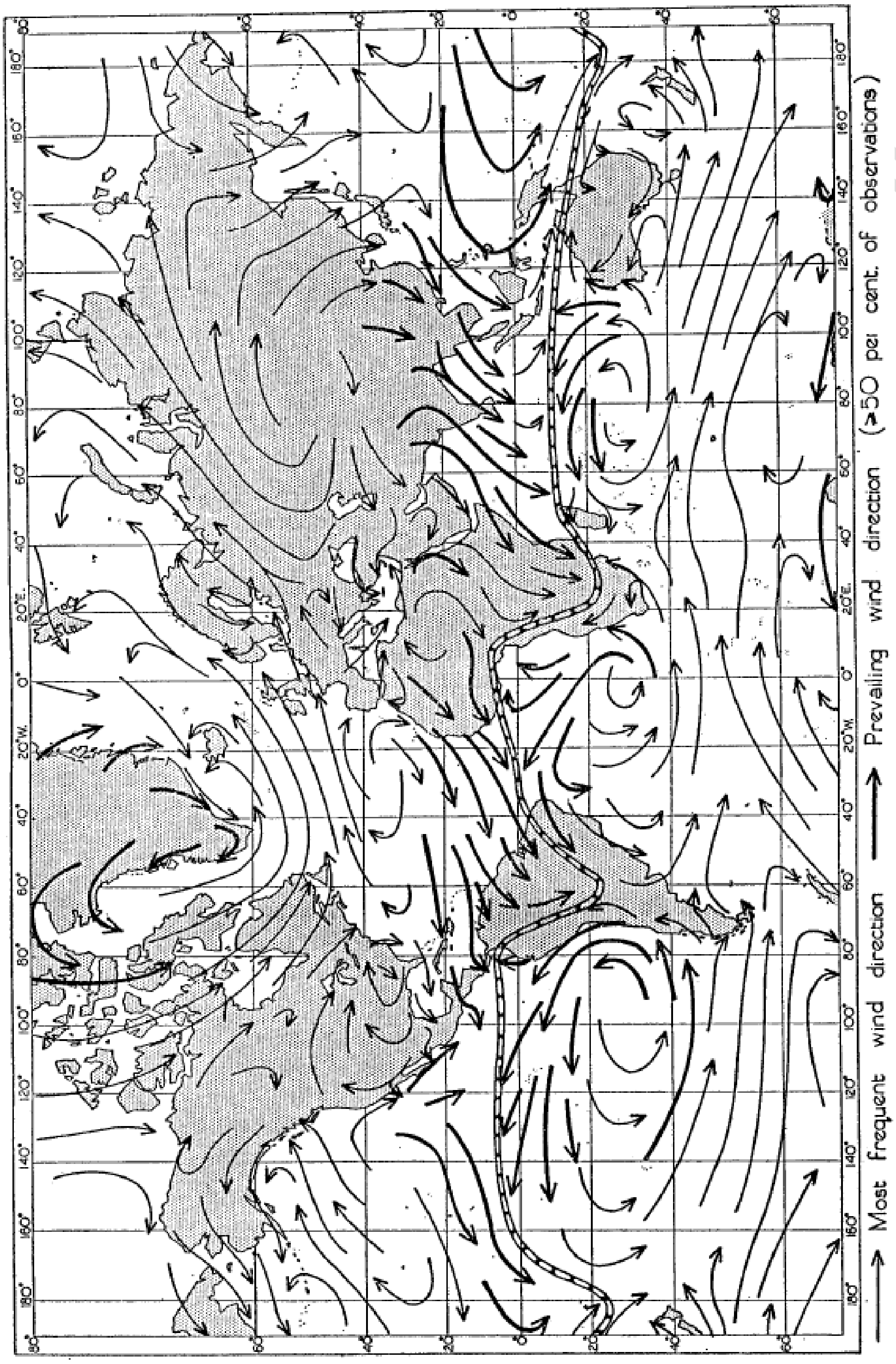


MEAN POSITION OF ITCZ AUGUST

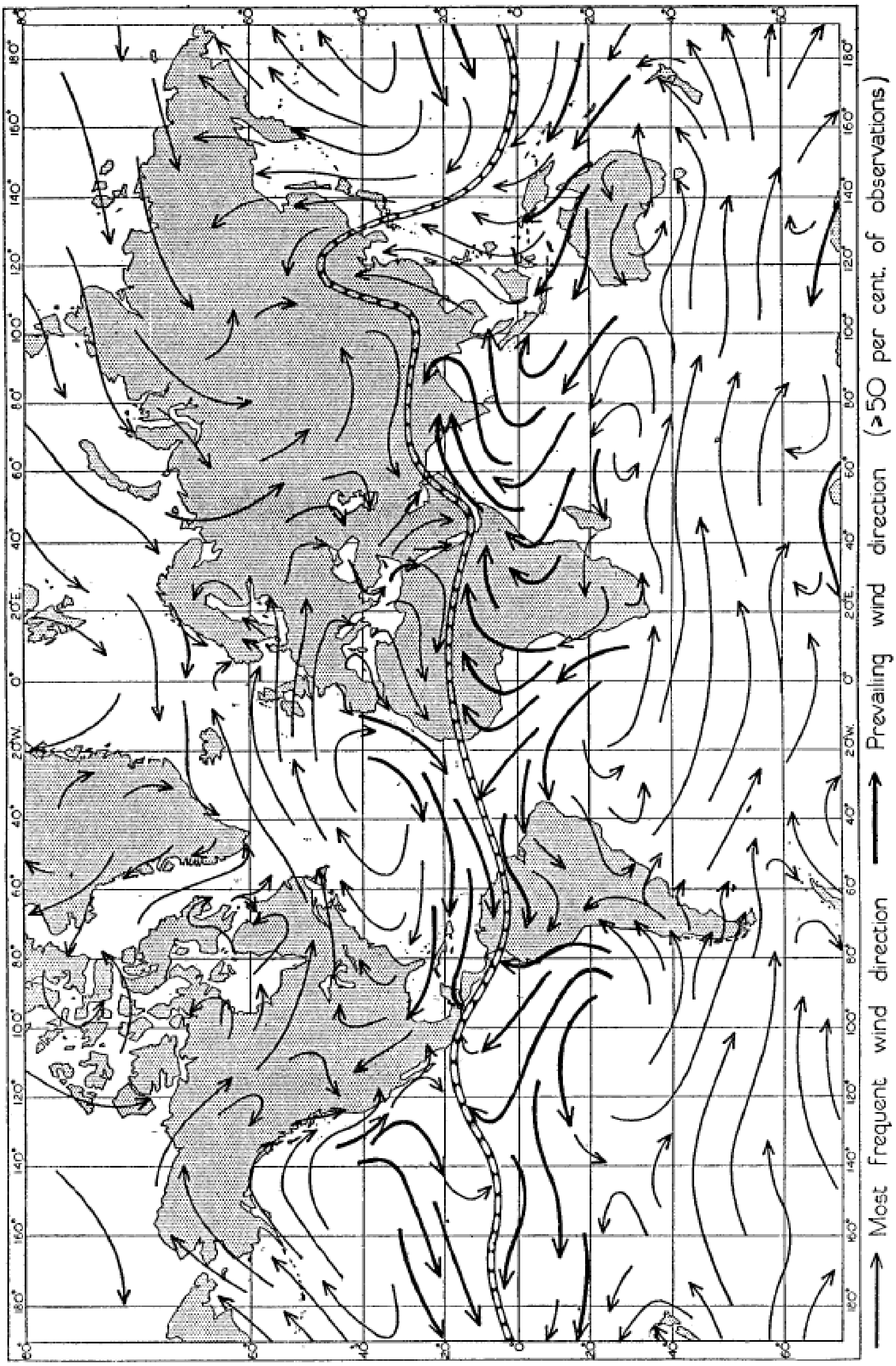
13.12.2.2 **EAST AND SOUTH AFRICA WEATHER**

INTERTROPICAL CONVERGENCE ZONE - (ITCZ)

