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NORTH ATLANTIC OPERATIONS AND AIRSPACE MANUAL

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Prepared by the ICAO European and North Atlantic Office
on behalf of the North Atlantic Systems Planning Group (NAT SPG)

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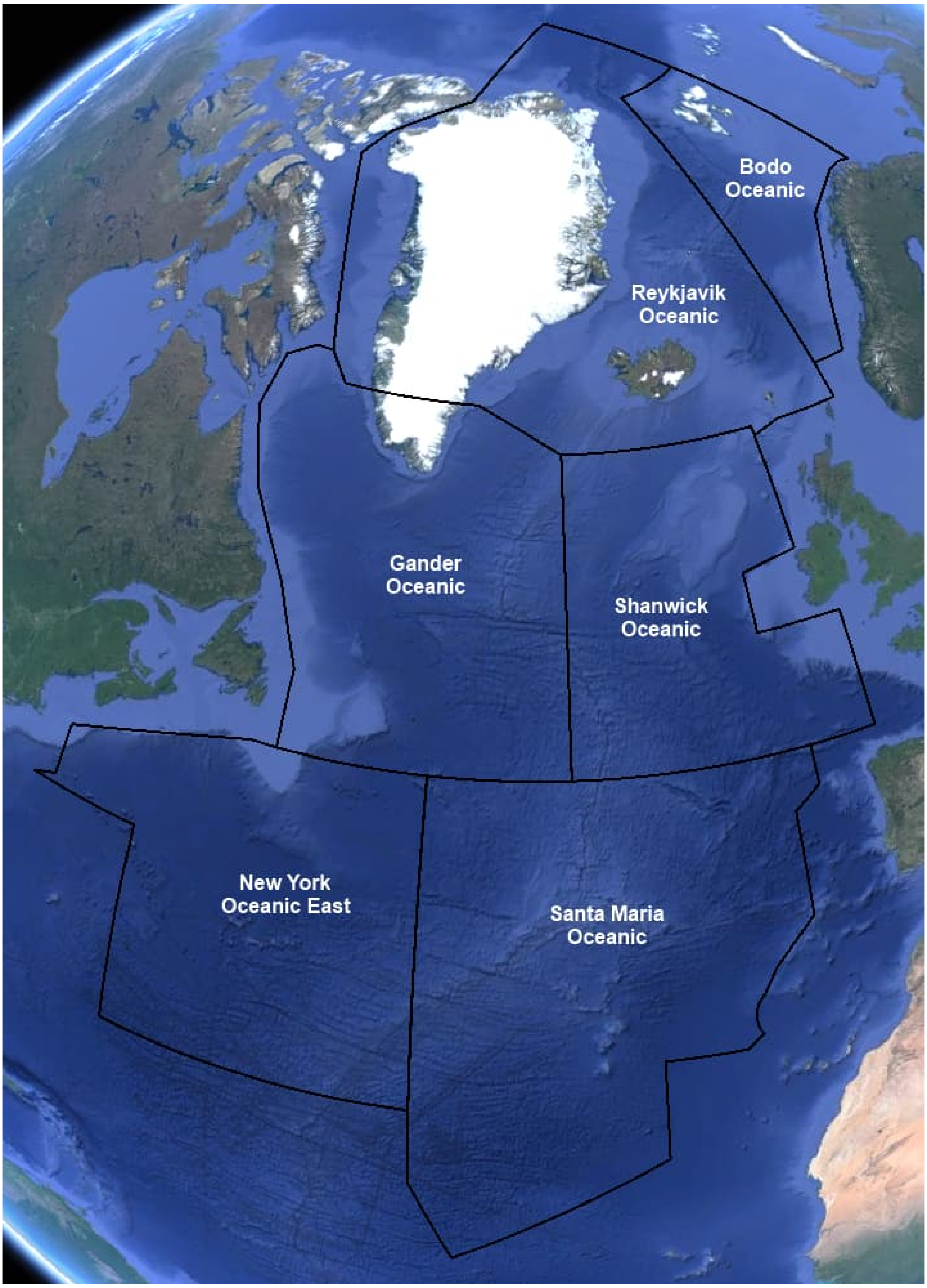
Figure 1 – The ICAO North Atlantic Region



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FOREWORD

This Document has been produced with the approval and on behalf of the North Atlantic (NAT) Systems Planning Group (SPG); the North Atlantic regional planning body established under the auspices of the International Civil Aviation Organisation (ICAO). This Group is responsible for developing the required operational procedures; specifying the necessary services and facilities; and defining the aircraft and operator approval standards employed in the NAT region.

Further information on the functions and working methods of the NAT SPG, together with the NAT Regional Safety Policy Statement, are contained in the NAT SPG Handbook (NAT Doc 001) which is available in the European and North Atlantic (EUR/NAT) Office public pages on the ICAO website (www.icao.int/EURNAT/).

This Document is for guidance only. Regulatory material relating to North Atlantic aircraft operations is contained in relevant ICAO Annexes, PANS-ATM (Doc 4444), *Regional Supplementary Procedures* (Doc 7030), State AIPs and current NOTAMs, which should be read in conjunction with the material contained in this Document.

The airspace of the North Atlantic which links Europe and North America is the busiest oceanic airspace in the world. For the most part in the North Atlantic, Direct Controller Pilot VHF voice Communications (DCPC VHF) and radar surveillance are unavailable. Communications via CPDLC are available to FANS equipped aircraft and ADS-B surveillance is available through most of the airspace. Aircraft separation assurance and hence safety is ensured by demanding the highest standards of horizontal and vertical navigation performance/accuracy and of operating discipline.

The vast majority of North Atlantic flights are performed by commercial jet transport aircraft in the band of levels FL 290 – FL 410. To ensure adequate airspace capacity and provide for safe vertical separations, Reduced Vertical Separation Minima (RVSM) is applied throughout the ICAO NAT region.

A large portion of the airspace of the NAT, which, incidentally, contains the majority of these NAT crossings routes, is designated as the NAT High Level Airspace (NAT HLA) between FL 285 and FL 420 inclusive. Within this airspace a formal approval process by the State of Registry of the aircraft or the State of the operator ensures that aircraft meet defined NAT HLA Standards and that appropriate flight crew procedures and training have been adopted. The lateral dimensions of the NAT HLA include the following Oceanic Control Areas (OCAs):

REYKJAVIK, SHANWICK (excluding SOTA & BOTA), GANDER, SANTA MARIA OCEANIC, BODO OCEANIC and NEW YORK OCEANIC EAST north of 27N.

Some idea of these dimensions can be obtained from the maps at and those in Chapter 2 and Chapter 3. However, for specific dimensions, reference should be made to the ICAO North Atlantic Regional Air Navigation Plan (NAT eANP, Doc 9634) and Doc 7030 – NAT (available at www.icao.int/EURNAT/).

Although aircraft and flight crews may fly above the NAT HLA without the requisite of a NAT HLA approval, it is important that flight crews of such aircraft have both an understanding of the operational procedures and systems employed in the NAT HLA and specific knowledge of any active organized route structures.

The bulk of this Document provides information for Aircraft Operating Agencies, flight crews and Dispatchers planning and conducting operations in or above the NAT HLA and it also offers guidance to the State Regulators responsible for the approval/certification/or licensing of such aircraft operators, flight crews or dispatchers.

Aircraft without NAT HLA or RVSM approvals may, of course, also fly across the North Atlantic below FL 285. However, due consideration should be given to the particular operating environment. Especially by pilots/operators of single and twin engine aeroplanes. Weather conditions can be harsh; there are limited VHF radio communications and ground-based navigation aids; and the terrain can be rugged and sparsely populated. International General Aviation (IGA) flights at these lower levels constitute a very small percentage of the overall NAT traffic but they account for the vast majority of Search and Rescue operations. Specific guidance for the pilots and operators of such flights is contained in Chapter 12.

The guidance document provided herewith is included in the ICAO NAT Regional Library and is designated as NAT Document 007 (NAT Doc 007). The Document can be accessed/downloaded from the European and North Atlantic (EUR/NAT) Office public pages on the ICAO website, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT Doc 007".

This website will also include, any noted post publication errata (changes) or addenda (additions) to the current edition.

"NAT Region Operations Bulletins", are also available from the website. These bulletins are used to distribute information on specific issues on behalf of the NAT SPG.

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To assist with the editing of this Manual and to ensure the currency and accuracy of future editions it would be appreciated if readers would submit their comments/suggestions for possible amendments/additions, to the ICAO EUR/NAT Office at the above Email address.

As part of the continuing development within the operating environment of NAT HLA, trials take place in the NAT from time to time, in support of various separation reduction and safety initiatives. Some of these trials require the assistance of operators and flight crews. For a listing of current initiatives and trials (if any) and participation details etc., reference should be made to the AIP of NAT ATS provider States. Information on some of these trials may also be found by looking for "NAT Documents" in the European and North Atlantic (EUR/NAT) Office public pages on the ICAO website (www.icao.int/EURNAT/).

EXPLANATION OF CHANGES

Edition v2026-1 - Content Modifications/Additions Incorporated

This modification includes:
- *Editorial and minor amendments throughout the document;*

Material changes:
- *Foreword: Paragraphs 4 and 14 amended.*
- *Abbreviations: Five abbreviations added, two amended and one deleted.*
- *Definitions: Random route definition added. RCL definition amended.*
- *Chapter 1: 1.1.3 amended, 1.1.7 TCAS 7.1 carriage requirements clarified, 1.2.4 amended, 1.3.1 amended, 1.3.4 amended, 1.3.6 a) Note: 4 updated, 1.5.4 amended, 1.6.2 amended, 1.6.3 amended, 1.7.1 amended, 1.7.4 amended, 1.7.5 image updated, 1.9.1 amended, 1.9.2 amended.*
- *Chapter 2: 2.1.2 amended, 2.1.4 amended, 2.2.3 amended, 2.3.4 amended, former 2.4.2 deleted, 2.4.2 amended, 2.5 NAT track message examples amended.*
- *Chapter 4: 4.1.1 amended, 4.1.9 amended, 4.1.10 amended, 4.1.13 added, 4.2.10 Note amended.*
- *Chapter 5: 5.1.1 amended, 5.1.31 amended, 5.1.37 amended, 5.3.5 amended, 5.3.9 amended, 5.4.1 amended, 5.5.3 amended.*
- *Chapter 6: Former 6.1.10 deleted, 6.2 added, 6.3 Attachment number updated, 6.3.2 g) amended, 6.3.10 amended, former 6.2.21 deleted, 6.3.22 Taxi and prior to take-off moved, 6.3.23-6.3.28 amended, 6.3.48 amended, 6.3.50 amended, 6.3.56 amended, former 6.2.59 and 6.2.60 moved, 6.3.57 and 6.3.58 added, 6.4.1-6.4.7 added, 6.4.8 amended, 6.5.1 d) table amended, 6.5.4, h) amended, i) added, 6.5.5 amended, 6.6.2 added, 6.6.7-6.6.10 added, 6.7.1 amended, former 6.6.2-6.6.5 deleted.*
- *Chapter 7: 7.3.1 amended.*
- *Chapter 8: 8.1.2 amended, 8.1.4 added, 8.2.1 amended, 8.3.1 amended, former 8.4 deleted.*
- *Chapter 9: 9.1.10 amended, 9.2.1 amended.*
- *Chapter 10: 10.5.1 amended, former 10.6 deleted, 10.6.6 e) corrected, 10.7.1 amended, 10.8.7 amended.*
- *Chapter 11: 11.3.8 amended, 11.4 amended, 11.5 amended, 11.5.5 amended, 11.5.6 amended, 11.6.6 amended, former 11.6.13 amended, 11.6.14 amended, 11.6.16 amended, 11.6.27 added, vii) added in the Checklist for Aircraft Dispatch into NAT RVSM Airspace.*
- *Chapter 12: 12.11.3 amended, 12.12.1 amended, 12.13.3 amended.*
- *Chapter 13: Rewritten mostly.*
- *Attachment 1: Several changes.*
- *Attachment 3: 6. deleted*
- *Attachment 5: 1. table amended, 2. amended, 4. amended,*
- *Former attachment 1: Deleted.*
- *Former attachment 2: Deleted.*
- *Former attachment 3: Deleted.*
- *Former attachment 5: Deleted.*

ABBREVIATIONS

ACARS	Aircraft Communications Addressing and Reporting System
ACAS	Airborne Collision Avoidance System
ACC	Area Control Centre
ADF	Automatic Direction Finding
ADS	Automatic Dependent Surveillance
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract
AFTN	Aeronautical Fixed Telecommunication Network
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation and Control
AIREP	Air Report
AIS	Aeronautical Information Service
ARINC	ARINC - formerly Aeronautical Radio Incorporated
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATM	Air Traffic Management
ATO	Actual Time Over Significant Point
ATS	Air Traffic Services
BOTA	Brest Oceanic Transition Area
CAR	Caribbean
CDL	Configuration Deviation List
CDM	Collaborative Decision Making
CDR	Conditional Route
CDU	Control Display Unit
CMA	Central Monitoring Agency
CPDLC	Controller Pilot Data Link Communications
DCL	Departure Clearance (via Data Link)
DCPC	Direct Controller/Pilot Communications
DME	Distance Measuring Equipment
DR	Dead Reckoning
EDTO	Extended Diversion Time Operations
EFB	Electronic Flight Bag
ELT	Emergency Locator Transmitter
ETO	Estimated Time Over Significant Point
ETOPS	Extended Operations

ETP	Equal Time Point
EUR	Europe
FAA	Federal Aviation Administration
FANS 1/A	Future Air Navigation System 1 or A. (Respectively, Boeing and Airbus Proprietary Air-Ground ATC Data Link Communications Systems)
FDE	Fault Detection and Exclusion
FDR	Flight Data Records
FIR	Flight Information Region
FL	Flight Level
FMC	Flight Management Computer
FMS	Flight Management System
GLONASS	Global Orbiting Navigation Satellite System
GMU	GPS (Height) Monitoring Unit
GNE	Gross Navigation Error
GNSS	Global Navigation Satellite System
GP	General Purpose
GPS	Global Positioning System
HF	High Frequency
HLA	High Level Airspace
HMU	Height Monitoring Unit
HSI	Horizontal Situation Indicator
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
INF	Inland Navigation Fix
INS	Inertial Navigation System
IRS	Inertial Reference System
JAA	Joint Aviation Authorities
kHz	Kilohertz
LAT	Latitude
LEO	Low Earth Orbit (in reference to satellites e.g Iridium Constellation)
LONG	Longitude
LRCS	Long Range Communication System
LRNS	Long Range Navigation System
MASPS	Minimum Aircraft System Performance Specifications
MEL	Minimum Equipment List
MET	Meteorological
MHz	Megahertz
MMEL	Master Minimum Equipment List

MNPS	Minimum Navigation Performance Specifications
MNT	Mach Number Technique
NAM	North America
NAR	North American Route
NAT	North Atlantic
NAT SPG	North Atlantic Systems Planning Group
NDB	Non Directional Beacon
NM	Nautical Miles
NOAA	National Oceanic and Atmospheric Administration
NOTA	Northern Oceanic Transition Area
NOTAM	Notice to Airmen
OAC	Oceanic Area Control Centre
OCA	Oceanic Control Area
OEP	Oceanic Entry Point
OESB	Oceanic Errors Safety Bulletin
OTS	Organized Track System
OWAFS	Operations Without an Assigned Fixed Speed
OXP	Oceanic Exit Point
PBCS	Performance-Based Communication and Surveillance
PDC	Pre Departure Clearance
PF	Pilot Flying
PM	Pilot Monitoring
PRM	Preferred Route Message
RA	Resolution Advisory (per ACAS/TCAS)
RAIM	Receiver Autonomous Integrity Monitoring
RCL	Voice, or data link message via ACARS, used to provide ETO at OEP, requested flight level, and Mach. (The RCL, or “RCL RECEIVED”, is not a clearance.)
RCP	Required Communication Performance
RMI	Radio Magnetic Indicator
RNP	Required Navigation Performance
RSP	Required Surveillance Performance
R/T	Radio Telephony
RVSM	Reduced Vertical Separation Minimum
SAM	South America
SELCAL	Selective Calling
SID	Standard Instrument Departure
SLOP	Strategic Lateral Offset Procedures
SMS	Safety Management System

SOTA	Shannon Oceanic Transition Area
SSB	Single Sideband
SSR	Secondary Surveillance Radar
TAS	True Airspeed
TCAS	Traffic (Alert and) Collision Avoidance System
TLS	Target Level of Safety
TMI	Track Message Identification
UPR	User Preferred Route
UTC	Co-ordinated Universal Time
VHF	Very High Frequency
VOR	VHF Omni-directional Range
WAH	When Able Higher
WATRS	West Atlantic Route System
WPR	Waypoint Position Report

DEFINITIONS

ATS Surveillance service	Term used to indicate a service provided directly by means of an ATS Surveillance system.
ATS Surveillance system	Generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.
Conflict	A situation that occurs when it is predicted that the spacing between aircraft, an aircraft and a defined airspace, or an aircraft and terrain, may or will reduce below the prescribed minimum.
Cost Index (ECON)	Operators can flight plan Cost Index (ECON) provided that the planned true Mach number for any portion of the flight within the NAT is specified in Item 15 of the ICAO FPL. Flight crews can fly Cost Index (ECON). ATC will assign a fixed Mach number if required due to traffic.
Current Flight Plan	The flight plan, including changes, if any, brought about by subsequent clearances. From a flight crew perspective this means what is loaded in the FMS.
Doc 7030	North Atlantic (NAT) Regional Supplementary Procedures (AKA NAT Supps).
Multilateration	A group of equipment configured to provide position derived from the secondary surveillance radar (SSR) transponder signals (replies or squitters) primarily using time difference of arrival (TDOA) techniques. Additional information, including identification, can be extracted from the received signals.
North Atlantic Operations Bulletin (NAT OPS Bulletin)	NAT OPS Bulletins are used to distribute information on behalf of the North Atlantic Systems Planning Group (NAT SPG) for the purpose of providing guidance to North Atlantic (NAT) operators on material relevant to their operations.
Oceanic Entry Point	The Oceanic Entry point is generally a “named” waypoint, on or close to the FIR boundary where the aircraft enters an oceanic control area. Note: For aircraft entering the Reykjavik OCA from Edmonton, at or north of 82N, the Oceanic Entry Point can be a LAT/LONG position on the boundary.
Oceanic Exit Point	The Oceanic Exit point is generally a “named” waypoint, on or close to the FIR boundary where the aircraft leaves the last oceanic control area. Note: Routes involving more than one OCA may result in multiple Oceanic Entry and Exit Points.
Procedural Control	Term used to indicate that information derived from an ATS Surveillance system is not required for the provision of air traffic control service. (PANS-ATM)
Random Route	A NAT route segment that does not follow a published OTS track in its entirety.
RCL	Voice, or data link message via ACARS, used to provide ETO at OEP, requested flight level, and Mach. (The RCL, or “RCL RECEIVED”, is not a clearance.)
RESUME NORMAL SPEED	An ATC clearance that allows the flight crew to select cost index (ECON) speed instead of the assigned fixed Mach number with the condition that ATC must be advised if the speed changes by plus or minus Mach .02 or more from the last

assigned Mach number.

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CHAPTER 1 OPERATIONAL APPROVAL AND AIRCRAFT SYSTEM REQUIREMENTS FOR FLIGHT IN THE NAT HLA

Flight crews may fly across the North Atlantic within NAT High Level Airspace (HLA) only if they are in possession of the appropriate NAT HLA and RVSM approvals issued by the State of Registry of the aircraft or by the State of the operator. The Minimum Equipment List (MEL) for operations must be strictly observed.

1.1 GENERAL

1.1.1 NAT HLA is that volume of airspace between flight level (FL) 285 and FL 420 within the oceanic control areas of Bodo Oceanic, Gander Oceanic, New York Oceanic East north of 27N, Reykjavik, Santa Maria and Shanwick, excluding the Shannon and Brest Ocean Transition Areas.

1.1.2 It is implicit in the concept of the NAT HLA that all flights within the airspace achieve the highest standards of horizontal and vertical navigation performance and accuracy. Formal monitoring programmes are undertaken to quantify the achieved performances and to compare them with standards required to ensure that established Target Levels of Safety (TLS) are met.

Note: Collision Risk Modelling is used to estimate risk in each of the three dimensions (i.e. lateral, longitudinal and vertical). The target maxima set for these estimates is $5x10^{-9}$ *fatal accidents per flight hour and is known as the "Target Levels of Safety (TLSs)".*

1.1.3 With the exception of the NAT corridors (refer to sections 1.4 and 1.7.5), aircraft operating within the NAT HLA are required to meet the RNAV 10 (RNP 10) or RNP 4 navigation performance in the horizontal plane through the carriage and proper use of navigation equipment that meets the identified standards and has been approved as such by the State of Registry or State of the operator for the purpose. Such approvals encompass all aspects affecting the expected navigation performance of the aircraft, including the designation of appropriate cockpit/flight deck operating procedures. RNAV 10 (RNP 10) or RNP 4 is not required outside the NAT HLA.