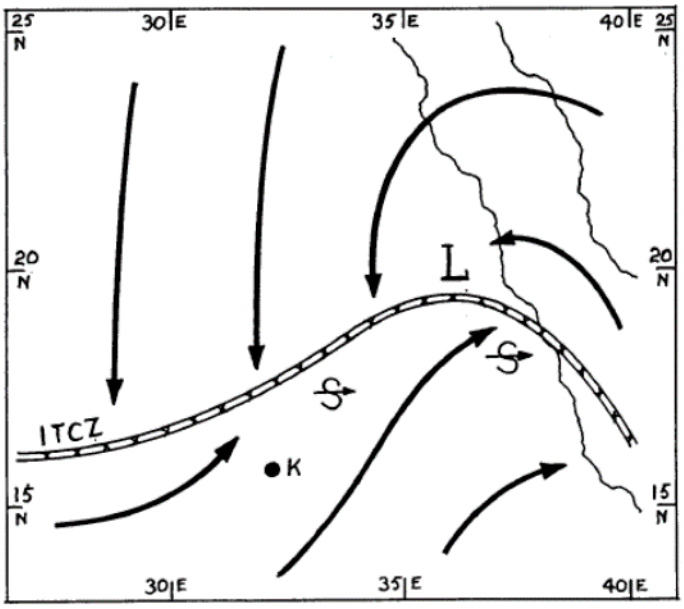
The ITCZ moves north through Khartoum in late May or early June; it moves south of Khartoum during September to near the Equator in November.



ITCZ & Surface Winds – January



ITCZ & Surface Winds – July



A TYPICAL SUMMER SITUATION SHOWING A BULGE IN THE ITCZ AND ASSOCIATED CENTRE OF LOW PRESSURE - THE SUDAN LOW.

13.12.2.3 NORTH AFRICAN COAST TO KHARTOUM

Widespread dust or sandstorms, as opposed to localised sandstorms of short duration, are often associated with a southerly wind ahead of an eastward travelling depression; in Egypt this hot, dry wind is called Khamsin. The dust laden air may be lifted above 10,000ft and visibility may fall well below 500 metres. These sandstorms are most frequent from March to May and may last several days.

Over Sudan the ITCZ reaches a limit of about 20ºN during July. This period is associated with severe dust storms, the Haboobs; visibility may fall to less than 200 metres and thunderstorms will be present.

13.12.2.4 KHARTOUM TO TANZANIA

A double transit of the ITCZ results in two distinct periods of rainfall. Kenya, for instance, experiences “long rains” from March to May as the ITCZ moves north and “short rains” from November to December as the ITCZ moves south; Uganda is similarly affected.

Very low stratus and/or fog in the early morning is, intermittently, a troublesome feature at Nairobi through the year.

13.12.2.5 TANZANIA TO SOUTH AFRICA

Lasting one to five days, particularly during the dry season from April onwards, south easterly winds bring ragged low cloud *(called Guti in Zimbabwe)* and large amounts of medium and high cloud from the east. Drizzle from the low cloud may be augmented by bursts of rain from higher levels which may be prolonged over the Transvaal. Line squalls are liable to occur at the onset and sometimes ahead of the south east winds. Cape Town is affected by Atlantic depressions during the southern winter (July); low cloud and poor visibility with rain may occur.

13.12.2.6 TROPICAL CYCLONES

In the Indian Ocean, the area from Mauritius as far west as the Mozambique Channel is affected by tropical Cyclones from November to May; they are most frequent from January to March.

See world distribution para 11.2.1

13.12.2.7 JET STREAMS

The sub-tropical jet stream is often present over North Africa during the northern winter at about 25ºN. An easterly equatorial jet stream may be present in about latitude 10ºN during the northern summer.

13.12.2.8 MEAN HEIGHT (FT) OF TROPOPAUSE 0º LONGITUDE

	January Polar	Tropical	July Polar	Tropical
40°N	37,000	54,000	43,000	52,000
30°N		56,000		56,000
0°		57,000		55,000
20°S		55,000		54,000
40°S	38,000	52,000	34,000	49,000
60°S	29,000		31,000	

13.12.3 MIDDLE EAST, SIBERIA, ASIA AND FAR EAST

See Appendix B and C.

13.12.3.1 MIDDLE EAST WEATHER

Summer - arid and very hot. A strong north westerly wind *(the Shamal*) over Iraq occurs from June to October causing dust storms in which visibility may fall severely. At the height of summer, the ITCZ reaches Oman bringing south westerly winds and associated low cloud and drizzle to the coast.

Winter - occasional depressions from the Mediterranean bring some rain. There is a possibility of severe thunderstorms giving heavy hail. There may be persistent fog or low stratus around dawn in the gulf area which often affects several gulf airfields at the same time. Snow falls over high ground north of about 27ºN.

Mountain waves are sometimes troublesome over Iran.