1.1.4 All aircraft intending to operate within the NAT HLA must be equipped with altimetry and height-keeping systems which meet RVSM Minimum Aircraft System Performance Specifications (MASPS). RVSM MASPS are contained in the *Manual on Implementation Vertical Separation* (Doc 9574) and detailed in designated FAA document, *AC91-85* (latest edition). These documents can be downloaded from:

- https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1035328
- https://skybrary.aero/bookshelf/ac-91-85-authorization-aircraft-and-operators-flight-rvsm-airspace

1.1.5 The ultimate responsibility for checking that a NAT HLA/RVSM flight has the necessary approval(s) rests with the pilot in command. In the case of most regular scheduled flights this check is a matter of simple routine, but flight crews of special charter flights, private flights, ferry and delivery flights are advised to pay particular attention to this matter. Routine monitoring of NAT traffic regularly reveals examples of flight crews of non-approved flights, from within these user groups, flight planning or requesting clearance within the NAT HLA. All such instances are prejudicial to safety and are referred to relevant State Authorities for further action.

1.1.6 While not a specific element of NAT HLA approval, flight crews and operators are reminded that for flights over the NAT, *ICAO SARPS in Annex 6 (Operation of Aircraft), Part I, Chapter 6 and*

Part II, Chapter 2 requires carriage of Emergency Locator Transmitters (ELTs) by all commercial and IGA aeroplanes, respectively.

1.1.7 The following table provides a summary of the equipment and performance requirements for aircraft planning to operate in the NAT HLA and other parts of the NAT airspace. Refer to the appropriate sections of the document for detailed description of each requirement.

	VHF	LRCS [(1)]	HF	CPDLC	ADS-C	SATCOM DATA	ADS-B ES	LRNS	RNP
NAT WITHOUT RESTRICTIONS	VHF	2 LRCS	HF	CPDLC (RCP240)	ADS-C (RSP180)	SATCOM DATA	ADS-B ES	2 LRNS	RNP4 and RNP2 Continental
NAT HLA DLM		2 LRCS	HF	CPDLC	ADS-C	SATCOM DATA		2 LRNS	RNAV 10 or RNP 4
NAT HLA PBCS TRACKS		2 LRCS	HF	CPDLC (RCP240)	ADS-C (RSP180)	SATCOM DATA		2 LRNS	RNP 4
NAT HLA OUTSIDE DLM		2 LRCS	HF					2 LRNS	RNAV 10 or RNP 4
NAT CORRIDORS [(4)(5)]	VHF						ADS-B ES [(5)]	[(2)]	
T9, T290 [(3)]	VHF	1 LRCS	HF				ADS-B ES	1 LRNS	RNP 2 Continental
OUTSIDE HLA		2 LRCS	HF [(1)]						

The following are required in all airspaces:
- TCAS 7.1. in accordance with State AIP specifications (with MEL considerations);
- SSR Mode A/C; and
- RVSM between FL285 and FL420.

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(1) When outside VHF coverage.
(2) Certified installation of equipment providing the ability to navigate along the cleared track.
(3) The requirements for T13, T16, T25 and T213 are the same as the requirements for "NAT HLA DLM" and "NAT OUTSIDE HLA" depending on the operating altitude.
(4) The NAT corridors offer a solution for aircraft that are lacking data link and/or communication and/or navigation equipment meeting NAT HLA requirements.
(5) See section 1.7.5 for details.

Exceptions - Special Operations

1.1.8 NAT ATS providers may approve moving or stationary temporary airspace reservations within the NAT HLA, for the benefit of State or Military Aircraft Operating Agencies to accommodate Military Exercises, Formation Flights, Missile Firing or Unmanned Aircraft Systems (UAS) Activities. Procedures are established in respect of the requests for and management of such reservations. Whenever such reservations might impinge upon other flights in the NAT region, relevant AIS is published, including, if appropriate, annotations on the NAT track message.

1.1.9 Manned Balloon flights can be operated in or through the NAT region. They are, however, required to avoid the NAT HLA and must be meticulously co-ordinated with affected ATS Authorities in advance allowing sufficient time for all parties involved to properly plan for the flight.

1.2 APPROVAL

1.2.1 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 Specifications (MASPS) and hold an issued approval. Approval for NAT HLA operations will require the checking by the State of Registry or State of the operator, of various aspects affecting navigation performance. These aspects include: the navigation equipment used, together with its installation and maintenance procedures; plus the flight crew navigation procedures employed and the flight crew training requirements.

1.2.2 Since the NAT HLA is designated as RVSM airspace at all levels, all NAT flight crews/operators must be State approved specifically for NAT RVSM operations and each aircraft intended to be flown in the NAT HLA must have State RVSM Airworthiness approval.

1.2.3 There are times when NAT HLA and/or RVSM approval documentation may need to be shown to “suitably authorised persons”, e.g. during a ramp inspection or on similar occasions.

1.2.4 In order to adequately monitor the NAT HLA, State aviation authorities should maintain a database of all NAT HLA and RVSM approvals that they have granted. States must also provide data on RVSM approved airframes to the North Atlantic Central Monitoring Agency (NAT CMA). The NAT CMA database facilitates the tactical monitoring of aircraft approval status and the exclusion of non-approved users.

1.2.5 In the case of approvals for IGA operations, the following points are emphasised:

a) aircraft NAT HLA and RVSM approvals constitute a package covering equipment standards, installation, maintenance procedures and flight crew training;

b) State aviation authorities should consider limiting the validity period of approvals; and

c) State aviation authorities should maintain detailed records of all NAT HLA and RVSM approvals.

1.3 HORIZONTAL NAVIGATION REQUIREMENTS FOR UNRESTRICTED NAT HLA OPERATIONS

Longitudinal Navigation

1.3.1 Time-based 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 ATOs/ETOs at common points. The time-based 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 (MNT). However, aircraft clock errors resulting in waypoint ATO errors in position reports can lead to an erosion of actual longitudinal separations between aircraft. It is thus important that the time-keeping device intended to be used to indicate waypoint passing times is accurate and synchronised to an acceptable UTC time signal before commencing flight in the 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 HLA 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.

1.3.2 Operations without an assigned fixed speed (OWAFS) were implemented in July 2019. This implementation allows flight crew to select a cost index (ECON) speed instead of a fixed Mach number with the condition that ATC must be advised if the speed changes by plus or minus Mach .02 or more from the last assigned Mach number or the Mach number entered in the RCL message as appropriate.

Lateral Navigation

Equipment

1.3.3 There are two navigational equipment requirements for aircraft planning to operate in the NAT HLA. One refers to the navigation performance that should be achieved, in terms of accuracy. The second refers to the need to carry standby equipment with comparable performance characteristics (*ICAO Annex 6 (Operation of Aircraft)* refers).

1.3.4 With the exception of the NAT corridors (refer to sections 1.4 and 1.7.5), the navigation system accuracy requirements for NAT HLA operation should only be based on the PBN specifications, RNP 10 (PBN application of RNAV 10) or RNP 4. Although when granting consequent approval for operations in NAT HLA, States should take account of the RNP 10 time limits for aircraft equipped with dual INS or inertial reference unit (IRU) systems. All approvals issued after 04 February 2016 must be designated as "NAT HLA" approvals.

Note 1: With respect to RNAV 10/RNP 10 operations and approvals the nomenclature "RNAV 10 (RNP 10)" is now used throughout this document for consistency with ICAO PBN Manual Doc 9613. As indicated in the PBN Manual RNAV 10 has, and is being, designated and authorized as "RNP 10" irrespective of the fact that such "RNP 10" designation is inconsistent with formal PBN RNP and RNAV specifications, since "RNP 10" already issued operational approvals and "RNP 10" currently designated airspaces in fact ***do not*** *include any requirements for on-board performance monitoring and alerting. The justification for continuing to use this "RNP 10" nomenclature being that renaming current "RNP 10" routes and/or operational approvals, etc., to an "RNAV 10" designation would be an extensive and expensive task, which is not cost-effective. Consequently, any existing or new RNAV 10 operational approvals will continue to be designated "RNP 10", and any charting annotations will be depicted as "RNP 10".*

Note 2: RNP 10 time limits are discussed in Doc 9613, Part B, Volume II, Chapter 1.

1.3.5 When granting approval for operations in the NAT HLA, States of Registry should also ensure that in-flight operating drills are approved which include mandatory navigation crosschecking procedures aimed at identifying navigation errors in sufficient time to prevent the aircraft inadvertently deviating from the ATC-cleared route.

1.3.6 Long Range Navigation Systems, namely INS, IRS or GNSS, have demonstrated the requisite navigation accuracy required for operations in the NAT HLA. Consequently, State approval of unrestricted operation in the NAT HLA may presently be granted to an aircraft equipped as follows:

a) **with 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.*

Note 2: In USA, FAA Advisory Circular (AC) 20-138() *provides guidance on airworthiness approval for positioning and navigation systems, to include GPS. AC 90-105() provides guidance on operational approval for RNP operations in oceanic airspace, to include the requirements for RNP 10 (RNAV 10) and RNP 4 applicable to NAT HLA operations. Equivalent EASA documents are provided in Easy Access Rules for Airborne Communications, Navigation and Surveillance*

(CS-ACNS).

Note 3: While GLONASS SARPs are included in the latest edition of ICAO Aeronautical Telecommunications, Annex 10, Volume 1, there is no equivalent approval material for GLONASS under development. That will need to be available prior to approval of any GLONASS equipped aircraft for NAT HLA operations.

Note 4: SARPs for the Galileo satellite-based radio navigation system are included in Annex 10, Volume 1.

b) each LRNS shall be capable of providing to the flight crew a continuous indication of the aircraft position relative to desired track.

c) it is also highly desirable that the navigation system employed for the provision of steering guidance is capable of being coupled to the autopilot.

Note: Some aircraft may carry two independent LRNS but only one FMCS. Such an arrangement may meet track keeping parameters but does not provide the required redundancy (in terms of continuous indication of position relative to track or of automatic steering guidance) should the FMCS fail; therefore, in order to obtain NAT HLA certification, dual FMCS is required to be carried. For example: a single INS is considered to be one LRNS; and an FMCS with inputs from one or more IRS/ISS is also considered to be a single LRNS.

1.3.7 If a LRNS is a GPS, it must be approved in accordance with FAA/EASA (E)TSO-C129, (E)TSO-C145, (E)TSO-C146 or (E)TSO-C196 as Class A1, A2, B1, B2, C1 or C2, or later standard. (Note: (E)TSO-C129 is currently superseded, and no new C-129 equipped aircraft will enter into service). Some States may have additional requirements regarding the carriage and use of GPS (e.g. a requirement for FDE RAIM) and flight crews should check with their own State of Registry to ascertain what, if any, they are. These above-mentioned documents can be found at:

- https://drs.faa.gov and
- https://www.easa.europa.eu/en/certification-specifications/cs-etso-european-technical-standard-orders

Flight Crew Training

1.3.8 It is essential that flight crews obtain proper training for NAT HLA and RVSM operations in line with procedures described in other chapters of this document.

1.4 SPECIAL ARRANGEMENTS FOR OPERATION IN NAT HLA FOR AIRCRAFT NOT MEETING HLA REQUIREMENTS

1.4.1 Aircraft that do not meet NAT HLA requirements may be authorized by the state of operator or state of registry as applicable, to operate in NAT HLA if the following conditions are satisfied:

a) The aircraft is being provided with ATS surveillance service;

b) Direct controller-pilot VHF voice communication is maintained; and

c) The aircraft has a certified installation of equipment providing it the ability to navigate along the cleared track.

Note 1: Flight crews operating in the NAT HLA under these provisions should familiarize themselves with NAT HLA operations and procedures as well as ATS Surveillance and VHF service areas as published in State AIPs. They should also have a current copy of the OTS message that is in effect for the time of their flight for situational awareness.

Note 2: See section 1.7 for data link requirements.

1.4.2 The areas that satisfy the ATS surveillance and VHF requirements in paragraph 1.4.1 are the Iceland – Greenland corridor, Azores corridor and Bodo corridor detailed in section 1.7.5.

1.4.3 Aircraft not approved to operate in NAT HLA and not meeting the provisions in 1.4.1 may be cleared to climb or descend through NAT HLA, traffic permitting.

1.4.4 Details of other special arrangements may be found in AIP of each ATS provider State.

1.5 SPECIAL ARRANGEMENTS FOR NON-RVSM APPROVED AIRCRAFT

To Climb/Descend Through RVSM Levels

1.5.1 NAT HLA approved aircraft that are not approved for RVSM operation will be permitted, subject to traffic, to climb/descend through RVSM levels in order to attain cruising levels above or below RVSM airspace. Flights should climb/descend continuously through the RVSM levels without stopping at any intermediate level and should "Report leaving" current level and "Report reaching" cleared level (N.B. this provision contrasts with the regulations applicable for RVSM airspace operations in Europe, where aircraft not approved for RVSM operations are not permitted to effect such climbs or descents through RVSM levels.). Such aircraft are also permitted to flight plan and operate at FL 430 either Eastbound or Westbound above the NAT HLA.

To Operate at RVSM Levels

1.5.2 ATC may provide special approval for a NAT HLA approved aircraft that is not approved for RVSM operation to fly in the NAT HLA provided that the aircraft:

a) is on a delivery flight; or
b) was RVSM approved but has suffered an equipment failure and is being returned to its base for repair and/or re-approval; or
c) is on a mercy or humanitarian flight.

1.5.3 Operators requiring such special approval should request prior approval by contacting the initial Oceanic Area Control Centre (OAC), normally not more than 12 hours and not less than 4 hours prior to the intended departure time, giving as much detail as possible regarding acceptable flight levels and routings. Operators should be aware, due to the requirements to provide non-RVSM separation, that requested levels and/or routes may not always be available (especially when infringing active OTS systems). The special approval, if and when received, should be clearly indicated in Item 18 of the ICAO flight plan.

1.5.4 This service, as explained above, will not be provided to aircraft without approval for NAT HLA operations. It must be noted that the provision of this service is intended exclusively for the purposes listed above and is not the means for an operator or flight crew to circumvent the RVSM approval process. Operators or flight crews are required to provide written justification for the request, upon completion of the flight plan, to the NAT CMA. Any suspected misuse of the exceptions rule above, regarding RVSM operation, will be reported and will therefore be subject to follow-up action by the State of Registry or State of the operator as applicable.

1.5.5 Some flight planning systems cannot generate a flight plan through RVSM airspace unless the "W" designator is inserted in Item 10 (equipment). For a flight which has received this special approval, it is of utmost importance that the "W" is removed prior to transmitting the ICAO flight plan to ATC. ATC will use the equipment block information to apply either 1000 ft or 2000 ft separation. Additionally, flight crews of any such non-RVSM flights operating in RVSM airspace should include the phraseology "Negative RVSM" in all initial calls on ATC frequencies, requests for flight level changes, read-backs of flight level clearances within RVSM airspace and read-back of climb or descent clearances through RVSM airspace.

1.6 ATS SURVEILLANCE SERVICE AREAS IN THE NAT REGION

1.6.1 ATS Surveillance services (radar, ADS-B and multilateration) are provided within some portions of the NAT HLA, where radar- and/or ADS-B and/or multilateration coverage exists. The ATS Surveillance services are provided in accordance with the ATS Surveillance services procedures in the PANS-ATM (Doc 4444).

1.6.2 All aircraft operating as IFR flights anywhere within the NAT region are required to be equipped with a pressure-altitude reporting SSR transponder and may therefore benefit from such radar and multilateration air traffic services, currently offered in parts of the NAT region. All IFR aircraft operating within the Reykjavik FIR must be equipped with Mode S Elementary Surveillance (ELS) and all IFR fixed-wing aircraft of a maximum certified take-off mass exceeding 5 700 kg or that have a maximum cruising true airspeed capability greater than 250 kt, with an individual certificate of airworthiness first issued on or after 7 June 1995, must be equipped with Mode S Enhanced Surveillance (EHS) (refer to AIP Iceland for certain exemptions that apply).

1.6.3 ADS-B services are provided within portions of the NAT region (see Chapter 8). Eligibility and procedures for ADS-B service in the NAT are based upon the provisions in the Doc 7030 section 5.5. All IFR aircraft operating within the Reykjavik FIR must be equipped with 1 090 MHz Extended Squitter (ES) ADS-B (refer to AIP Iceland for certain exemptions that apply).

1.6.4 North Atlantic States providing ADS-B Air Traffic Services maintain a common exclusion list of aircraft that are known to not satisfy the conditions promulgated by Doc 7030. The purpose of the exclusion list is to ensure that ADS-B reports received from such aircraft are not utilized by the air traffic control system for separation services.

1.6.5 Aircraft operators wishing to receive an exemption from the procedures specified in Doc 7030 for an individual flight shall apply for an exemption to the ATS unit(s) in accordance with AIP directives. Any approvals for such exemptions may be contingent on specific conditions such as routing, flight level and time of day.

1.7 DATA LINK REQUIREMENTS

1.7.1 The NAT Data Link Mandate (DLM) requires aircraft to be equipped with, and operating, FANS 1/A CPDLC and ADS-C over Inmarsat or Iridium SATCOM in the NAT region. Currently, the mandate incorporates FL 290 to FL 410 inclusive.

1.7.2 The DLM is not applicable to aircraft operating in:

a) Airspace north of 80° North;

b) New York Oceanic East flight information region (FIR);

c) Airspace where an ATS surveillance service is provided by means of radar, multilateration and/or ADS-B, coupled with VHF voice communications as depicted in State Aeronautical Information Publications (AIP), provided the aircraft is suitably equipped (transponder/ADS-B extended squitter transmitter) (refer to paragraph 1.7.5 below).

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

1.7.4 Any aircraft not equipped with FANS 1/A CPDLC and ADS-C over Inmarsat or Iridium SATCOM systems may request to climb or descend through the NAT DLM airspace. Other requests for operation of non-DLM equipped aircraft in the NAT DLM airspace will be considered on a tactical basis, as outlined below:

a) Altitude reservation (ALTRV) requests and requests for “special operations” (e.g., for scientific research or weather observations) will be considered on a case-by-case basis, irrespective of the equipage status of the participating aircraft.

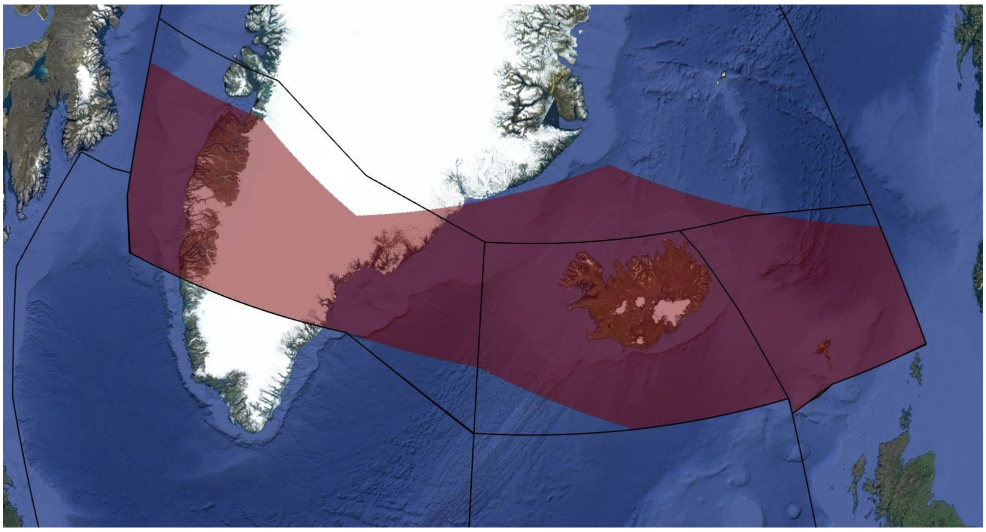
b) If a flight experiences an equipment failure AFTER DEPARTURE which renders the aircraft unable to operate FANS 1/A CPDLC and/or ADS-C and/or Inmarsat or Iridium SATCOM systems, requests to operate in the NAT DLM airspace will be considered on a tactical basis. Such flights must notify ATC of their status PRIOR TO ENTERING the airspace.

c) If a FANS 1/A data link equipment failure occurs while the flight is OPERATING WITHIN NAT DLM AIRSPACE, ATC must be immediately advised. Such flights may be re-cleared so as to avoid the airspace, but consideration will be given to allowing the flight to remain in the airspace, based on tactical considerations.

d) If a flight experiences an equipment failure PRIOR to departure which renders the aircraft non-DLM compliant, the flight should re-submit a flight plan so as to remain clear of the NAT regional DLM airspace.

1.7.5 Airspace excluded from the DLM in accordance with 1.7.2c) above is as follows:

a) Iceland – Greenland corridor



ADS-B is required for all IFR flights within the Iceland – Greenland corridor.

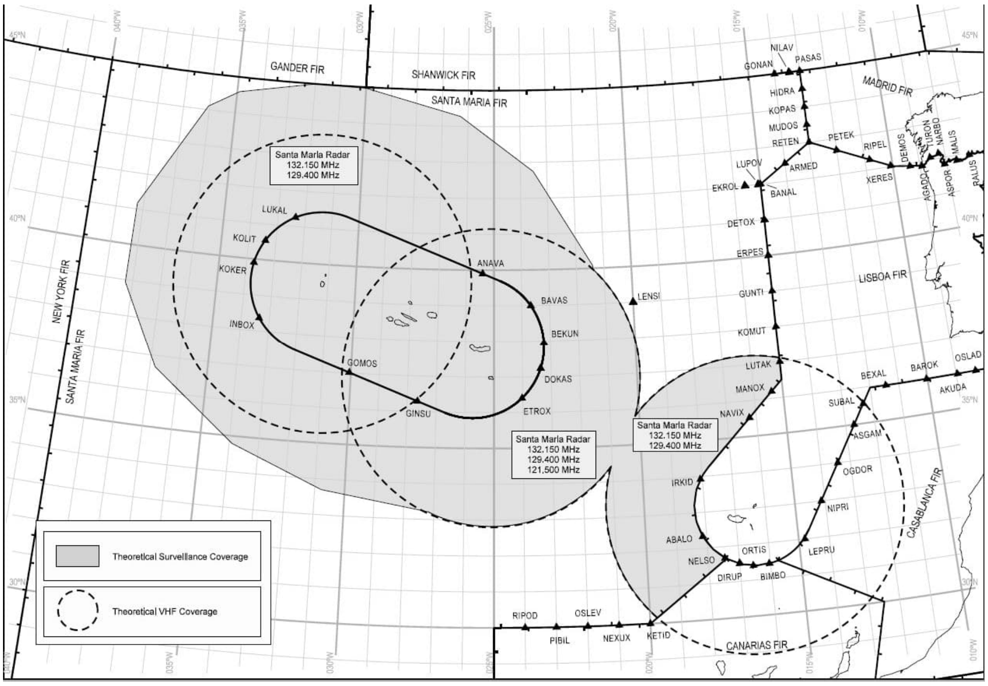
For planning purposes, this area is bounded by the following:

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

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

Note: This area, which is within direct controller pilot VHF voice coverage, offers a solution for suitably equipped aircraft (transponder with ADS-B extended squitter transmitter) *that are equipped with a single or no Long Range Communication System, to cross the North Atlantic at or above FL290.*

b) Azores corridor



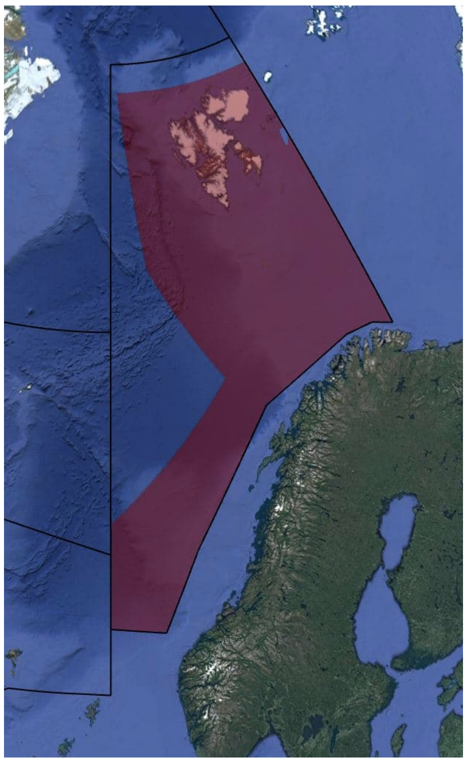
Traffic flying to/from Azores Islands is allowed to operate in the NAT HLA, when the oceanic portion of the planned route is contained inside the Santa Maria FIR ATS Surveillance airspace and VHF coverage, typically via MANOX, NAVIX or IRKID direct 350000N 0200000W or 360000N 0200000W direct Azores Islands,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

c) Bodo corridor

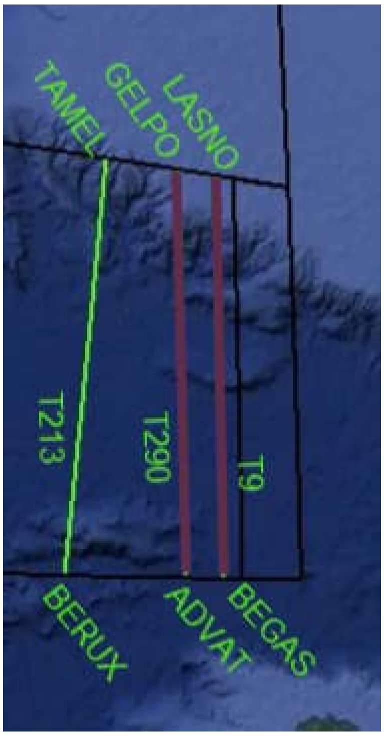
Aircraft need to be equipped with transponder with ADS-B extended squitter transmitter.

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

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



d) Shanwick Tango Routes T9 and T290



Note: Details in State Aeronautical Information Publications (AIP).

1.8 PERFORMANCE MONITORING

1.8.1 The horizontal (i.e. lateral and longitudinal) and vertical navigation performance of operators within the NAT HLA is monitored on a continual basis. If a deviation is identified, follow-up action after flight is taken, both with the operator and the State of Registry of the aircraft involved, to establish the cause of the deviation and to confirm the approval of the flight to operate in NAT HLA and/or RVSM airspace. The overall navigation performance of all aircraft in the NAT HLA is compared to the standards established for the region, to ensure that the relevant TLSs are being maintained. (See Chapter 13).

1.8.2 A NAT regional monitoring programme to assess actual communication and surveillance performance against RCP and RSP specifications is being undertaken to monitor individual aircraft performance and to determine whether and what, if any, corrective action is required by contributing entities (Operators, ANSPs, CSPs, SSPs, etc.) to ensure achievement of the system performance required for continued PBCS based separation operations.

1.9 PBCS OPERATIONS

1.9.1 Performance Based separation minima as small as 15 NM lateral and 14 NM longitudinal predicated on PBCS and PBN, in accordance with *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444) has been implemented in the ICAO NAT Region. Operators should consult the AIS of relevant NAT Provider States for the detailed application of these separation minima in each of the NAT OCAs. To benefit from these separations, Operators must obtain State Approvals in accordance with Annex 6 to file RCP/RSP capabilities in the flight plan. Guidance material for implementation of communication and surveillance capability supporting these separation minima is contained in the *Performance-based Communication and Surveillance (PBCS) Manual* (Doc 9869) and the *Global Operational Data Link (GOLD) Manual* (Doc 10037).

1.9.2 Within the OTS the 42.6 km (23 NM) lateral separation minimum is implemented by applying 42.6 km (23 NM) lateral spacing through whole and half degrees of latitude between PBCS designated NAT OTS Tracks between flight levels FL 340 to FL 400 inclusive, except when the OTS occurs in the New York OCA East. In addition to requiring RNP 4 Approval, aircraft must have formal State Authorization for filing RCP 240 and RSP 180 for operation on designated PBCS based OTS tracks.

1.9.3 Application of the reduced lateral and longitudinal separation minima in the NAT Region is dependent on a smooth functioning FANS 1/A data link system. Various known data link related deficiencies in aircraft systems and poor data link performance have a detrimental effect on the air traffic control system and impede aircraft operator's efforts to obtain performance-based communication and surveillance (PBCS) authorizations. Many of these known deficiencies have already been fixed by aircraft manufacturers and software upgrades are available. To ensure the best possible functioning of the NAT air traffic control system, it is of utmost importance that aircraft operators always operate the latest available FANS 1/A related software version in aircraft that fly in the NAT high level airspace (HLA) and that the aircraft systems are configured in an optimal manner. Meanwhile, implementation of improvements and corrections is also a priority undertaking for the ground and network segments of the overall FANS 1/A system.

1.9.4 NAT OPS Bulletin 2019_003 provides a list of recommended data link performance improvement options and recommended software versions for NAT data link operations. Aircraft operators are advised to review this OPS Bulletin to identify if some of the issues identified in the Bulletin apply to their operations. The bulletin will be updated on regular basis.

1.9.5 NAT ANSPs have implemented the message latency monitor function which is designed to prevent pilots from acting on a CPDLC uplink message that has been delayed in the network. The most serious of such cases would be the pilot executing a clearance that was no longer valid. Because aircraft implementations are varied, it is impossible for ATC to tailor the uplink of the message SET MAX UPLINK DELAY VALUE TO 300 SEC to different aircraft types. It has therefore been decided among the NAT ANSPs to uplink this message to all CPDLC connected aircraft immediately after they enter each control area. An aircraft may therefore receive this message multiple times during a flight. Refer to section 6.5.5 for pilot procedures concerning this function.

Note: When operating in the NAT airspace, aircraft operators can expect a value of 300 seconds for the delayed message parameter.

1.10 TRIALS AND FUTURE DEVELOPMENTS

1.10.1 The ICAO North Atlantic Systems Planning Group undertakes a continuous programme of monitoring the safety and efficiency of flight operations throughout the NAT region. Plans are thereby developed to ensure the maintenance and further enhancement of the safety and traffic capacity of the airspace. An overview of expected development of North Atlantic flight operations is contained in Volume III of the *NAT Regional Air Navigation Plan* (NAT eANP, Doc 9634). This document is available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "eANP NAT Doc9634".

1.10.2 All planned or anticipated changes will involve consultation and coordination with the airspace users. Advanced notification of any changes will be provided by the appropriate ANSP(s).

CHAPTER 2 THE ORGANISED TRACK SYSTEM (OTS)

2.1 GENERAL

2.1.1 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 crossing the 30W longitude between 1130 UTC and 1900 UTC and peak eastbound traffic crossing the 30W longitude between 0100 UTC and 0800 UTC.

2.1.2 The flight levels typically associated with the OTS are FL 340 to FL 400 inclusive. The use of flight levels both within the OTS and areas wholly or partly outside of the OTS, are negotiated and agreed upon by the NAT ATS providers to ensure that the majority of traffic can operate at optimal flight profiles.

2.1.3 The hours of validity of the two Organised Track Systems (OTS) are as follows:

(Westbound) Day-time OTS	1130 UTC to 1900 UTC at 30°W
(Eastbound) Night-time OTS	0100 UTC to 0800 UTC at 30°W

Note: *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 as 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.*

2.1.4 Use of the OTS tracks is not mandatory. Aircraft may flight plan on random routes which remain clear of the OTS or may fly on any route that joins, leaves, or crosses the OTS. Operators must be aware that while ATC will make every effort to clear random traffic across the OTS at requested levels, re-routes or significant changes in flight level from those planned are likely to be necessary during most of the OTS traffic periods. An understanding of the OTS and North Atlantic region traffic flows may assist flight planners in determining the feasibility of flight profiles.

2.2 CONSTRUCTION OF THE ORGANISED TRACK SYSTEM (OTS)

General processes

2.2.1 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 planners 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. Random routes and OTS tracks eastbound typically start with a “named” oceanic entry point, followed by LAT/LONG waypoints, and typically end with 2 “named” waypoints, the first being the oceanic exit point, and the second being a “named” waypoint inside domestic airspace. Random routes and OTS tracks westbound typically start with a “named” oceanic entry point, followed by LAT/LONG waypoints, and typically end with a “named” waypoint that is the oceanic exit point.

2.2.2 When the expected volume of traffic justifies it, tracks may be established to accommodate the EUR/CAR traffic axis. 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 routing to join or leave).

Note 1: The "named" waypoint inside domestic airspace ensures application of oceanic North Atlantic separations beyond the common boundary allowing time for domestic agency to establish identification, establish direct controller pilot communications via VHF voice, and to issue instructions as necessary.

Note 2: OTS tracks can start at "named" waypoints or LAT/LONG waypoints in NAT oceanic airspace (i.e. not at oceanic entry point or exit point). OTS track design of this nature is most commonly seen within New York East and Reykjavik OCAs.

Collaborative Decision Making Process

2.2.3 Operators planning NAT flights during the upcoming OTS period are encouraged to contribute to the OTS planning process. A comprehensive set of Collaborative Decision Making (CDM) procedures for NAT track design is now employed.

2.2.4 To ensure that emphasis is placed on operators' preferred routes, the CDM process begins with the Preferred Route Message (PRM) system. All NAT operators (both scheduled and non-scheduled) are urged to provide information by AFTN message to the appropriate OACs regarding optimum routing for any/all of their flights intending to operate during upcoming peak traffic periods. Such information should be provided, in the correct format, as far in advance as possible, but not later than 1900 UTC for the following day-time OTS and 1000 UTC for the following night-time OTS. The details for submitting operators' preferred routes in respect of day-time westbound flights are specified in the UK AIP. The filing of night-time eastbound preferred routings is an element of the NAV CANADA Traffic Density Analyser (TDA) tool (see Chapter 11).

2.2.5 Subsequently, following the initial construction of the NAT tracks by the publishing agencies, the proposed tracks are published on an internet site for interested parties to view and discuss. One hour is allocated for each of the proposals during which any comments will be considered by the publishing agency and any changes which are agreed are then incorporated into the final track design. This internet site is currently operated by NAV CANADA. Access to this site is by password which any bona fide NAT operator may obtain on application to NAV CANADA - see Canada AIP for details. Requests for access should be sent to noc@navcanada.ca.

Split Westbound Structure

2.2.6 On occasions, when a strong westerly Jetstream closely follows the Great Circle of the dominant NAT traffic flow between London and New York, the resulting daytime Westbound minimum time tracks can be located both north and south of this great circle. In such cases, Shanwick may publish a "split" track structure, leaving at least two adjacent exit points and landfalls at the Eastern NAT boundary for use by the daytime eastbound traffic flow.

2.3 THE NAT TRACK MESSAGE

2.3.1 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.

2.3.2 This message gives full details of the coordinates 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 routings associated with individual tracks (e.g. 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. Examples of both eastbound and westbound systems and NAT track messages are shown in Example 1/**Figure 2-0-1** and Example 2/ **Figure 2-0-2** in this chapter.

2.3.3 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.) If any subsequent NAT track amendments affecting the entry/exit points, route of flight (coordinates) or flight level allocation are made, the whole NAT track message will be re-issued. The reason for this amendment will be shown in the Notes and a successive alphabetic character, i.e. ‘A’, then ‘B’, etc., will be added to the end of the TMI number (e.g. TMI 032A).

2.3.4 The remarks section is an important element of the NAT track message. Included is essential information for pilots and operators that may vary greatly from day to day. The Remarks may also include details of special flight planning considerations, reminders of ongoing initiatives (e.g., Data Link Mandate), planned amendments to NAT operations, or active NOTAMS referencing airspace restrictions. The remarks section of both the Westbound and Eastbound OTS Messages will identify any designated PBCS tracks.

2.4 OTS CHANGEOVER PERIODS

2.4.1 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.

2.4.2 During these times there is often a need for flights 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.

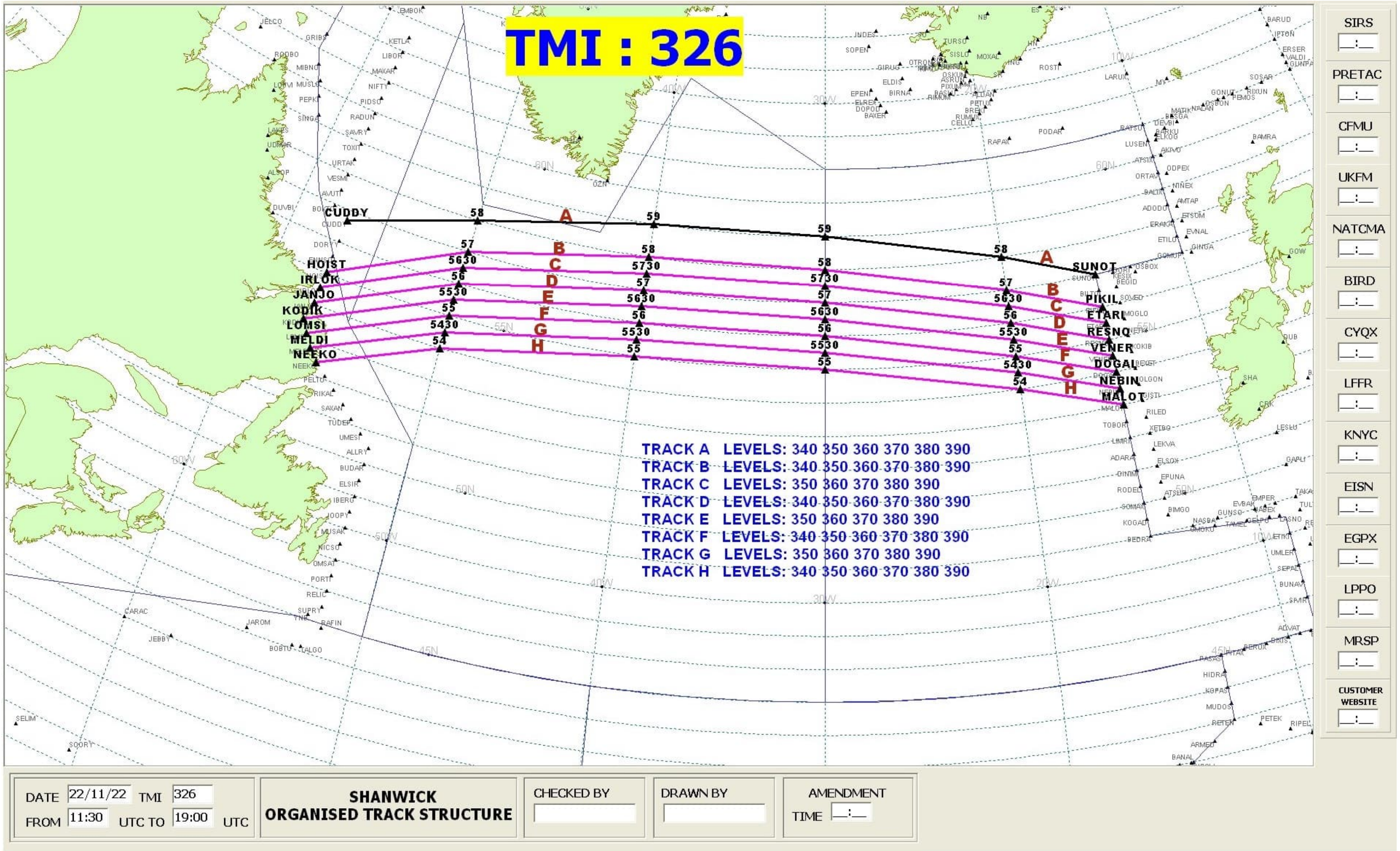
2.5 EXAMPLES OF DAY-TIME WESTBOUND AND NIGHT-TIME EASTBOUND NAT TRACK MESSAGES AND ASSOCIATED TRACK SYSTEMS

Example 1 — Example of Westbound NAT Track Message

```
ZCZC OLG068 2020190FF EGZZOWXX EGZZOXXX
082009 202019 EGGXZOZX
(NAT-1/3 TRACKS FLS 310/390 INCLUSIVE
APR 09/1130Z TO APR 09/1900Z
PART ONE OF THREE PARTS-
A ERAKA 60/20 62/30 63/40 63/50 MAXAR
EAST LVLS NIL
WEST LVLS 350 360
EUR RTS WEST NIL
NAR NIL -
B GOMUP 59/20 61/30 62/40 52/50 PIDSO
EAST LVLS NIL WEST LVLS 350 360 380
EUR RTS WEST NIL
NAR NIL –
C SUNOT 58/20 60/30 61/40 61/50 SAVRY
EAST LVLS NIL
WEST LVLS 340 360 380
EUR RTS WEST NIL
NAR NIL -
END OF PART ONE OF THREE PARTS)

FF EGZZOWXX EGZZOXXX
082009 202020 EGGXZOZX
(NAT-2/3 TRACKS FLS 310/390 INCLUSIVE
APR 09/1130Z TO APR 09/1900Z
PART TWO OF THREE PARTS-
D PIKIL 57/20 57/30 56/40 NEEKO
EAST LVLS NIL
WEST LVLS 340 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL -
E RESNO 56/20 56/30 55/40 53/50 RIKAL
EAST LVLS NIL
EST LVLS 340 350 360 370 380 390
EUR RTS WEST NIL

NAR NIL –
F VENER 5530/20 5530/30 5430/40 5230/50 SAXAN
EAST LVLS NIL
WEST LVELS 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL –
G DOGAL 55/20 55/30 54/40 52/50 TUDEP
EAST LVLS NIL
WEST LVLS 340 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL –
END OF PART TWO OF THREE PARTS)

72 202021FF EGZZOWXX EGZZOXXX
082010 202021 EGGXZOZX
(NAT-3/3 TRACKS FLS 310/390 INCLUSIVE
APR 09/1130Z TO APR 09/1900Z
PART THREE OF THREE PARTS-

H MALOT 54/20 54/30 53/40 51/50 ALLRY
EAST LVLS NIL
WEST LVLS 340 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL –
REMARKS.
1. TMI IS 326
2. SEND RCL 90-30 MINUTES PRIOR TO OCEANIC ENTRY POINT. INCLUDE MAX
LEVEL IN RCL
3. PBCS OTS LEVELS 350-390. PBCS TRACKS AS FOLLOWS
TRACK E
TRACK F
TRACK G
END OF PBCS OTS
4. SLOP SHOULD BE USED IN NAT HLA AIRSPACE. LEFT SLOP IS PROHIBITED.
5. 10 MINUTES AFTER PASSING OEP SQUAWK 2000 UNLESS OTHERWISE
INSTRUCTED.
6. ADS-C AND CPDLC ARE MANDATED FOR LEVELS 290-410 IN NAT AIRSPACE.
7. UK AIP ENR 2.2.4.2 PARA 5.2 STATES THAT NAT OPERATORS SHALL FILE PRM.
8. OPERATORS ARE REMINDED TO ONLY USE NAT TRACK DESIGNATORS IN THE
FLIGHT PLANS WHEN FLYING THE WHOLE LENGTH OF THE NAT TRACK
```