13.12.3.2 **SIBERIA WEATHER**

Summer - travelling depressions from the west; precipitation decreases towards the east. Heavy cumulonimbus activity a possibility over mountainous terrain.

Winter - Siberian High gives stable conditions and very low temperatures. Ice fog, generated from the warmth of urban areas may last for several days.

13.12.3.3 **MEAN HEIGHT (FT) OF TROPOPAUSE 90ºE**

	January Polar	Tropical	July Polar	Tropical
70°N	29,000		36,000	
60°N	31,000		39,000	
40°N	35,000	51,000	43,000	51,000
20°N		57,000		55,000
0°		57,000		54,000
20°S		55,000		53,000
40°S	38,000	51,000	34,000	49,000

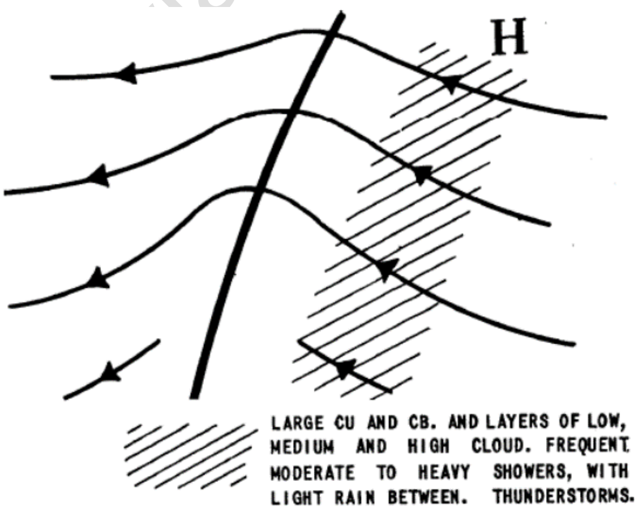
13.12.4 SOUTH AMERICA AND CARIBBEAN

13.12.4.1 **TROPICAL CYCLONES**

June to October - Caribbean to Mexico (Southern and eastern coasts of the USA affected during Hurricane's north to north easterly track). Hurricanes do not occur in the South Atlantic.

See world distribution para 11.2.1

13.12.4.2 **CARIBBEAN**



TYPICAL EASTERLY WAVE

13.12.4.3 **JET STREAMS**

The sub-tropical jet stream is in evidence across South America at about 40ºS during the southern winter (July).

At high level, over the Andes, turbulence associated with jet streams is frequently made considerably more severe by the presence of the mountains.

13.12.4.4 **MEAN HEIGHT (FT) OF TROPOPAUSE 90ºW**

	January Polar	Tropical	July Polar	Tropical
20°N		56,000		53,000
0°		56,000		54,000
20°S		54,000		54,000
40°S	38,000	52,000	34,000	49,000
60°S	30,000		31,000	

13.12.5 EUROPE AND MEDITERRANEAN

Most depressions that affect the Mediterranean form in the west where about eight occur each month in winter and about four each month in summer, but many of these are weak. The numbers are smaller in the east and no active depressions occur there in summer.

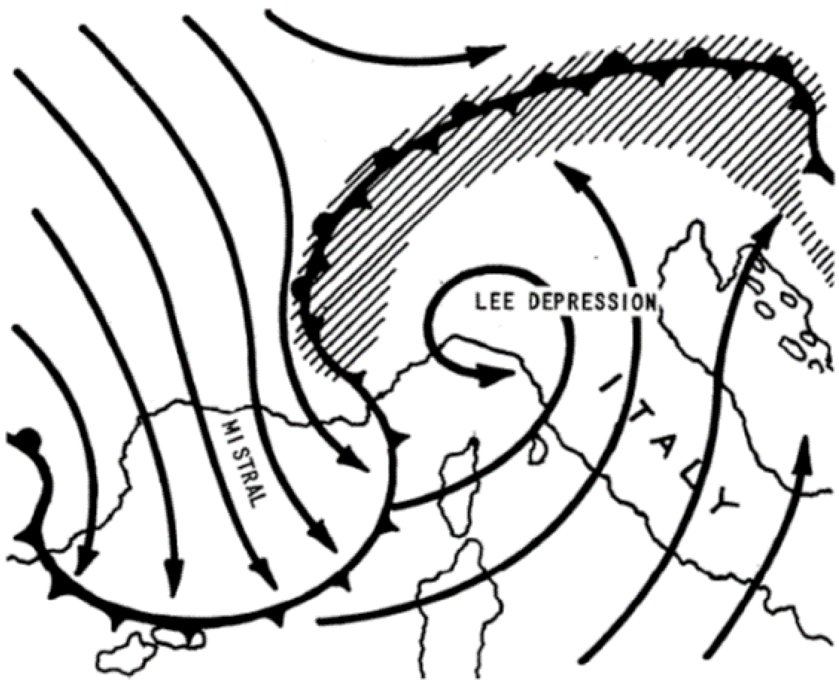
TYPICAL TRACKS OF DEPRESSIONS IN THE MEDITERRANEAN

The tracks of eastward travelling depressions over northern Europe vary considerably; they move further north in summer.

13.12.5.1 **LOCAL WINDS**

Vendevale - strong south westerly wind in the Strait of Gibraltar occurring mainly from September to March. It is associated with travelling depressions and brings rough weather conditions and some thunderstorms.

Mistral - strong, cold, northerly wind blowing down the Rhone valley. It is most frequent in winter and is often associated with an alpine lee depression over northern Italy. The wind speed may reach 80 knots.



Bora - a strong, cold, north easterly, katabatic wind occurring mainly in winter along the eastern coast of the Adriatic. It may reach speeds of 100 knots.

Scirocco - a hot, dry, dust laden, southerly wind blowing from North Africa ahead of an eastward travelling depression. On reaching the Mediterranean Sea it may pick up sufficient moisture to give extensive low stratus and rain by the time it reaches 40ºN (Naples).

13.12.5.2 **JET STREAMS**

Jet streams over Europe are most frequently associated with frontal depressions; the jet stream usually lies parallel to the fronts of the depression.

13.12.5.3 **MEAN HEIGHT (FT) OF TROPOPAUSE 0º LONGITUDE**

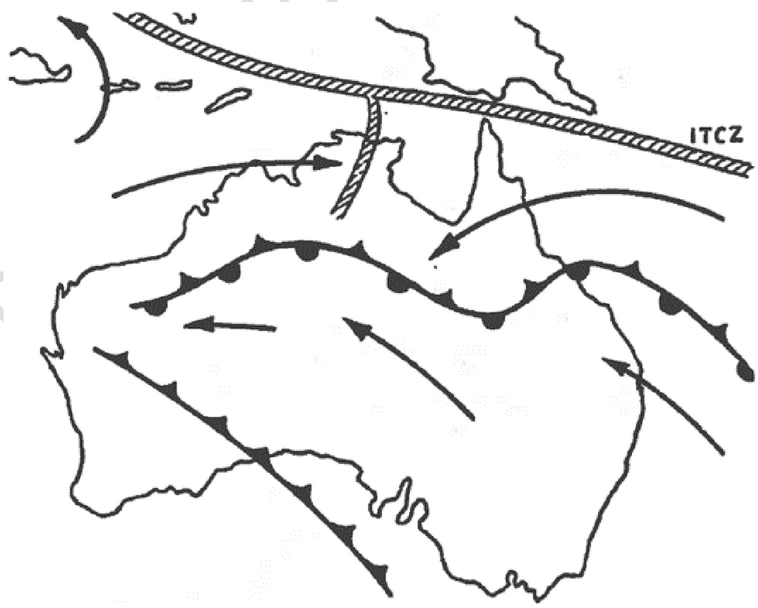
	January Polar	Tropical	July Polar	Tropical
60°N	32,000		35,000	
40°N	37,000	54,000	43,000	52,000

13.12.6 AUSTRALASIA & PACIFIC

January – families of frontal depressions in the North Pacific whose presence may be felt as far south as Hawaii. Some frontal depressions affecting the South of Australia and New Zealand can bring bad weather and very strong winds.

July – travelling frontal depressions over the South of Australia and New Zealand can bring very bad weather. This may include snow with its associated problems.