9. DATA LINK EQUIPPED FLIGHTS NOT LOGGED ON TO DOMESTIC AIRSPACE, PRIOR TO ENTERING THE SHANWICK OCA, MUST INITIATE A LOGON TO EGGX 10 - 25 MINS PRIOR TO OCA ENTRY.
10. EGGX HAS DELAYED IMPLEMENTATION OF OCR UNTIL FURTHER NOTICE
END OF PART THREE OF THREE PARTS)

Figure 2-0-1 — Example of Day-Time Westbound NAT Organised Track System



Example 2 — Example of Eastbound NAT Track Message

DD CYZZENAT
021302 CZQXZQZX
(NAT - 1 / 3 TRACKS FLS 320 / 400 INCLUSIVE
NOV 03/0100Z TO NOV 03/0800Z
PART ONE OF THREE PARTS -
U JANJO 56/50 58/40 59/30 58/20 SUNOT KESIX
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N685A N683A-
V LOMSI 55/50 57/40 58/30 57/20 PIKIL SOVED
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N625A N621A-

END OF PART ONE OF THREE PARTS)

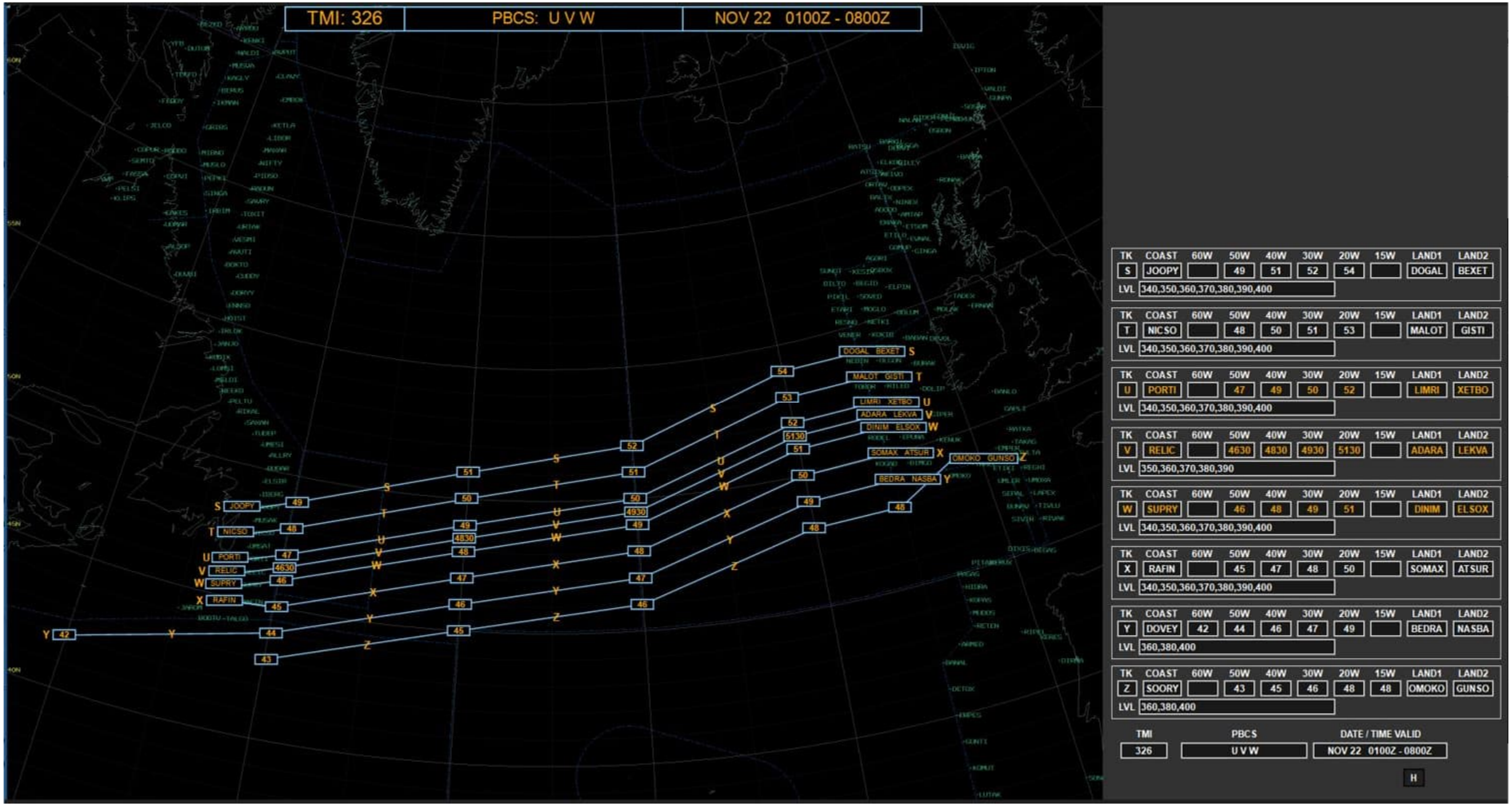
DD BIRDZQZZ
021302 CZQXZQZX
(NAT - 2 / 3 TRACKS FLS 320 / 400 INCLUSIVE
NOV 03/0100Z TO NOV 03/0800Z
PART TWO OF THREE PARTS -
W MELDI 5430/50 5630/40 5730/30 5630/20 ETARI MOGLO
EAST LVLS 350 360 370 380 390
WEST LVLS NIL
EUR RTS EAST NIL
NAR N597A N587A-
X NEEKO 54/50 56/40 57/30 56/20 RESNO NETKI
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N561A N555A-
Y RIKAL 53/50 55/40 56/30 55/20 DOGAL BEXET
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N511A N495C-

END OF PART TWO OF THREE PARTS)

DD BIRDZQZZ
021303 CZQXZQZX
(NAT - 3 / 3 TRACKS FLS 320 / 400 INCLUSIVE
NOV 03/0100Z TO NOV 03/0800Z
PART THREE OF THREE PARTS -
TUDEP 52/50 54/40 55/30 54/20 MALOT GISTI
EAST LVLS 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N453A N435A-
REMARKS:
1. TMI IS 326.
2. SEND RCL 90-60 MINUTES PRIOR TO OCEANIC ENTRY POINT. INCLUDE MAX LEVEL IN RCL
3. PBCS OTS LEVELS 350-390. PBCS TRACKS AS FOLLOWS
TRACK V
TRACK W
TRACK X
END OF PBCS OTS
4. SLOP SHOULD BE USED IN NAT HLA AIRSPACE. LEFT SLOP IS PROHIBITED.
5. 10 MINUTES AFTER PASSING OEP SQUAWK 2000 UNLESS OTHERWISE INSTRUCTED.
6. ADS-C AND CPDLC ARE MANDATED FOR LEVELS 290-410 IN NAT AIRSPACE.
7. CANADIAN AIP ENR 7.1.7 STATES THAT NAT OPERATORS SHALL FILE PRM.
8. OPERATORS SHALL FILE NAT DESIGNATORS IN FLIGHT PLANS WHEN FLYING THE ENTIRE NAT TRACK.
9. DATA LINK EQUIPPED FLIGHTS NOT LOGGED ON TO DOMESTIC AIRSPACE, PRIOR TO ENTERING THE GANDER OCA, MUST INITIATE A LOGON TO CZQX 10 - 25 MINS PRIOR TO OCA ENTRY.

END OF PART THREE OF THREE PARTS)

Figure 2-0-2 — Example of Night-Time Eastbound NAT Organised Track System



CHAPTER 3 ROUTES, ROUTE STRUCTURES, AND TRANSITION AREAS WITHIN OR ADJACENT TO THE NAT HLA

3.1 GENERAL

3.1.1 Routes, route structures, and transition areas within and adjacent to the NAT HLA are detailed below.

3.2 ROUTES WITHIN THE NAT HLA

3.2.1 Routes within the NAT HLA (illustrated in *Figure 3-1*) are as follows:

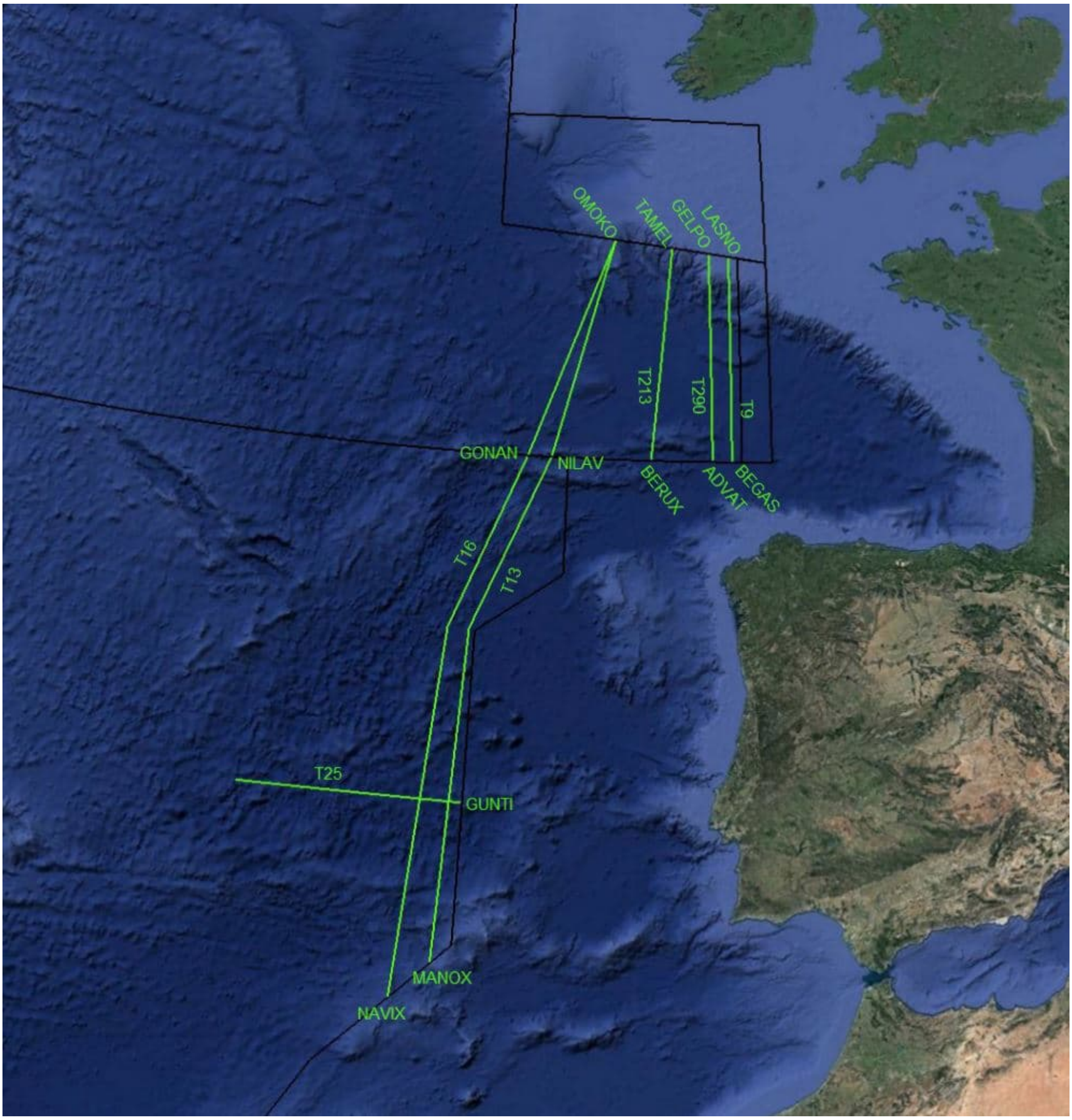
a) routes between Northern Europe and Spain/Canarias/Lisboa FIR. (T9*#, T290*#, T13, T213 and T16. State approval for NAT HLA operations is required.); and

b) T25 between the Azores and Lisboa FIR.

*Note 1: *routes/routings identified with an asterisk in sub paragraph (a) above may be flight planned and flown by approved aircraft equipped with normal short-range navigation equipment (VOR, DME, ADF) and at least one approved fully operational LRNS.*

Note 2: #routes T9 and T290 may be flight planned and flown by approved aircraft equipped with and operating ADS-B (1090 MHz ADS-B 'out' capability), VHF and capable of RNP 2 (Continental).

Figure 3-1 Tango routes



3.3 ROUTE STRUCTURES ADJACENT TO THE NAT HLA

North American Routes (NARs)

3.3.1 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. (For further information see Chapter 4).

3.3.2 Full details of all NAR routings (eastbound and westbound) together with associated procedures are published in two saleable documents:

- the United States Chart Supplement – Northeast U.S., currently available through the following: https://www.faa.gov/air_traffic/flight_info/aeronav/productcatalog/supplementalcharts/AirportDirectory/
  with an electronic version currently available through the following link: https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dafd/

and

- the Canada Flight Supplement.

It should be noted that these routes are subject to occasional changes and are re-published/updated on a regular AIRAC 56-day cycle.

US East Coast Transitions

3.3.3 Aircraft operators are encouraged to refer to FAA Air Traffic Control System Command Centre Advisory Database (https://nasstatus.faa.gov/) for NAT Advisory Message, published daily, for specified transitions from select US 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 East OCA.

Routes between North America and the Caribbean area

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

Northern Oceanic Transition Area (NOTA) and Shannon Oceanic Transition Area (SOTA)

3.3.5 Parts of the Shanwick OCA are designated as the Shannon Oceanic Transition Area (SOTA) and the Northern Oceanic Transition Area (NOTA).

3.3.6 NOTA:

5400N 01500W – 5700N 01500W – 5700N 01000W – 5434N 01000W – 5400N 01500W

FL 055 TO UNLIMITED

NAT HLA FL 285 TO FL 420.

3.3.7 Air Traffic Services are provided by Shannon ACC using the call sign SHANNON CONTROL. Full details of the service provided, and the procedures used are contained in AIP Ireland.

3.3.8 SOTA:

5100N 01500W- 5100N 00800W – 4830N 00800W – 4900N 01500W – 5100N 01500W

FL 055 TO UNLIMITED

NOT INCLUDED IN NAT HLA*

** Note: Flights transitioning through SOTA and entering the Shanwick OCA FL 285 to FL 420 inclusive must meet NAT HLA requirements.*

Brest Oceanic Transition Area (BOTA)

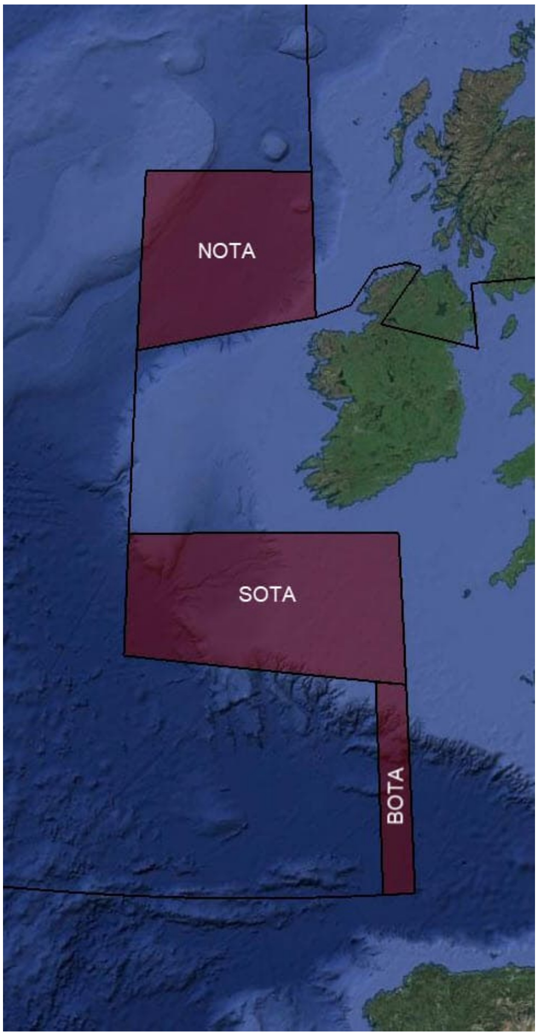
3.3.9 Part of the Shanwick OCA is designated as the Brest Oceanic Transition Area (BOTA):

4834N 00845W – 4830N 00800W – 4500N 00800W – 4500N 00845W – 4834N 00845W

FL 055 TO UNLIMITED

NOT INCLUDED IN NAT HLA*

Figure 3-2: NOTA, SOTA and BOTA areas

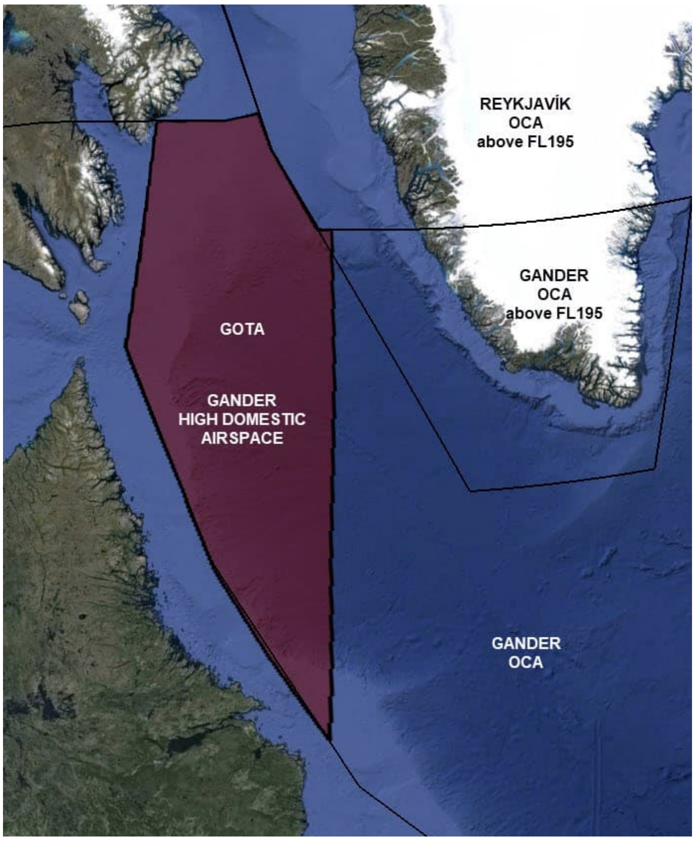


** Note: Flights transitioning through BOTA and entering Shanwick OCA FL 285 to FL 420 inclusive must meet NAT HLA requirements.*

3.3.10 Air Traffic service is provided by the Brest ACC, call sign BREST CONTROL.

Gander Oceanic Transition Area (GOTA)

Figure 3-3 GOTA area



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

6523N 06238W - 6530N 06000W - 654236N 0582356W - 6500N 05745W - 6330N 05540W - 6330N 05500W - 5352N 05458W - 5700N 05900W - 582816N 0602104W - 6100N 06300W - 6519N 06300W - 6523N 06238W.

FL 290 to FL 600 inclusive

NAT HLA FL 285 to FL 420

3.3.12 Air Traffic service is provided by the Gander ACC, call sign GANDER CENTRE. For details of the service provided and the procedures used refer to the Canadian AIP.

CHAPTER 4 FLIGHT PLANNING

4.1 GENERAL

4.1.1 State AIPs provide detailed flight planning rules in the NAT Region. General rules are paraphrased below.

4.1.2 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 or half 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.

4.1.3 In Bodo OCA, Shanwick OCA, and Santa Maria OCA, operators can flight plan their user-preferred routes (UPRs)/free route airspace operations without the need to satisfy the flight planning requirements in sections 4.2.6-4.2.7 in accordance with requirements specified in the relevant State AIPs.

4.1.4 Additionally, relevant State AIPs may detail areas of ATS Surveillance coverage and VHF voice coverage. These areas may allow flight planning between defined entry and exit points without requiring adherence to the above provisions.

Routings

4.1.5 Operators are allowed to flight plan on the OTS, across the OTS or to join or leave the OTS. While ATC will make every effort to clear random traffic affecting the OTS at published flight levels, operators should be aware that re-routes or significant changes in flight level may occur during most of the OTS traffic periods.

4.1.6 Outside of the OTS periods, operators flying against the pending OTS may flight plan any random routing, except:

a) Eastbound flights that cross 30°W less than one hour prior to the pending Westbound OTS (i.e. after 1029 UTC); or

b) Westbound flights that cross 30°W less than one hour prior to the pending Eastbound OTS (i.e. after 2359 UTC),

should plan to remain clear of the pending OTS structure.