FRONTAL WAVE BRINGING EXTENSIVE LOW CLOUD AND RAIN OVER SOUTH EAST AUSTRALIA



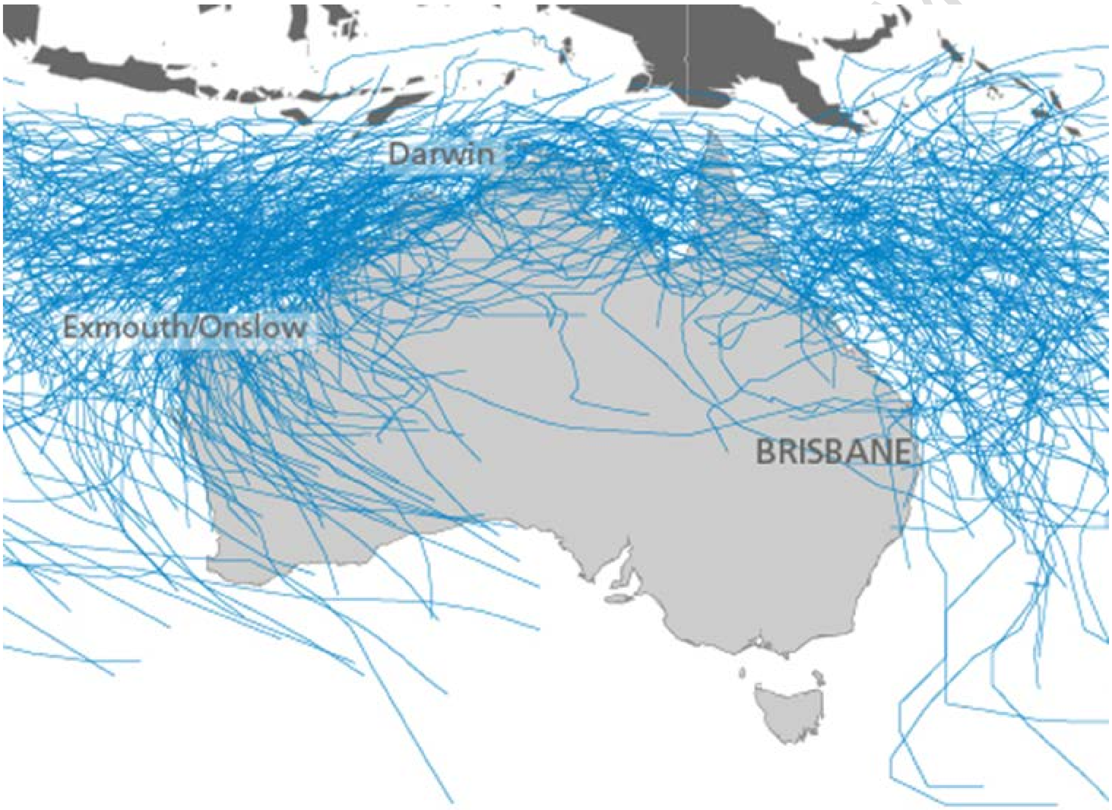
FRONTAL ACTIVITY IN SOUTHERN SUMMER WITH A COMMON SOUTHWARD EXTENSION OF THE ITCZ NEAR DARWIN

Line squalls are a possibility, occurring more usually in the southern half of Australia; inland they are often accompanied by severe dust storms. Most of them arrive from the south with the advent of a cold front. Squalls frequently follow in the airstream behind the newly formed front. Particularly vigorous line squalls affect the coastal strip of New South Wales (the Southerly Buster) Five to Six each month are likely from November to February, two thirds of the annual total.

13.12.6.1 TROPICAL CYCLONES

December to April – South Pacific islands to north east coast of Australia *(New Zealand only rarely affected)* and north west coast of Australia *(Wily-willies).*

June to November – North east Pacific, Philippines, Chin and Japan *(Typhoons).*



TROPICAL CYCLONE TRACKS

13.12.6.2 JET STREAMS

The sub-tropical jet stream is normally present over Australia in the southern winter (July). Its core usually lies between 25° S and 28°S at a height near 40,000ft.

In the northern winter (January) the sub-tropical jet stream is usually present in the north west Pacific and may combine with a Polar jet stream (associated with the Polar Front) to give wind speeds over 200 knots.

13.12.6.3 **MEAN HEIGHT (FT) OF TROPOPAUSE 180° E / W**

	January Polar	Tropical	July Polar	Tropical
60°N	30,000		35,000	
40°N	35,000	54,000	42,000	51,000
20°N		56,000		53,000
0°		56,000		53,000
20°S		54,000		53,000
40°S	28,000	51,000	34,000	49,000
60°S	31,000		31,000	