4.1.7 Flight crews of all NAT flights at or above FL 290, even those that will transit the NAT either above the NAT HLA, or laterally clear of the OTS, must carry a copy of the NAT track message, including any amendments. In the case of amendments, Note One of the NAT track message will generally contain a brief explanation of the amendment and, if warranted, a revised TMI with an alpha suffix.

Note: *A revised TMI with an alpha suffix will be issued for changes to: any track coordinate(s), including "named" waypoints; published track levels; or "named" waypoints within European routes west. A TMI revision will not be issued for changes to other items such as NARs.*

Flight Levels

4.1.8 Flight planning in the NAT between FL 290 and FL 410 inclusive is restricted by the Data Link Mandate. Chapter 1 indicates equipment required within this flight level band.

4.1.9 Flights which are 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. Flight crews intending to fly on a random route or outside the OTS time periods may plan any flight level, taking into account feasibility of flight profiles due OTS and traffic flows, additional guidance described paragraphs 4.1.11 and 4.1.12 below.

Note: Flight level allocation arrangements for routes T9 and T290 are published in the UK AIP at ENR 3.3.

4.1.10 Flights which are planned to follow an OTS track for its entire length (during the OTS periods) may plan any levels, keeping in mind PBCS and DLM requirements.

Note: PBCS tracks will be identified in Note 3 of the OTS message. Operators planning to operate in the altitude band FL 340 - FL 400 on the PBCS OTS are subject to equipage and authorization requirements as outlined in NAT OPS Bulletin, "Implementation of Performance Based Separation Minima".

4.1.11 Operators may include climbs in the flight plan, although each change of level during flight must be requested from ATC by the flight crew. Approval of such requests will be entirely dependent upon potential traffic conflicts. ATC may not always be able to accommodate requested flight level changes and prudent pre-flight fuel planning should take this into consideration.

4.1.12 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.

4.1.13 Aircraft planning to land at airports in Greenland south of 6330N may be restricted to low flight levels due to larger separation minima applicable in this airspace.

Speed

4.1.14 The planned Mach number must be included in the ICAO flight plan for aircraft capable of maintaining an assigned Mach.

4.1.15 ATC uses speed information, along with position information to calculate estimated times along the cleared route. These times are used as the basis for longitudinal separation and for coordination with adjacent units.

Flight Plans

4.1.16 Correct completion and addressing of the ICAO flight plan is extremely important as errors can lead to delays in data processing and the subsequent issuing of clearances to the flights concerned. Detailed explanations of how to correctly complete a flight plan with respect to the NAT portion of a flight are contained in Chapter 11 of this Manual.

4.1.17 Operators are reminded that they must indicate their aircraft and flight crew capabilities (e.g. RNP, RNAV, RCP 240 and RSP 180 authorization, RVSM, FANS 1/A data link, ADS-B and NAT HLA approval) in the flight plan. Separation criteria and safety improvement initiatives in the NAT region are made available to all appropriately equipped flights based on filed flight plan information. This also supports planning for future initiatives by providing more accurate information regarding the actual capabilities of the fleet operating in the ICAO NAT region.

4.2 FLIGHT PLANNING REQUIREMENTS

4.2.1 If (and only if) the flight is planned to operate along the entire length of one of the organised tracks (as detailed in the NAT track message), from oceanic entry point to oceanic exit point, Item 15 of the flight plan may be defined by using the abbreviation 'NAT' followed by the track letter assigned to the track.

4.2.2 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.

4.2.3 The planned Mach number and flight level should be specified at either the last domestic reporting point prior to oceanic airspace or the organised track commencement point.

4.2.4 Each point at which a change of Mach number or flight level is planned must be specified by geographical coordinates in latitude and longitude or as a “named” waypoint and followed in each case by the next significant point.

4.2.5 The accumulated estimated elapsed time to each oceanic FIR boundary shall be specified in Item 18 of the FPL following the EET/ indicator.

Flight Planning on Random Route Segments in a Predominantly East - West Direction

4.2.6 Doc 7030 states that flights operating between North America and Europe shall generally be considered as operating in a predominantly east-west direction. However, flights planned between these two continents via the North Pole shall be considered as operating in a predominantly north-south direction. Except in those areas defined in State AIPs where operators meeting specified requirements can flight plan their user-preferred trajectories, the following applies:

a) 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.

b) 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.

c) 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. When the flight time between successive significant points is less than 30 minutes, one of these points may be omitted. Additional significant points should be established when deemed necessary due to aircraft speed or the angle at which the meridians are crossed, e.g.:

   i) at intervals of 10 degrees of longitude (between 5°W and 65°W) for flights operating at or south of 70°N; and

   ii) 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.

d) For flights operating north of 80°N, the planned tracks shall normally 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.

Flight Planning on Random Routes in a Predominantly North - South Direction

4.2.7 Except in those areas defined in State AIPs where operators meeting specified requirements can flight plan their user-preferred trajectories, the following applies:

a) 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.

b) 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.

Flight Planning to Enter or Leave the NAT Region via the North American Region

4.2.8 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:

Common Portion — that portion of the route between a specified coastal fix and specified Inland Navigation Fix (INF). (*Note: Eastbound NARS only have a common portion).*

Non-common Portion — that portion of the route between a specified INF and a system airport.

4.2.9 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. An alpha character may follow the one to three digit identifying code indicating an amendment. Together it forms the route identifier. The alpha numeric identifier is associated with the common routes only and not with the non-common route portions.

4.2.10 The use of NARs is not compulsory for every oceanic exit point. The Eastbound NAT track message includes recommended NARs for each track which enters oceanic airspace through Canadian domestic airspace. The Westbound NAT track message carries the annotation “NAR Nil” for each track with the exception of tracks terminating at CARAC, JAROM, or RAFIN where NARs must be filed. Operators may file on any one of the destination appropriate NARs published from that relevant coastal fix.

Note: Westbound NAR details are listed in the Canada Flight Supplement.

4.2.11 Canadian Domestic route schemes and the US East Coast Link Routes are also published. All of these linking structures are referenced in Chapter 3 of this Manual and account must be taken of any such routing restrictions when planning flights in this category.

Flight Planning to Operate Without Using HF Communications

4.2.12 When operating outside of VHF coverage the carriage of fully functioning HF is mandatory throughout the NAT, however some exceptions may apply, refer to State AIPs for further details. Aircraft with only functioning VHF communications equipment should plan their route according to the information contained in the appropriate State AIPs and ensure that they remain within VHF coverage of appropriate ground stations throughout the flight.

Flight Planning to Operate with a Single Functioning LRNS

4.2.13 Information on specific routes that 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 can be found in Chapter 3.

CHAPTER 5 COMMUNICATIONS AND POSITION REPORTING PROCEDURES

5.1 ATS COMMUNICATIONS

Equipage Requirements

5.1.1 Operations in the NAT outside VHF coverage require the carriage of two long range communication systems, one of which must be HF. A second HF, SATVOICE and/or CPDLC over SATCOM (appropriate to route of flight) may satisfy the requirement of the second-long range communication system. Due to coverage limitations, an Inmarsat CPDLC or SATVOICE system does not qualify as a long range communication system when operating north of 80°N. Aircraft that are equipped with both Inmarsat (J5) and Iridium (J7) data link capability should use Iridium when north of 80°N.

5.1.2 Flights planning to operate outside VHF coverage may request waivers from the HF requirement provided the flight falls into one of the following categories:

- Air carriers with HF unserviceable wishing to return to base for repairs, or
- Ferry or delivery flights, or
- Special event flights.

5.1.3 Relief from the HF requirement in accordance with 5.1.2 may be granted by the Air Traffic Control Centres serving the route of flight provided the aircraft has at least two other long-range communication systems appropriate for route of flight.

Note: See State AIPs for details.

HF Voice Communications

5.1.4 It is important that flight crews appreciate that routine[*] air/ground ATS voice communications in the NAT region are conducted via aeronautical radio stations (hereafter referred to as radio stations) staffed by radio operators **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 SATVOICE.

5.1.5 There are six radio stations in the NAT: Bodø Radio (Norway), Gander Radio (Canada), Iceland Radio (Iceland), New York Radio (USA), Santa Maria Radio (Portugal) and Shanwick Radio (Ireland).

5.1.6 Even with the growing use of data link communications a significant volume of NAT air/ground communications are conducted using voice on SSB HF frequencies and GP VHF frequencies. To support air/ground ATC communications in the North Atlantic region, twenty-four HF frequencies have been allocated, in bands ranging from 2.8 MHz to 18 MHz. Additionally, Shanwick Radio, Santa Maria Radio, and Iceland Radio operate a number of Regional and Domestic Air Route Area (RDARA) frequencies in accordance with operating requirements and agreements between the stations.

5.1.7 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 the higher bands during day-time. Generally, in the

[*] *See 5.1.14 c) and 5.1.27*

North Atlantic frequencies of less than 6 MHz are utilised at night and frequencies of greater than 5 MHz during the day.

5.1.8 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. A full listing of the frequencies operated by each NAT radio station is contained in the ***"HF Management Guidance Material for the North Atlantic Region"*** (NAT Doc 003), available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT Doc 003".

5.1.9 Each individual flight may be allocated a primary and a secondary HF frequency before the oceanic boundary.

5.1.10 Radio operators usually maintain a continuous air-ground communication watch on more than one single frequency therefore it is useful for flight crews to state the frequency used when placing the initial call to the radio station.

HF Phraseology applicable when using data link

5.1.11 The integrity of the ATC service remains wholly dependent on establishing and maintaining HF or VHF voice communications with each ATS unit along the route of flight. The procedures in this section are applicable only in NAT airspace and pertain only to ATS data link operations.

5.1.12 Prior to or upon entering each NAT OCA, the flight crew should contact the appropriate aeronautical radio station.

5.1.13 If the flight enters an OCA followed by another OCA, the flight crew should, on initial contact:

a) not include a position report;

b) after the radio operator responds, request a SELCAL check and state the next OCA;

c) the radio operator will assign primary and secondary frequencies, perform the SELCAL check and designate the position and frequencies to contact the aeronautical radio station serving the next OCA. If the communications instructions are not issued at this stage, the crew should assume that the frequencies to use prior or upon entering the next OCA will be delivered at a later time by CPDLC or voice.

Example (Initial contact from an eastbound flight entering GANDER Oceanic):
GANDER RADIO, AIRLINE 123, SELCAL CHECK, SHANWICK NEXT
AIRLINE 123, GANDER RADIO, HF PRIMARY 5616 SECONDARY 2899, AT 30 WEST CONTACT SHANWICK RADIO HF PRIMARY 8891 SECONDARY 4675, (SELCAL TRANSMITTED)
GANDER RADIO, AIRLINE 123, SELCAL OKAY, HF PRIMARY 5616 SECONDARY 2899. AT 30 WEST CONTACT SHANWICK RADIO, HF PRIMARY 8891 SECONDARY 4675

5.1.14 If the flight will exit an OCA into continental airspace or airspace where the primary means of communication is VHF voice and an ATS surveillance service is available, on initial contact with the OCA, the flight crew should:

a) not include a position report;

b) after the radio operator responds, request a SELCAL check;

Example (Initial contact from an eastbound flight about to enter SHANWICK Oceanic):
SHANWICK RADIO, AIRLINE 123, SELCAL CHECK
AIRLINE 123, HF PRIMARY 2899 SECONDARY 5616 (SELCAL TRANSMITTED)

SHANWICK RADIO, AIRLINE 123, SELCAL OKAY, HF PRIMARY 2899 SECONDARY 5616.

c) For flights on T9 and T290, monitor VHF channel 128.360 as advised by Shanwick Radio. Exceptionally, in the event of navigational non-conformance or in an emergency, controllers may communicate directly with the flight. Controllers will use the callsign "Shanwick Control".

5.1.15 Depending on which data link services are offered in the OCA and the operational status of those services, the aeronautical radio operator will provide appropriate information and instructions to the flight crew.

5.1.16 If a data link connection cannot be established, maintain normal voice communication procedures. In the event of data link connection failure in a NAT OCA after a successful logon revert to voice and notify the appropriate radio station. Inform the OAC in accordance with established problem reporting procedures.

Note: Flights on T9 or T290 should contact Shanwick Radio on HF voice.

5.1.17 To reduce frequency congestion, flight crews of flights using ADS-C should not additionally submit position reports via voice unless requested by aeronautical radio operator.

5.1.18 ADS-C flights are exempt from all routine voice meteorological reporting; however, the flight crew should use voice to report unusual meteorological conditions such as severe turbulence to the aeronautical radio station.

5.1.19 For any enquiries regarding the status of ADS-C connections, flight crew should use CPDLC. Should the ATS unit fail to receive an expected position report, the controller will follow guidelines for late or missing ADS-C reports.

5.1.20 When leaving CPDLC/ADS-C or ADS-C-only airspace, the flight crew should comply with all communication requirements applicable to the airspace being entered.

5.1.21 If the flight crew does not receive its domestic frequency assignment by 10 minutes prior to the flight's entry into the next OCA, the flight crew should contact the aeronautical radio station and request the frequency, stating the current OCA exit fix or coordinates.

Note: Flights on T9 or T290 should contact Shanwick Radio on HF voice.

SELCAL

5.1.22 When using HF, SATVOICE, or CPDLC, flight crews shall maintain a continuous air-ground communication watch on the assigned frequency, unless SELCAL equipped, in which case they should ensure the following sequence of actions:

a) provide the SELCAL code in the flight plan; (any subsequent change of aircraft for a flight will require refiling of the flight plan or submitting a modification message (CHG) which includes the new registration and SELCAL);

b) check the operation of the SELCAL equipment, at or prior to entry into oceanic airspace, with the appropriate radio station. (This SELCAL check shall be completed prior to commencing SELCAL watch); and

c) maintain thereafter a SELCAL watch.

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

5.1.24 Flight management staff and flight crews of aircraft equipped with SELCAL equipment should be made aware that SELCAL code assignment is predicated on the usual geographical area of operation of the aircraft. If the aircraft is later flown in geographical areas other than as originally specified by the aircraft operator, the aircraft may encounter a duplicate SELCAL code situation. Whenever an aircraft is to be flown routinely beyond the area of normal operations or is changed to a new geographic operating area, the aircraft operator should contact the SELCAL Registrar and request a SELCAL code appropriate for use in the new area.

5.1.25 When acquiring a previously owned aircraft equipped with SELCAL, many aircraft operators mistakenly assume that the SELCAL code automatically transfers to the purchaser or lessee. This is not true. As soon as practical, it is the responsibility of the purchaser or lessee to obtain a SELCAL code from the Registrar, or, if allocated a block of codes for a fleet of aircraft, to assign a new code from within the block of allocated codes.

5.1.26 Issues associated with duplicate SELCALS should be made to the SELCAL Registrar, Aviation Spectrum Resources, Inc. (ASRI). The SELCAL Registrar can be contacted via the AFTN address KDCAXAAG, and by including "ATTN. OPS DEPT. (forward to SELCAL Registrar)" as the first line of message text or via online at https://www.asri.aero/selcal/.

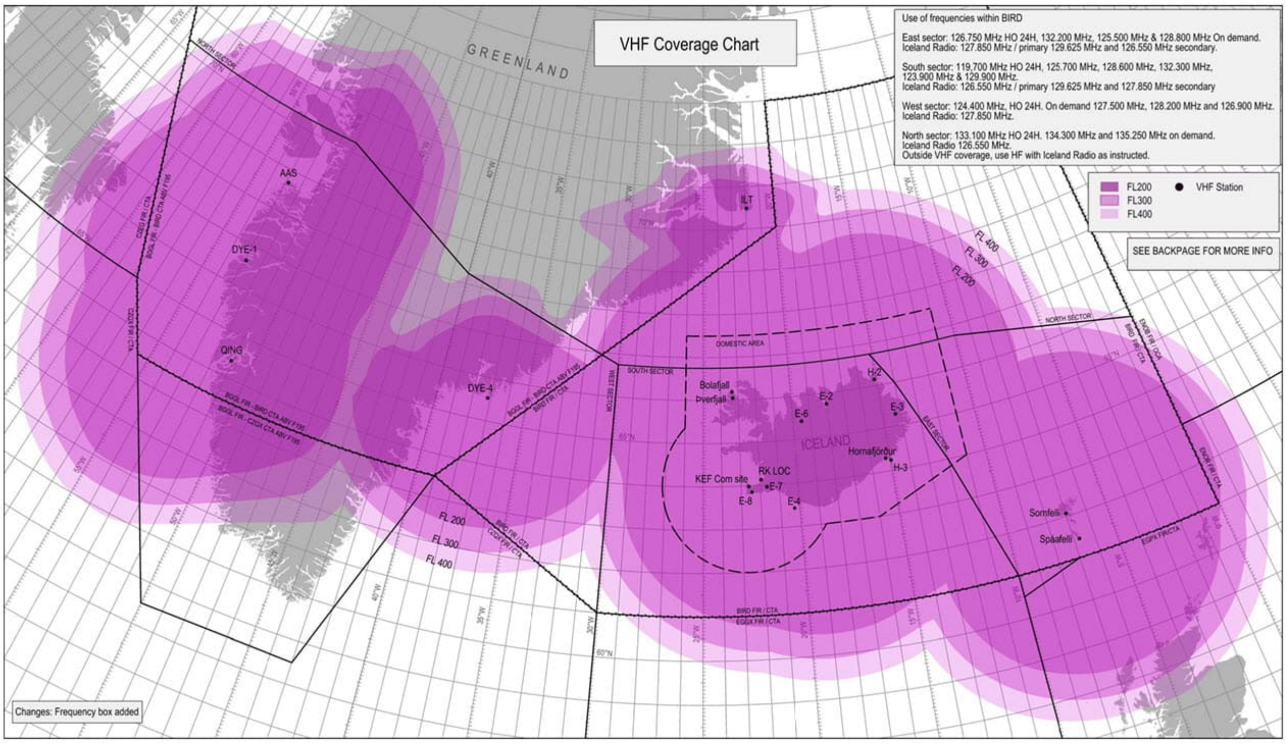
VHF Voice Communications

5.1.27 Radio stations are also responsible for the operation of General Purpose VHF (GP/VHF) outlets. North Atlantic flights may use these facilities for all regular and emergency communications with relevant OACs, except that VHF Channel 128.360 may not be used for routine communication on routes T9 and T290. Such facilities are especially valuable in the vicinity of Iceland, Faroes and Greenland since VHF is not as susceptible to sunspot activity as HF. Outlets are situated at Prins Christian Sund, which is operated by Gander Radio, and at Kangerlussuaq (Sondrestrom), Kulusuk, several locations in Iceland and the Faroes, via Iceland Radio. It is important for the flight crew to recognise that when using GP/VHF, as with HF and SATVOICE, these communications are with a radio station, and the flight crew is not normally in direct contact with ATSU. However, contact between the flight crew and ATC can be arranged, for example via patch-through on HF or GP/VHF frequencies by Iceland Radio and Shanwick Radio.

5.1.28 Reykjavik centre operates a number of Direct Controller Pilot Communications (DCPC) VHF stations in Iceland, Faroe Islands and Greenland. At jet flight levels the coverage is approximately 250 NM as indicated in *Figure 5-1* below. Those stations are used to provide tactical procedural control and ATS Surveillance services within the South, East and West sectors of the Reykjavik area. The callsign of the Reykjavik centre is *"Reykjavik Control"* or just *"Reykjavik"* and indicates that the flight crew is communicating directly with an air traffic controller. The callsign of Iceland radio is *"Iceland radio"* and indicates that the flight crew is communicating with a radio operator who is relaying messages between the flight crew and the appropriate control facility.

Note: Due to technical data link interoperability requirements, CPDLC uplink messages refer to Iceland Radio as "Iceland Radio Centre". This is done to enable the flight crew of capable aircraft to automatically load the specified frequency into the aircraft communication system.

Figure 5-1 Reykjavik Control Direct Controller Pilot VHF Coverage



SATVOICE Communication

5.1.29 The Aeronautical Mobile Satellite (Route) Service (AMS(R)S), more commonly referred to as SATVOICE, can be used as a supplement to HF & CPDLC communications throughout the NAT region for any routine, non-routine or emergency ATS air/ground communications. NAT ATS provider State AIPs contain the necessary telephone numbers and/or short-codes for air-initiated call access to radio stations and/or direct to OACs. Since oceanic traffic typically communicates with ATC through radio facilities, routine SATVOICE calls should be made to such a facility rather than the ATC Centre. Only when the urgency of the communication dictates otherwise should SATVOICE calls be made to the ATC Centre. SATVOICE communication initiated due to HF propagation difficulties does not constitute urgency and should be addressed to the air-ground radio facility. The use of SATVOICE is described in The *SATVOICE Operations Manual* (Doc 10038).

5.1.30 The provisions governing the use of SATVOICE for ATS communications in the NAT region are contained in Doc 7030. These provisions include that even when using SATVOICE, flight crews must simultaneously operate SELCAL or maintain a continuous air-ground communication watch on the assigned HF/VHF frequency.

5.1.31 Operators must also recognise that they are bound by their own State of Registry's regulations regarding carriage and use of long-range ATS communications equipment. Some States do not authorise the carriage of SATVOICE as redundancy for HF equipage.

Data Link Communications

5.1.32 Data link communications are used in the NAT for position reporting (via ADS-C and CPDLC) and air/ground ATC communications using FANS 1/A CPDLC. Operational procedures are specified in Doc 10037, *Global Operational Data Link (GOLD) Manual*. AIP publications of the NAT ATS provider States should be consulted to determine the extent of current implementation in each of the North Atlantic OCAs.

5.1.33 Generally, when a CPDLC aircraft is operating in an airspace beyond the range of VHF voice communications, and CPDLC is available, then:

a) CPDLC will be the primary means of communication, and

b) Voice will be used as the alternative means of communication (for example, third party HF or SATVOICE).

5.1.34 Within VHF voice coverage, an ATSU may provide CPDLC service as the primary means of communication to alleviate frequency congestion or to enable the use of automation associated with the use of CPDLC. In such airspace, VHF voice communication is the alternative means of communication for CPDLC aircraft.

5.1.35 Flights equipped with CPDLC and /or ADS-C and SATCOM should ensure that the data link system is logged on to the appropriate OAC. This applies even when the aircraft is using VHF voice communications.

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

5.1.37 Similar to SATVOICE usage, flight crews using Data link communications for regular ATS communications in the ICAO NAT region remain responsible for operating SELCAL (including completion of a SELCAL Check) or maintaining a continuous air-ground communication watch on the assigned HF frequency outside VHF voice coverage. As stated in section 2.1.4 of the *ICAO Global Operational Data Link (GOLD) Manual* (Doc 10037) ANSPs are required to notify operators, using the AIP or other appropriate AIS, the detail of all the supported data link services. Such notification will include advice when the aircraft SATCOM system is not serviceable. In such circumstances, when the planned route of flight is to extend beyond VHF data link coverage, the ANSP may restrict the use of CPDLC and ADS-C, even within VHF data link coverage areas, if so, operators should then ensure that the relevant CPDLC/ADS-C descriptors (J5/J7/D1) are not filed.

5.2 INTER-PILOT AIR-TO-AIR VHF FACILITY 123.450 MHZ AND EMERGENCY FREQUENCY 121.500 MHZ

5.2.1 The frequency 121.500 MHz should be continuously monitored by all aircraft operating in the NAT region so as to be prepared to offer assistance to any other aircraft advising an emergency situation.

5.2.2 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, 123.450 MHz, is intended for pilot-to-pilot exchanges of operationally significant information *(N.B. It is not to be used as a "chat" frequency*).

5.2.3 123.450 MHz may be used to relay position reports via another aircraft in the event of an air-ground communications failure.

5.2.4 This frequency (123.450 MHz) may also be used by flight crews to contact other aircraft when needing to coordinate offsets required in the application of the Strategic Lateral Offset Procedures (SLOP).

5.2.5 If necessary, initial contact for relays or offset coordination can be established on 121.500 MHz, although great care must be exercised should this be necessary, in case this frequency is being used by aircraft experiencing or assisting with an ongoing emergency.

5.2.6 Therefore, in order to minimise unnecessary use of 121.500 MHz, it is recommended that, when possible, aircraft additionally monitor 123.450 MHz when flying through NAT airspace.

5.3 POSITION REPORTING

Time and Place of Position Reports

5.3.1 Unless otherwise requested by ATC, position reports from flights on routes which are not defined by designated reporting points shall be made at the significant points listed in the flight plan.

5.3.2 ATC may require any flight to report its position at any intermediate waypoints when deemed necessary.

5.3.3 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.

5.3.4 Unless providing position reports via ADS-C, if the estimated time 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.

5.3.5 Flight crews not using CPDLC/ADS-C must always report to ATC as soon as possible on reaching any new cruising level.

Contents of Position Reports

5.3.6 For flights outside domestic ATS route networks, position should be expressed in terms of latitude and longitude except when flying over named reporting points. Except in those areas defined in State AIPs where operators meeting specified requirements can flight plan their user-preferred trajectories, 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.

5.3.7 All times should be expressed in four digits giving both the hour and the minutes UTC.

5.3.8 Radio operators may simultaneously monitor and operate more than one frequency. Therefore, when initiating an HF voice contact it is helpful if the flight crew include advice on the frequency being used (see examples below).

"Operations Normal" Reports

5.3.9 When "operations normal" reports are transmitted by flight crews, they should consist of the prescribed callsign followed by the words "OPERATIONS NORMAL".

Standard Message Types

5.3.10 Standard air/ground message types and formats are used within the NAT region and are published in State AIPs and Atlantic Orientation charts. To enable ground stations to process messages in the shortest possible time, flight crew 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**.

5.3.11 The message types are shown below with examples:

POSITION

Pilot:	*"Shanwick Radio, Swiss 456, Position on 8831"*
Radio operator:	*"Swiss 456, Shanwick Radio"*
Pilot:	*"Shanwick Radio, Swiss 456, RESNO at 1235, Flight Level 330, Estimating 56 North 020 West at 1310, Next 56 North 030 West"*

POSITION REPORT AND REQUEST CLEARANCE

Pilot:	*"Shanwick Radio, American 123, Request Clearance on 8831"*
Radio operator:	*"American 123, Shanwick Radio"*
Pilot:	*"Shanwick Radio, American 123, 56 North 020 West at 1308, Flight Level 330, Estimating 56 North 030 West at 1340, Next 56 North 040 West. Request Flight Level 350"*

REQUEST CLEARANCE

Pilot:	*"Shanwick Radio, Speedbird 212, Request Clearance on 3476"*
Radio operator:	*"Speedbird 212, Shanwick Radio"*
Pilot:	*"Shanwick Radio, Speedbird 212, Request Flight Level 370"*

REVISED ESTIMATE

Pilot:	*"Shanwick Radio, Speedbird 212, Revised Estimate on 3476"*
Radio operator:	*"Speedbird 212, Shanwick Radio"*
Pilot:	*"Shanwick Radio, Speedbird 212, 57 North 040 West at 0305"*

MISCELLANEOUS

Plain language – free format

5.4 "WHEN ABLE HIGHER" (WAH) REPORTS

5.4.1 The provision of WAH reports advises ATC of the time or position that a flight will be able to accept the next higher level allowing controllers to more effectively utilise their airspace and provide aircraft more fuel efficient profiles. Provision of WAH reports on entering NAT OCAs is optional or may be requested by any OAC.

5.4.2 Information provided of the aircraft's future altitude "ability" will not automatically be interpreted by ATC as an advance "request" for a climb. It will be used as previously indicated to assist ATC in planning airspace utilisation.

5.4.3 It should be noted that ATC acknowledgement of a WAH report (and any included requests) is NOT a clearance to change altitude.

5.5 METEOROLOGICAL REPORTS

5.5.1 In accordance with ICAO Annex 3 - *Meteorological Service for International Air Navigation*, aircraft are no longer required to provide voice reports of MET observations of wind speed and direction nor outside air temperature.

5.5.2 When an ATS unit establishes an ADS-C contract, it may also request the MET group, which contains wind and temperature data, to 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 flight crew 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 coordinates.

VOLMET Services

5.5.3 This is a H24 continuous voice broadcast of weather information consisting of SIGMETS for the NAT region, terminal forecasts and actual weather observations for the principal airports in North America & Europe provided by Shannon. Consult State AIPs and NAT Doc 003-*HF Management Guidance Material for the North Atlantic Region*.

5.6 COMMUNICATIONS FAILURE

5.6.1 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. The general principles of such rules and procedures are set out in Annexes 2 and 10 to the ICAO Convention. States publish in their AIPs specific RCF rules and regulations to be followed within their particular sovereign airspace.

5.6.2 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 HF communications difficulties.

5.6.3 Sometimes these disturbances are very wide-spread and HF air-ground communications on 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.

5.6.4 In this latter circumstance, HF air-ground communications with the intended radio station may be possible on a frequency other than the primary or secondary frequencies previously allocated to an aircraft. In the event of encountering poor HF propagation conditions flight crews should try using alternative HF frequencies to contact the intended radio station.

5.6.5 While these disturbances may be severe, they may only be localized between the aircraft's position and the intended radio station rendering communications with that station impossible on any HF frequency. Radio stations providing air-ground services co-operate as a network and it may be possible to communicate with another radio station on HF and request that they relay communications.

5.6.6 The occurrence of poor HF propagation conditions can simultaneously interrupt HF air-ground communications for many aircraft over a wide area and ATC may be unable to make any interventions to assure safe traffic separations using HF. Flight crews must recognise that an HF blackout may impact the ability of ATC to ensure the safe separation of aircraft. Even if using other than HF for regular communications with ATC (CPDLC and SATVOICE), flight crews should still exercise appropriate caution when HF blackout conditions are encountered.

General Provisions

5.6.7 The following procedures are intended to provide general guidance for aircraft which experience a VHF and HF communications failure with ATC while operating in, or proposing to operate in, the NAT region. These procedures are intended to complement and not supersede State procedures/regulations.

1. When so equipped, an aircraft should use CPDLC to communicate with the current controlling authority ATC.

2. When so equipped, an aircraft may also use SATVOICE to contact the responsible facility via special telephone numbers/short codes published in State AIPs (see also NAT Doc 003, "*HF Management Guidance Material for the North Atlantic Region*" which can be downloaded from the www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents").

3. If the aircraft is not equipped with SATVOICE or CPDLC then the flight crew 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.

4. The inter-pilot air-to-air VHF frequency, 123.450 MHz, may be used to relay position reports via another aircraft. The emergency frequency 121.500 MHz should not be used to relay regular communications, but since all NAT traffic is required to monitor the emergency frequency, it may be used, in these circumstances, to establish initial contact with another aircraft and then request transfer to the inter-pilot frequency for further contacts.

5. In view of the traffic density in the NAT region, flight crews of aircraft experiencing a two-way ATS communications failure should broadcast regular position reports on the inter-pilot frequency 123.450 MHz until such time as communications are re-established.

6. The flight crew of an aircraft experiencing a total two-way communications failure (including VHF, HF, CPDLC and SATVOICE) should operate the SSR Transponder on identity Mode A Code 7600 and Mode C.

Operational Procedures following Loss of HF Communications Prior to Entry into the NAT

On-Board HF Communications Equipment Failure

5.6.8 Due to the potential length of time in oceanic airspace, it is strongly recommended that a flight crew, experiencing an HF communications equipment failure:

- Prior to departure:
    - Coordinate with the initial NAT OAC according to flight planned route to determine if eligible for HF relief waiver as outlined in 5.1.2.
    - Include any coordinated HF waiver relief details in Item 18 of the flight plan.
- After departure and prior to entering the NAT:

- Coordinate with the initial NAT OAC according to flight planned route to determine if eligible for HF relief waiver as outlined in 5.1.2.

Operational Procedures for Loss of Communications before Entering the NAT

5.6.9 If loss of communications is encountered before entering the NAT, then the pilot should:

a) follow the radio communication failure procedures of the airspace in which the aircraft is operating.

b) if the pilot elects to continue the flight, then enter oceanic airspace at the oceanic entry point at the level and speed resulting from the execution of the adjacent airspace RCF procedures; then

c) follow the procedures in 5.6.10 below.

Operational Procedures for Loss of Communications after Entering the NAT

5.6.10 If loss of communications is encountered after entering the NAT, then:

a) The pilot shall maintain the currently cleared route, flight level and speed until reaching the Oceanic Exit Point.

b) No route, flight level or speed change shall be made before the Oceanic Exit Point unless a change is deemed necessary by the pilot in command to ensure the safety of the aircraft.

c) When being vectored or having been directed by ATC to proceed offset using 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: a) and b) are NAT specific rules while c) is a globally applicable rule in accordance with PANS-ATM 15.3.3 b)3).

5.6.11 Aircraft with a destination within the NAT region should follow the procedures in 5.6.10 above until reaching the top of decent point and should thereafter follow globally applicable procedures in accordance with PANS-ATM 15.3.3 b) 4) – 7). Those procedures are repeated below for convenience:

a) proceed according to the current flight plan route to the appropriate designated navigation aid or fix serving the destination aerodrome and, when required to ensure compliance with b), hold over this aid or fix until commencement of descent;

b) commence descent from the navigation aid or fix specified in a) 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;

c) complete a normal instrument approach procedure as specified for the designated navigation aid or fix; and

d) land, if possible, within 30 minutes after the estimated time of arrival specified in b) or the last acknowledged expected approach time, whichever is later.

In all cases, after the NAT oceanic exit point, follow the radio communication failure procedures of the airspace in which the aircraft is operating.

CHAPTER 6 NAT HLA FLIGHT OPERATIONS & NAVIGATION PROCEDURES

6.1 INTRODUCTION

6.1.1 Today's aircraft navigation systems necessary for flying in the NAT HLA are capable of high-performance standards.

6.1.2 ICAO specifies the navigation system performance required for operations within a given airspace. This concept is referred to as "Performance Based Navigation" (PBN). Within this philosophy some navigation specifications, in addition to stating the accuracies to be achieved, also require on-board automatic integrity monitoring and alerting functions. Such specifications are referred to as Required Navigation Performance (RNP X), where X represents a lateral accuracy of 95% containment in X NMs. However, specifications requiring the same accuracies but not requiring on-board monitoring/alerting are referred to as RNAV X.

6.1.3 The majority of modern turbine powered aeroplanes worldwide are capable of "RNP 10" approvals. To conform with the PBN standard terminology, as indicated above, this system should actually be designated as "RNAV 10". However, it has been recognised that re-classifying such a widespread existing approval designation would create significant difficulties for both operators and State regulators. Consequently, it has been agreed that this designation of "RNP 10" will remain as such, even though the navigation specifications here are, in PBN terminology, effectively "RNAV 10".

6.1.4 With current technology, on-board automatic performance monitoring can only be carried out using Global Navigation Satellite Systems (GNSS). Hence GNSS is mandatory for true RNP airspace (e.g. RNP 4) but is not required for RNAV airspace, including that historically and still designated as "RNP 10".

Note: For more detailed information on RNP see Doc 9613 – 'Performance Based Navigation Manual'.

6.1.5 Regardless of how sophisticated or mature a system is, it is still essential that stringent navigation and crosschecking procedures are maintained if Gross Navigation Errors (GNEs) are to be avoided. A GNE within NAT airspace is defined as a deviation from cleared route of 10 NM or more. The importance of employing strict flight deck navigation system operating procedures, designed to avoid the insertion of inaccurate waypoints or misunderstandings between the flight crew and ATC over cleared routes, cannot be over-stated.

6.1.6 All reported navigation errors in North Atlantic airspace are thoroughly investigated. Records show that navigation equipment or system technical failures are rare. However, when they do occur, they can sometimes be subtle or progressive, resulting in a gradual and not immediately discernible degradation of performance. Chapter 13 of this Manual provides guidance on detection and recovery when such problems are encountered.

6.1.7 About half of NAT flights are routed via an Organized Track System (OTS) track and a large portion of the remaining random-route flights follow routes that at some point approach within one or two degrees of latitude from the outermost OTS tracks. One consequence of this is that a single digit error in the latitude of one significant point of an aircraft's route will likely lead to a conflict with another aircraft operating correctly. When such errors are made, the risk of an actual collision between two aircraft operating via a common point is further exacerbated by the improved technical accuracy of the modern lateral navigation and height keeping equipment.

6.1.8 Many of the procedures listed in this chapter are not equipment specific and others may not be pertinent to every aircraft. For specific equipment, reference should be made to Airplane Flight Manuals, Operators' Flight Operations Manuals, and other operator specific guidance material.

6.1.9 There are various references in this material to “two” pilots; however, when additional pilots (augmented crew) are on duty, they should all be involved in pre-flight planning, flight deck pre-flight briefings, any route amendments and in all crosscheck procedures to the extent practicable. Complete navigation crosschecks should be performed independently by at least two flight crew members. Maintaining the highest standard of navigation performance is essential to safety in the NAT HLA. Maintain situational awareness. Take advantage of every available means to ensure you are proceeding according to your ATC clearance.

6.1.10 Avoid casual R/T procedures. A number of GNEs have been the result of a misunderstanding between flight crew and controller as to the cleared route and/or flight level. Adhere strictly to proper R/T phraseology and do not be tempted to clip or abbreviate details of waypoint coordinates.

6.2 FMS NAVIGATIONAL FORMAT AND WAYPOINT VERIFICATION PROCEDURES

Pilot Training on Map and FMS Displays of Half-Degree and Whole Degree Waypoints

6.2.1 To mitigate misinterpretation of waypoint coordinates, operator initial and recurrent training programs and operations manuals must incorporate training and guidance to enable pilots to understand map and FMS displays of half degree and whole degree waypoints regardless of the waypoint format being used for waypoint FMS input.

Explanation

> Map displays and certain FMS pages generally do not display full waypoint degrees and minutes, e.g. when the full 13 latitude/longitude characters are used to insert half degree waypoints.

Aircraft Navigation Data Base Waypoint Identifiers:

6.2.2 NAT operators should use a full latitude/longitude (e.g., 13-character) input for waypoints containing both half-degree and whole degrees of latitude and whole degrees of longitude.

6.2.3 NAT operators with an operational need to populate the aircraft navigation data base with a 5-character waypoint identifier should ensure that the aircraft navigation data base vendors and flight planning services use the ARINC 424 specified H- prefix Hxxyy format for half-degree of latitude waypoints, where xx = degrees and 30 minutes of North latitude and yy = degrees of West longitude (e.g., H5250 = 5230’ North 05000’ West) and the ARINC 424 “N-suffix” format (e.g., 5250N = 5200’ North 05000’West) for whole degree waypoints.

6.2.4 CPDLC route clearance will be uplinked in a full Lat/Long format that will be unfamiliar to the flight crews using an ARINC 424 format.

6.2.5 **Operators with an operational need to populate the aircraft navigation data base with a 5-character waypoint identifier format need to ensure flight crews are properly trained on the use of the full Lat/Long waypoint format in CPDLC route clearance uplinks. They must also emphasize the necessity for proper waypoint verification procedures.**

Pilot Procedures for Verifying Waypoint Degrees and Minutes Inserted into Aircraft Navigation Systems:

6.2.6 Procedures must be used to display and verify the DEGREES and MINUTES loaded into the Flight Management Computer (FMS) for the “un-named” (Lat/Long) waypoints defining the route contained in the oceanic clearance.

6.2.7 Regardless of FMS waypoint format and entry method, crew procedures should be designed to promote strong crew resource management techniques, to prevent opportunities for error occurring because of confirmation bias and to generally maintain an attitude of healthy suspicion. Accordingly, the waypoint verification procedures should be conducted as detailed below.

• During pre-flight long-range navigation system (LRNS) programming, both pilots independently verify the full latitude and longitude coordinates of "un-named" (Lat/Long) waypoints defining the expected route of flight within oceanic airspace as entered in the FMS.

• Upon receipt of a route clearance (i.e., one not conforming to the flight planned route), both pilots independently verify the full latitude and longitude coordinates of "unnamed" (Lat/Long) waypoints defining the route contained in the revised route clearance.

• Approaching an oceanic waypoint, one pilot should verify the full latitude and longitude coordinates of that waypoint in the FMS, the NEXT and NEXT +1 waypoints, while the other pilot crosschecks the latitude and longitude coordinates against the master flight plan/ clearance.

Explanation

> Due to the factors in the map and FMS display of half degree and whole degree waypoints, it is imperative that pilots follow the procedure in this document to avoid lateral errors caused by incorrect insertion of waypoints. Verification of the full DEGREES and MINUTES of oceanic waypoints loaded into the FMS is a critical step in ensuring a proper navigational load.

6.3 FLIGHT OPERATIONS AND NAVIGATION PROCEDURES

Note: For pilot operational use, a Sample Oceanic Checklist is in Attachment 1.

Flight Planning

Communication/Navigation/Surveillance (CNS) flight plan codes and planning documents

6.3.1 Perform the following:

a) Review the ATS flight plan with emphasis on Items 10a and 10b and Item 18.

b) Ensure that the appropriate CNS and Performance-based Navigation codes are properly filed in Items 10 and 18 of the flight plan.

c) Review aircraft MELs to ensure CNS equipment capability is correctly reported on the flight plan.

Oceanic documents

6.3.2 Operators are encouraged to develop a flight planning checklist, specific to the aircraft/fleet, to ensure they have the necessary documents before departure. The checklist should include, but is not limited to, the following:

a) Master Document (i.e., master flight plan).

b) NOTAMs for departure, destination, alternate(s), Extended Diversion Time Operations (EDTO) alternates (as applicable) and oceanic FIRs.

c) Weather for departure, destination, alternate(s), EDTO alternates (as applicable).

d) Track Message(s).

e) SIG WX Chart.

f) ETP(s).

g) GNSS NOTAMs (as applicable).

h) Volcanic Ash Information.

i) PIREPs.

j) Plotting/Orientation Charts.

k) AIREP Form (as applicable) for position report.

l) Filing of the ATC FPL.

m) ETOPS critical fuel analysis.

n) Space WX (as appropriate).

Flight plan

6.3.3 The document designated as the Master Document should be carefully checked for date, aircraft type, fuel load and performance requirements. Crosschecks should also be done for routing and forecast ground speeds. The Master Document should be carefully checked against the filed flight plan to ensure the routing agrees with both documents. The enroute time on the Master Document should be compared against the distance to destination for a reasonable groundspeed. The enroute time should also be compared against the total distance for a reasonable fuel load.

Plotting/Orientation chart

6.3.4 A plotting/orientation chart of appropriate scale or a programmed Electronic Flight Bag (EFB)/Tablet indicating published oceanic routes and tracks should be used for oceanic operations. ICAO groups who review oceanic errors have determined that the routine use of a plotting/orientation chart is an excellent aid to reduce lateral errors. A plotting/orientation chart/EFB can also serve as a critical aid in case of partial or total navigation failure. It should be noted that the pilot should read from the plotting/orientation chart/EFB back to the Master Document when verifying data. To read from the Master Document to the plotting/orientation chart/EFB has led to errors based on "seeing what we expect to see". Plot your *currently cleared route* from oceanic entry (OEP) to oceanic exit (OXP). Be sure to update this whenever your route clearance changes.

Equal Time Point (ETP)

6.3.5 ETPs should be computed for contingencies such as medical divert, engine loss or rapid depressurization. Performance with an engine loss and rapid depressurization should also be calculated. This is an ETOPS Critical Fuel Analysis. It is advisable to note the ETPs on the plotting/orientation chart/EFB. Pilots should review with each other the appropriate diversion airport(s) when crossing ETPs. Pilot procedures should also include a manual method for computing ETPs. Pilots should not enter ETPs in the active route of the Flight Management System (FMS) as this could create out-of-conformance alerts on ground-based monitoring systems and could create confusion in the event of a revised route clearance.

Extended Diversion Time Operations (EDTO) [see also Extended Operations (ETOPS)]

6.3.6 Verify EDTO alternates meet the appropriate limitations (e.g., 120 minutes, 180 minutes). Identify EDTO/ETOPS entry and exit points.

Contingency procedures and plans

6.3.7 Operators and Pilots should understand airspace-specific contingency procedures (for in-flight contingencies and weather deviations) as well as plans for any enroute diversion. (See Chapter 10).

Note: Pilots should comply with ATC clearances. If a given contingency requires deviation from the current clearance, timely and effective coordination can help re-establish a new ATC clearance for the changed flight profile.

Track message

6.3.8 Pilots shall have access to a current track message even if filed for a random route or filed above North Atlantic High Level Airspace (HLA). Reviewing the date, effective UTC time and Track Message Identifier (TMI) ensures having a current track message on board. The TMI is linked to the Julian Date. Operators must also ensure that their flight planning and operational control process notify pilots in a timely manner of any amendments to the daily track message. Amendments will be identified by an alpha character to the TMI number for each revision (e.g., TMI031A). Awareness of adjacent tracks can improve situational awareness while executing a contingency procedure.

Weather analysis

6.3.9 Pilots must note enroute temperature and turbulence forecasts as well as diversion/emergency airport weather, volcanic activity, magnetic storms, and solar flares affecting the route of flight.

Pre-Flight

Master clock

6.3.10 A master clock, as designated on board, should be synchronized to UTC or GNSS. This time source, which is typically the Flight Management System (FMS), must be used for all ETOs and ATOs.

Maintenance log

6.3.11 Before entering a special area of operation, pilots should focus on any maintenance write-ups that affect communication, navigation, surveillance, EDTO/ETOPS, or RVSM requirements. Any discrepancies noted in the maintenance log or during the walk-around may require delays or rerouting.

RVSM

6.3.12 Required equipment includes two primary independent altimetry sources, one altitude alert system and one automatic altitude control system. In most cases a functioning transponder that can be linked to the primary altimetry source is also required. Pilots should note any issues that can affect accurate altimetry.

Altimeter checks

6.3.13 Before taxi, pilots should set their altimeters to the airport QNH. Both primary altimeters must agree within ± 75 feet of field elevation. The two primary altimeters must also agree within the limits noted in the aircraft operating manual.

Wind shear or turbulence forecast

6.3.14 Pre-flight preparations should include the projected wind shear and turbulence forecast. Forecast severe turbulence supported by PIREPS, could lead to RVSM suspension. Operators are cautioned against flight planning through areas of forecast greater than moderate turbulence.

Dual Long Range NAV System (LRNS)

6.3.15 Two operational LRNSs are required for remote oceanic operations. A single FMS receiving inputs from two navigation sensors is not considered to be two LRNSs. Aircraft with an “Alternate NAV” capability may be able to dispatch with one FMS INOP.

Long Range Communication Systems (LRCS)

6.3.16 Long range communication system checks:

a) High Frequency (HF) Radio

An HF check should be conducted on the primary and secondary HF radios. If possible, HF checks should be done on the ground or before entering oceanic airspace. A SELCAL check shall also be accomplished at each Oceanic Control Area (OCA) boundary even if datalink equipped.

b) SATCOM

Ensure SATCOM pre-flight check is complete to comply with FANS/CPDLC requirements.

Confirm Present Position coordinates

6.3.17 Before taxi, both pilots should independently verify the Present Position coordinates using either published ramp coordinates or determine position from the airfield diagram. They should not rely solely on the Present Position when the FMS was shut down from the previous flight.

Master Document symbols

6.3.18 Operators are encouraged to use consistent symbols on the Master Document. For example, a circled waypoint number or LAT/LONG (②), means the Pilot Monitoring (PM) has independently verified the coordinates entered or crosschecked by the Pilot Flying (PF). A checkmark (✓) may indicate that the track and distances have been confirmed. A diagonal line (\ ) may indicate that the Pilot Monitoring (PM) has confirmed the coordinates of the approaching and next waypoint. An X-symbol (X) may indicate having flown overhead the waypoint.

LRNS programming

6.3.19 Check currency and software version:

a) It is important to check the effective date of the database. Pilots should note if the database is projected to expire during their trip. MELs may allow relief to fly with an expired database but require the pilots to manually crosscheck all data. The software version of the database should also be confirmed in case there has been a change.

b) Independently verify the full/expanded LAT/LONG of oceanic waypoint entries.

6.3.20 Regardless of the operator, FMS oceanic waypoint format of either full LAT/LONG or ARINC 424, it is critical that both the PF and the PM independently verify the full/expanded LAT/LONG of all unnamed oceanic waypoints. Full LAT/LONGs are truncated in the FMS and cannot be verified without displaying the full LAT/LONGs. ARINC 424 waypoints are coded waypoints susceptible to incorrect coding. Pilots should read from the FMS back to the Master Document when verifying data. Reading from the Master Document to the FMS has led to errors based on “seeing what we expect to see”.

6.3.21 Upload winds:

- FMS units generally allow the crew to upload forecast winds. This procedure supports more accurate reporting of ETOs.

<u>*Groundspeed check*</u>

6.3.22 The groundspeed should be noted before taxiing the aircraft. Pilots should expect the groundspeed to read zero (0) knots. This procedure is a good practice to detect an error that may be developing in the LRNS.

Climb-out

<u>*Verify ETOs*</u>

6.3.23 After climbing above the "sterile-cockpit" altitude, and time permitting, pilots should verify ETOs from departure to destination. These should be noted on the Master Document. This is a crosscheck against ETOs computed by the FMS.

Prior to oceanic entry

Send RCL message only to Bodo, Gander, Santa Maria and Shanwick.

RCL is **not** required for New York OCA East and Reykjavik.

Note: For Reykjavik, if an RCL is sent, the flight crew will be notified that RCL is not required by BIRD.

6.3.24 An RCL is a voice or data link message via ACARS used to provide ETO at OEP, requested flight level, and speed. There is a requirement to send an RCL message prior to the OEP as follows:

- Gander OCA 90-60 minutes;
- Shanwick OCA 90-30 minutes;
- Santa Maria OCA at least 40 minutes;
- Bodo OCA at least 20 minutes;

Note: The RCL, or "RCL RECEIVED", is not a clearance.

6.3.25 The ACARS or voice RCL must contain all of the following information:

- Oceanic Entry Point (OEP);
- ETO for the OEP;
- Mach number (based on FMS cost index (ECON));
- Requested flight level;
- The highest <u>acceptable</u> Flight Level which can be attained at the OEP (via free text);
    - o Provide the highest acceptable Flight Level as MAX FL
        - ▪ Example: Requesting FL360 – enter free text MAX FL380

- If requested Flight Level is the highest acceptable; provide the requested Flight Level as MAX FL
  - Example: Requesting FL360 – enter free text MAX FL360

6.3.26 Voice shall be used to submit an RCL message if;

- Not ACARS data link equipped;
- ACARS data link is not operational;
- ETO for OEP is less than 30 minutes;
- RCL REJECTED is received by the aircraft;
- No response to RCL is received within 15 minutes of sending RCL.

6.3.27 The following response message to the RCL will be generated automatically and delivered to the aircraft via ACARS or voice as appropriate:

RCL RECEIVED BY [ANSP]

Note:
Due to delayed OCR implementation by Shanwick Oceanic, Oceanic Clearances will continue to be issued by **SHANWICK OCEANIC only**, following submission of an RCL until further notice.

Revert to voice if **RCL REJECTED** is received.

Note: There will be no clearance sent via the traditional ACARS method.

Note: If ATC cannot accept the requested OEP altitude, the closest oceanic FL to the one requested (RCL) will be determined and a clearance to climb or descend issued prior to the OEP. The "MAX FL" will never be violated.

Note: Flight crews are reminded that a change in FL, Speed or Route can be requested at any time after the OEP.

6.3.28 The information provided in the RCL message is processed as follows:

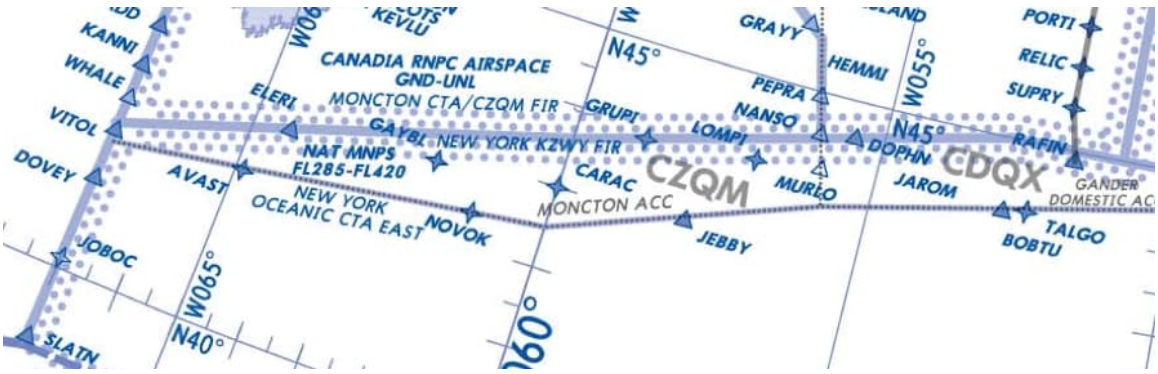
RCL data item	ATC Processing
Oceanic Entry Point (OEP) and ETO time	Information is used to update the currently held ATC data.
Mach Number	ATC will use the requested Mach speed information as the reference speed for cost index (ECON) operations. The aircraft should continue to operate on FMS cost index (ECON) unless it is assigned a fixed Mach speed by ATC. ATC must be advised if the speed changes by Mach 0.02 or more from the Mach in the RCL.

RCL data item	ATC Processing
Flight Level	ATC will store the requested flight level information. The aircraft shall not change flight level unless it is cleared for a flight level change by ATC. Flight crews are reminded that a change in Flight Level can be requested at any time after the OEP as the traffic situation constantly changes and previously blocked flight levels may become available.
Max Flight Level	Max FL shall be provided in the RCL. ATC will store the Max Flight Level Information for traffic planning purposes. If no Max Flight Level is provided, the RCL requested Flight Level will be considered as the highest acceptable flight level at OEP.
Other information	Information is brought to the attention of the controller.

6.3.29 Aircraft routing from Gander Domestic to New York Oceanic via TALGO are required to send an RCL for TALGO to Gander Oceanic.

6.3.30 Aircraft routing from New York Oceanic to Gander Domestic via BOBTU are required to send an RCL for their OEP (RAFIN or north) to Gander Oceanic.

Note: In all cases, any necessary changes to route, level or speed will be issued by the jurisdictional controller.



Oceanic Route Change prior to the OEP

6.3.31 Any route amendment will be issued either by voice or CPDLC loadable route clearance uplink.

6.3.32 Route amendments are the number one scenario leading to Gross Navigation Errors. Pilots must be particularly cautious when receiving a route amendment.

a) Both pilots should confirm the new routing and conduct independent crosschecks after the FMS, Master Document and plotting/orientation chart are updated.

b) Ensure the expanded coordinates for new waypoints are checked and confirmed. It is critical that pilots check the magnetic course and distance between the new waypoints as noted in PREFLIGHT under the paragraph “FMS Programming”.

c) Brief all relief pilots on the amended route prior to them assuming cockpit duties. It is also good practice for relief pilots to independently check the amended route in the FMS.

6.3.33 Abbreviated route clearance may be issued by Air Traffic Services prior to the oceanic entry point when re-clearing an aircraft to fly along the whole length of an organised track. The flight crew should confirm the current NAT track message by using the TMI number (including any appropriate alpha suffix) in the read back. There is no requirement for the flight crew to read back the NAT track coordinates. If any doubt exists as to the TMI or the NAT track coordinates, the flight crew should request the complete track coordinates. Similarly, if the flight crew cannot correctly state the TMI, confirmation will include NAT track coordinates in full and a full read back of those coordinates will be required.

Shanwick

6.3.34 The Shanwick oceanic controller will only issue the ACARS message **CONTACT SHANWICK BY VOICE** instructing the flight crew to contact Shanwick OAC (123.950/127.650) when:

- An oceanic route amendment is necessary due to traffic;
- Shanwick OAC considers it appropriate to do so, to ensure the most efficient oceanic route and altitude.

Entry Conditions

6.3.35 Enroute aircraft shall enter the oceanic airspace in accordance with their existing ATC clearance. **No oceanic clearance is required**.

6.3.36 Fly cost index (ECON). ATC will assign a fixed Mach number if required due to traffic and will rarely assign a fixed Mach number more than 0.01 faster or 0.02 slower than requested or filed in the flight plan.

6.3.37 **An assigned Mach number must be maintained.** If an immediate temporary change in an assigned Mach number is essential (due to turbulence for example), ATC must be informed.

Navigation Accuracy Check

6.3.38 Before oceanic entry, the accuracy of the GNSS navigation equipment (FMS) should be checked.

HF Checks

6.3.39 If the crew was unable to accomplish the HF and SELCAL checks on the ground, these checks should be accomplished before oceanic entry. Additional SELCAL checks should be conducted at each control area boundary, regardless whether CPDLC is working normally.

SATCOM data communication

6.3.40 If the aircraft is equipped, pilots should check that SATCOM data link is operational before oceanic entry.

Log on for CPDLC and ADS-C

6.3.41 If the operator is approved to use Controller Pilot Data Link Communications (CPDLC) and/or Automatic Dependent Surveillance Contract (ADS-C), the pilot should log on to the appropriate FIR 10 to 25 minutes prior to the boundary **if not already logged on to ATC**.

Verify RNP value

6.3.42 Pilots should verify that the RNP value set in the FMS is at least as stringent as that required for the route of flight and reflects the RNP capability indicated in the filed ATS flight plan.

Altimeter checks

6.3.43 Pilots are required to check the two primary altimeters which must be within 200 ft of each other. This check is conducted while at level flight. The stand-by altimeter should also be noted. The altimeter readings should be recorded along with the time. This is a requirement to operate in RVSM airspace.

After oceanic entry

Route Conformance Checking

6.3.44 **CONFIRM ASSIGNED ROUTE** will be uplinked to FANS equipped aircraft after crossing the OEP. CPDLC loadable route clearance uplinks will be used to amend the current flight plan, when necessary, after the OEP.

Squawk 2000

6.3.45 Except when operating in the Reykjavik CTA or transitioning Bermuda RADAR, pilots should squawk 2000 10 minutes after passing the OEP.

Speed

6.3.46 The aircraft should maintain a cost index (ECON) speed unless ATC has issued a clearance to maintain a fixed Mach number. ATC must be advised if the speed changes by plus or minus Mach .02 or more from the speed in the RCL message or the last assigned Mach number.

VHF radios

6.3.47 After contacting oceanic radio (HF), and if not on an assigned VHF frequency, pilots should set their VHF radios to air-to-air (123.450 MHz) and guard frequency (121.500 MHz). Pilots must monitor these frequencies. They are not to be used for non-operational conversation.

Strategic Lateral Offset Procedures (SLOP)

6.3.48 Except as specified in section 6.5.4 i), SLOP should be Standard Operating Procedure for all the NAT region. This procedure distributes traffic between the centreline and 2 NM right of centreline and greatly reduces collision risk in the airspace by virtue of randomness. SLOP should also be used when there is a need to avoid wake turbulence; coordination with other aircraft may be necessary.

6.3.49 Operators that have an automatic offset capability should fly up to 2 NM right of the centreline. Aircraft that do not have an automatic offset capability (that can be programmed in the FMS) should fly the centreline only. Aircraft that do not have a capability to offset in 0.1 NM increments should fly the centreline, 1 NM, or 2 NM right only. **Left offsets are prohibited.**

Note: Pilots should make sure the "TO" waypoint is correct after entering SLOP. With some avionics, when executing an offset near the active "TO" waypoint, the FMS can sequence to the "next + 1" waypoint—skipping a point. Some GNEs have occurred as a result of this.

Routine monitoring

6.3.50 If the FMS provides a predicted ETO capability, pilots should take advantage of that function in order to track the accuracy of ETOs and provide reminders for performing the “approaching waypoint” and “10 minute after” procedures. Ensure there is an active CPDLC connection with the proper current data authority.

Approaching waypoints

Confirm next latitude/longitude

6.3.51 Approaching an oceanic waypoint, pilots should crosscheck the coordinates of the next and subsequent (“next + 1”) oceanic waypoints. This check should be done by comparing the expanded coordinates against the Master Document based on the currently effective ATC clearance. Verify the course/heading and distance in the FMS to the next waypoint matches the Master Document. Confirm autopilot steering is engaged in the proper lateral (LNAV/NAV) mode.

Waypoint crossing

Confirm aircraft transitions to next waypoint

6.3.52 When overhead an oceanic waypoint, pilots should ensure that the aircraft transitions to the next leg. This is confirmed by noting the magnetic heading and distance to the next waypoint compared against the Master Document (as updated based on the current flight plan) and that the aircraft remains in the proper lateral (LNAV/NAV) mode.

Confirm time to next waypoint

6.3.53 When transmitting waypoint position reports via voice, a change of three (3) minutes or more requires that ATC be notified in a timely manner. Inaccurate position reports adversely affect ATC’s ability to safely separate aircraft.

Position report

6.3.54 After passing over the oceanic waypoint, pilots that give a position report to ATC must use the standard format. Pilots should also note and record their fuel status at each oceanic waypoint. This is especially important if the cleared route and flight level differ significantly from the filed flight plan.

10 minutes after waypoint passage

Crosscheck navigational performance and course compliance

6.3.55 In FMS-equipped aircraft, pilots should confirm that proper lateral (LNAV/NAV) mode is engaged and the aircraft is tracking to the proper waypoint. Other methods of navigation crosschecking may be used subject to State aviation authority approval.

Midway between waypoints

Confirm ETO

6.3.56 It is recommended that during a wind check the pilots also confirm the ETO the next waypoint. When transmitting waypoint position reports via voice, a change of three (3) minutes or more requires that ATC be notified in a timely manner.

Pilot action when notified by ATC of possible deviation from cleared track.

6.3.57 Pilots are advised that, should they be notified that ATC systems indicate the aircraft is not flying the cleared route, they should immediately display the full degrees and minutes loaded into the FMS for the NEXT and NEXT + 1 waypoints, and verify against the cleared route before responding.

Voice message example: "SHANWICK CONFIRMS YOUR POSITION REPORT INDICATES INCORRECT ROUTING. CHECK FULL DEGREES AND MINUTES LOADED INTO FMS. YOUR CLEARED ROUTE IS [route]"

CPDLC message example: "YOUR POSITION REPORT INDICATES INCORRECT ROUTING. CHECK FULL DEGREES AND MINUTES LOADED INTO FMS. YOUR CLEARED ROUTE IS [route]."

6.3.58 When ATC notifies the pilot that the aircraft has indicated it has already deviated from the cleared track (ADS-C INDICATES OFF ROUTE. ADVISE INTENTIONS), the pilot shall immediately display the full DEGREES and MINUTES loaded into the FMS for the NEXT waypoint and verify against the cleared route.

Explanation

Due to the factors in the map and FMS display of half degree and whole degree waypoints, it is imperative that pilots follow the procedure in this document to avoid lateral errors caused by incorrect insertion of waypoints. Verification of the full DEGREES and MINUTES of oceanic waypoints loaded into the FMS, when notified by ATC of possible deviation from cleared track, is a critical step in ensuring a proper navigational load.

Oceanic exit

Remove Strategic Lateral Offset

6.3.59 Any lateral offset used during the oceanic crossing must be removed prior to the OXP. It is advisable to include this as a checklist item.

Confirm routing beyond oceanic airspace

6.3.60 Before entering the domestic route structure, pilots must confirm their routing and speed assignment.

Note: Pilots experiencing loss of communications leaving oceanic airspace should follow State guidance as published in AIPs.

Speed

6.3.61 If ATC assigns a fixed Mach number in oceanic airspace, request NORMAL SPEED (via CPDLC or voice) after the OXP in Domestic airspace.

Destination / Block-in

Navigation accuracy check

6.3.62 When arriving at the destination gate, pilots should note any drift or circular error in the LRNS. A GPS Primary Means system normally should not exceed 0.27 NM for the flight. Some inertial systems may drift as much as 2 NM per hour. Because the present generation of LRNSs is highly accurate, operators should establish a drift tolerance which if exceeded would require a write-up in the Maintenance Log. RNP requirements demand that drift be closely monitored.

RVSM write-ups

6.3.63 Problems noted in the altimetry system, altitude alert or altitude hold must be noted in the maintenance log.

6.4 GENERAL PROCEDURES

General

6.4.1 Prior to entering the NAT Region from adjacent continental FIRs, most flights are provided air traffic control service by domestic Air Navigation Service Providers (ANSPs) using radar and/or ADS-B combined with direct controller to pilot VHF Voice communications.

6.4.2 These flights are, in many cases, advised that “radar service is terminated”, or “surveillance service is terminated” upon transfer to the appropriate oceanic control centre. Prior to ADS-B enabled Air Traffic Service (ATS) surveillance service being available in Gander, Reykjavik, Shanwick and Santa Maria, pilots often used this phraseology as a reminder to adopt NAT Region flight crew procedures required for non-surveillance “procedural” airspace, or airspace where ATS surveillance services are not provided.

6.4.3 ATS surveillance services have now become more widely available in the NAT Region. The transition of aircraft (operating ADS-B and SSR equipment) across adjoining areas of radar and/or ADS-B systems coverage will not normally constitute an interruption in identification, and therefore the existing practice of announcing ‘surveillance/radar services terminated’ to most flights entering the NAT Region may no longer occur.

6.4.4 Furthermore, the termination of an ATS surveillance service by any individual ANSP no longer implies that the identification of the aircraft to the ATC system is also terminated.

Flight Crew Procedures

6.4.5 Operator and flight crew procedures for flights operating in the NAT Region can be found in ICAO Annex 2, ICAO Doc 8168, ICAO Doc 4444, ICAO Doc 7030, NAT Doc 007, NAT OPS Bulletins, and State AIPs.

6.4.6 Operators are reminded to evaluate their own flight crew procedures and practices.

6.4.7 Regardless of whether ATC issues a termination of “surveillance/radar service”, when direct controller to pilot VHF Voice communication for the provision or air traffic control is no longer used, existing flight crew procedures continue to be required and remain unchanged while operating in the NAT region oceanic airspace.

Provision of Climbs

6.4.8 Controllers will accommodate requests for climbs whenever possible. When cleared, pilots should initiate the climb without delay unless a conditional clearance was issued. Flight crews not using CPDLC/ADS-C should report leaving the old and reaching the new cruising levels. Flight crews using CPDLC/ADS-C should comply with any reporting requests.

6.4.9 Flight levels requested in the flight plan or through the RCL message process are stored in the NAT Air Traffic Management (ATM) systems. These systems routinely interrogate a flight’s profile to determine if the requested level becomes available. When this occurs, controllers will verify the availability and offer the higher level to the flight. Additionally, Gander and Shanwick have instituted a procedure whereby pilots transiting their OCAs will be advised if any higher flight level becomes available during their flight.

Note: These advisory messages are not to be considered a clearance to change FL. ALL FL changes will ALWAYS require a clearance to climb or descend.

Clearances including variable flight level

6.4.10 Clearances which include variable flight level may be requested and granted, traffic permitting. Clearance requests for a variable flight level may be made by voice or CPDLC.

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

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

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

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

Relief Flight Crew Members

6.4.14 Long range operations may include the use of relief pilots (augmented crew). In such cases operators should have procedures in place to ensure the safe continuity of the operation, particularly with respect to the management of the navigation systems, to ensure positive control of the aircraft.

6.4.15 A comprehensive crew briefing checklist is highly recommended. The briefing by the outgoing pilot(s) to the incoming pilot(s) should take place, in order to ensure that the incoming pilot(s) is (are) aware of any potential changes in flight level, speed, fuel/time score, weather, contingency planning, aircraft status, communication status/frequencies, conditional clearances, cabin issues, and any other operational considerations as required by the operator.

RNP Approval Status

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

ATC Re-clearances

6.4.17 Where practicable, two pilots should listen to and record every ATC clearance, and both agree that the recording is correct. Standard Operating Procedures (SOPs) must include independent clearance copy, data entry (coordinates and/or “named” waypoints), and independent crosschecks to verify that the clearance is correctly programmed. These procedures must also be used when enroute changes are entered. Any doubt should be resolved by requesting clarification from ATC.

6.4.18 In the event that a re-clearance is received when only one pilot is on the flight deck, unless the re-clearance is an ATC instruction that requires immediate compliance, any flight profile, Mach number or routing changes should not be executed, nor should the Navigation or Flight Management Systems be updated, until the second pilot has returned to the Flight Deck and a proper crosschecking and verification process can be completed.

6.5 SPECIAL IN-FLIGHT PROCEDURES

CPDLC Route Clearance Uplinks

6.5.1 **When a loadable CPDLC clearance is sent to the aircraft, pilots are to follow their Operator's SOP with the utmost discipline in order to mitigate any human error.**

a) CPDLC route clearance uplinks are used by ATC or flight crews to amend the oceanic routing.

b) CPDLC route clearance uplinks allow the flight crew to LOAD the CPDLC route clearance uplink directly into the FMS without having to manually enter waypoints possibly introducing navigational errors.

c) Flight crews should ensure that the CPDLC route clearance uplink properly "LOADs" before sending ACCEPT/WILCO.

d) Flight crews must be familiar with the proper loading and execution of the following CPDLC message uplinks:

OCA	**CPDLC LOADABLE ROUTE CLEARANCE UPLINKS** **ICAO Doc10037 (GOLD) CPDLC Message Set**			
	PROCEED DIRECT TO ***(position) **** *Not loadable by some Airbus aircraft	**CLEARED TO [position] VIA** ***(route clearance) **** *Note: this message may cause a route discontinuity	**CLEARED** ***(route clearance)***	**AT [position] CLEARED** ***(route clearance)***
Reykjavik	YES	YES	YES	YES
Shanwick		YES	NO	NO
Santa Maria		YES	YES	YES
New York		YES	YES	YES
Gander		YES	NO	NO
Bodo		NO	NO	NO

PROCEED DIRECT TO (*position*)

- Instruction to proceed directly to the specified position.

CLEARED TO (*position*) VIA (*route clearance*)

- Instruction to proceed to the specified position via the specified route clearance.

- This uplink may not show the “VIA ROUTE CLEARANCE” until it is loaded in the FMS.
- **This is not a “direct”** to the CLEARED TO waypoint. It is a clearance to the waypoint via the route clearance specified.

CLEARED (*route clearance*)

- Instruction to proceed via the specified route clearance.
- This uplink may not show the “ROUTE CLEARANCE” until it is loaded in the FMS.

AT (*position*) CLEARED (*route clearance*)

- Instruction to proceed from the specified position via the specified route clearance.
- This uplink may not show the “ROUTE CLEARANCE” until it is loaded in the FMS.

*Note: Experience shows that pilots often misunderstand the uplink message **CLEARED TO** (position) **VIA** (route clearance) when they fail to LOAD the uplink in the FMS and incorrectly fly directly to the CLEARED TO position not realizing that the “route clearance” may contain several other waypoints prior to the CLEARED TO position.*

Note: FMS waypoint weather data (winds and temperature) may be lost depending on the route clearance message received. Flight crews should verify the weather data as they may need to re-enter the weather data for proper FMS predictions.

Note: The FMS Legs page should be reviewed to ensure there are no “discontinuities” in the route. If ANY discontinuity, it must be resolved (closed) with ample time before reaching the discontinuity.

6.5.2 Flight crews should revert to voice if there is any doubt or confusion about any CPDLC uplink.

Strategic Lateral Offset Procedures (SLOP)

6.5.3 This procedure provides for offsets within the following guidelines:

a) an aircraft may fly offsets right of centreline up to a maximum of 2 NM; *and*
b) offsets **left** of centreline are **prohibited**.

6.5.4 Distributing aircraft laterally and equally across all available positions adds an additional safety margin and reduces collision risk. The SLOP procedure was developed to reduce the collision risk from highly accurate navigation systems and operational errors. SLOP is now **a standard operating procedure** for the entire NAT region and flight crews **are required** to adopt this procedure as is appropriate. It should be noted that:

a) Aircraft without automatic offset programming capability must fly the centreline.
b) Aircraft able to perform offsets in tenths of nautical mile should do so as it contributes to risk reduction.
c) It is recommended that flight crews of aircraft capable of programming automatic offsets should randomly select flying centreline or an offset. In order to obtain lateral spacing from nearby aircraft (i.e. those immediately above and/or below), flight crews should use whatever means are available (e.g. ACAS/TCAS, communications, visual acquisition, GPWS) to determine the best flight path to fly.
d) An aircraft overtaking another aircraft should offset within the confines of this procedure, if capable, so as to minimize the amount of wake turbulence for the aircraft being overtaken.

e) For wake turbulence purposes, flight crews should fly one of the offset positions. Flight crews may contact other aircraft on the air-to-air channel, 123.450 MHz, as necessary, to co- ordinate the best wake turbulence mutual offset option. *(Note: It is recognized that the flight crew will use their judgement to determine the action most appropriate to any given situation and that the pilot-in-command has the final authority and responsibility for the safe operations of the aircraft. See also Chapter 10).*

f) Flight crews may apply an offset outbound at the oceanic entry point and must return to centreline prior to the oceanic exit point unless otherwise authorized by the appropriate ATS authority or directed by the appropriate ATC unit.

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.

i) Aircraft shall not apply SLOP below FL 285 in the Reykjavik OCA and Bodo OCA.

j) The offset should be applied from the time the aircraft reaches its cruising level until top of descent.

Uplink Message Latency Monitor Function

6.5.5 The uplink message latency monitor function is designed to prevent pilots from acting on a CPDLC uplink message that has been delayed in the network. All NAT ANSPs uplink the latency monitor message to all CPDLC connected aircraft immediately after they enter each control area. An aircraft may therefore receive this message multiple times during a flight.

6.5.6 When the pilot receives the uplink CPDLC message SET MAX UPLINK DELAY VALUE TO 300 SEC he/she shall:

a) Send a positive response to ATC as prompted by the avionics (ACCEPT [ROGER]) regardless of whether the aircraft supports the latency monitor function.

Note 1: It is important that pilots respond to the SET MAX UPLINK DELAY VALUE TO 300 SEC uplink message to avoid having open unanswered CPDLC messages in the system. This also applies to aircraft that have deficient message latency monitor functionality or no such functionality at all.

Note 2: The Global Operational Data Link (GOLD) Manual (Doc 10037) specifies that the pilot should append the response downlink with the free text message TIMER NOT AVAILABLE when the message latency monitor function is not available in the aircraft (refer to GOLD Table 4-1).

b) If the aircraft is equipped with a correctly functioning message latency monitor, enter the specified uplink delay into the avionics in accordance with the aircraft procedures. Some avionics will automatically set the delay value in accordance with the uplink message and do not allow for a manual input.

Note 3: If an aircraft is instructed to log off and then log on again mid-flight, ATC may send the message SET MAX UPLINK DELAY VALUE TO 300 SEC again once the logon is completed.

6.5.7 When a pilot receives a CPDLC uplink message with an indication that the message has been delayed the pilot shall:

a) Revert to voice communications to notify the ATS unit of the delayed message received and to request clarification of the intent of the CPDLC message; and

b) Respond appropriately to close the message as per the instructions of the controller.

c) **The pilot must not act on the delayed uplink message until clarification has been received from the controller.**

d) **If a pilot receives a random clearance, for example a change in FL, without the pilots requesting a FL change, it is good practice to check the time-stamp in the message to ensure it is logically relevant.**

6.6 OLDER AIRCRAFT SYSTEMS

6.6.1 This section addresses those aircraft operating in the NAT HLA with reduced LRNS equipage (inertial navigation only) and/or no altimetry monitoring.

Groundspeed check

6.6.2 The groundspeed should be noted before taxiing the aircraft. Pilots should expect the groundspeed to read zero (0) knots. This procedure is a good practice to detect an error that may be developing in the LRNS.

Navigation accuracy check prior to OEP

6.6.3 Before oceanic entry, the accuracy of the LRNS should be checked against a ground-based NAVAID. The results of the accuracy check should be recorded with the time and position. A large difference between the ground-based NAVAID and the LRNS may require immediate corrective action. Operators should establish a navigation accuracy check tolerance based on the type of LRNS. It is not advisable for pilots to attempt to correct an error by doing an air alignment or by manually updating the LRNS since this has often contributed to a Gross Navigation Error (GNE). A latitude/longitude radar fix from ATC can also support a navigation accuracy check in lieu of a NAVAID. Select the most accurate navigation system for auto-coupling as appropriate.

6.6.4 It is good practice to discuss in advance a primary and secondary ground based navigational aid that will be used to verify the accuracy of the LRNS. This planning may help to identify intended navigation aids that are limited or have a NOTAM rendering them unusable and is helpful when departing airports close to oceanic airspace. Examples include Shannon (EINN), Lisboa (LPPT), Boston (KBOS), etc.

Note: Track and distance tables are available commercially for every ten degrees of longitude.

Compass heading check (Inertial Navigation Systems)

6.6.5 It is recommended to conduct a compass heading check and record the results when inertial systems are the only means of long-range navigation. The check can also aid in determining the most accurate compass if a problem develops over water.

Hourly altimeter checks

6.6.6 Pilots are required to observe the primary and stand-by altimeters each hour. It is recommended that these hourly checks be recorded with the readings and times. This documentation can aid pilots in determining the most accurate altimeter if an altimetry problem develops.

Pilot track and distance check

6.6.7 It is recommended that pilot pre-flight and in-flight procedures call for the pilot to compare the track and distance between waypoints shown on the Computer Flight Plan (CFP) to those displayed by the FMS.

6.6.8 Pilots should be aware that waypoint insertion errors of half degree of latitude may in some cases result in only small differences in track and distance, however, the track and distance check can help prevent waypoint insertion errors of one degree or more that have been observed in oceanic operations.

Note: the currency of magnetic variation tables loaded into aircraft navigation databases and the point at which the track is measured affect the track displayed on the FMS by as much as ±3 degrees.

Explanation

This check remains valuable because waypoint insertion errors are not limited to half degree errors and waypoint insertion errors of one degree or more have been observed in oceanic operations. Waypoint insertion errors of half degree produce a small difference in leg segment track and distance, however, as noted above, waypoint insertion errors are not limited to half degree.

6.6.9 To minimize oceanic errors, pilots should conduct a magnetic course and distance check from oceanic entry to oceanic exit. Operators should establish a tolerance such as ± 2°and ± 2 NM. The course and distance check comparing the Master Document against the LRNS are critical in detecting errors that may not have been noticed by simply checking coordinates. A difference of more than 2˚ between waypoints may be due to a difference of the magnetic variation in the database versus the variation used in the Master Document. Any difference outside the ± 2°or ± 2 NM should be rechecked and verified.

6.6.10 Mag Var tables exist not only in the FMS, but also in the Inertial Reference System and in the flight planning systems. If all of these are not current, this check will be meaningless.

Routine Monitoring

6.6.11 Plot the latitude/longitude on the chart being used to track flight progress. Confirm the chart. It is advisable to plot the non-steering LRNS. A 10-minute plot can alert the crew to any lateral deviation from their ATC clearance prior to it becoming a Gross Navigation Error. A good crosscheck for the position of the 10-minute plot is that it is approximately 2˚ of longitude past the oceanic waypoint.

6.6.12 Specify which FMS pages, or other appropriate displays of the navigation system are assigned to specific flight crew for monitoring (e.g. cross-track error or time/distance). The non-steering navigation system should be used to display cross-track error and track angle error, if available.

6.6.13 Check system-generated cross-track deviation or similar indication to confirm there is NO deviation from the programmed route of flight (e.g. XTRK is 0.0 NM). Verify the "TO" waypoint is consistent with the current flight plan.

Cross-check winds

6.6.14 It is good practice to crosscheck winds midway between oceanic waypoints by comparing the Master Document, LRNS and upper millibar wind chart. This crosscheck will also aid pilots in case there is a need for a contingency procedure such as dead reckoning (DR).

Compare ground-based NAVAID to LRNS after Oceanic Exit (OXP)

6.6.15 When departing oceanic airspace and acquiring ground-based NAVAIDs, pilots should note the accuracy of the LRNS by comparing it to those NAVAIDs. Any discrepancy should be noted in the maintenance log.

6.7 LATERAL NAVIGATION PERFORMANCE MONITORING

6.7.1 The navigation performance of operators within the NAT HLA is monitored on a continual basis. This monitoring process is described in Chapter 13.

Note: The most common causes of lateral navigation errors are found in the Oceanic Errors Safety Bulletin (NAT OPS Bulletin 2017_002).

CHAPTER 7 RVSM FLIGHT IN THE NAT HLA

7.1 GENERAL

7.1.1 The aircraft altimetry and height keeping systems necessary for flying in RVSM airspace are capable of high-performance standards. However, it is essential that stringent operating 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. Should any of the required components fail, ATC must be informed.

7.1.2 Operational errors in the vertical plane occur. Aircraft are sometimes flown at levels other than those for which an ATC clearance has been issued. The potential collision risk of even a single incidence of flying at an un-cleared level can be significant. The NAT HLA risk estimates in the vertical plane, as a result of operational errors or un-cleared departures from flight level, exceed those arising from lateral gross navigation errors.

7.1.3 It is essential that flight crews do not take modern technology for granted. They should at all times, especially during periods of low workload, guard against complacency and over-confidence, by adhering rigidly to approved cockpit/flight deck procedures which have been formulated over many years, in order to help stop operational errors.

7.1.4 In the event of severe turbulence, RVSM procedures may be suspended.

Pre-Flight

7.1.5 For flight through the NAT HLA the aircraft and the operator must have the appropriate State approvals for both NAT HLA and RVSM operations. The flight crew must be qualified for flight in RVSM airspace and all aircraft intending to operate within the NAT HLA must be equipped with altimetry and height-keeping systems which meet RVSM Minimum Aircraft System Performance Specifications (MASPS). RVSM MASPS are contained in Doc 9574 (*Manual on implementation of a 300m (1,000ft) Vertical Separation Minimum between FL 290 and FL 410 inclusive*) and detailed in FAA Advisory Circular (AC) 91-85 which can currently be accessed through:
https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1035328
Also, further guidance from EASA on where to find information related to Airborne RVSM Equipment and Performance Requirements is contained within CS-ACNS (Certification Specification and Acceptable Means of Compliance for Airborne Communications, Navigation and Surveillance), in the EUROCONTROL Library, at:
https://www.skybrary.aero/articles/reduced-vertical-separation-minima-rvsm.

7.1.6 A 'W' must be entered into Item 10 of the ICAO flight plan to indicate that the aircraft is approved for flight at RVSM levels.

7.1.7 For operations in NAT HLA, flight crews are required to perform standard pre-flight checks of altimeters.

7.1.8 Special arrangements exist for non-RVSM approved aircraft/operators to climb or descend through NAT RVSM airspace; and in very specific circumstances arrangements may be made for non-approved aircraft to fly at RVSM levels in the NAT region. Both such arrangements are explained in Chapter 1 (See Special Arrangements for Non-RVSM Approved Aircraft – Section 1.5).

In-Flight – Before Operating in the NAT HLA

7.1.9 Most flights will approach the NAT HLA through European or North American RVSM airspaces. It is therefore expected that continuous monitoring of the serviceability of the aircraft's height keeping systems will have been undertaken. Nevertheless, in view of the significant change of operating environment (i.e. to indirect surveillance and communications) it is recommended that a final confirmation of the aircraft systems serviceability is performed immediately prior to entering the NAT HLA. Check to ensure the two primary altimeters are reading within 200 feet of each other (or lesser value if specified in your aircraft's flight manual). Conduct this check while at level flight. You should also note the stand-by altimeter reading. The readings of the primary and standby altimeters should be recorded to be available for use in any possible contingency situations.

In-Flight – Entering and Flying in the NAT HLA

7.1.10 One automatic altitude-control system should be operative and engaged throughout the cruise. This system should only be disengaged when it is necessary to re-trim the aircraft, or when the aircraft encounters turbulence and operating procedures dictate.

7.1.11 When passing waypoints, or at intervals not exceeding 60 minutes (whichever occurs earlier), or on reaching a new cleared flight level, a crosscheck of primary altimeters should be conducted. If at any time the readings of the two primary altimeters differ by more than 200 ft, the aircraft's altimetry system should be considered defective and ATC must be informed.

7.1.12 To prevent unwanted TCAS/ACAS warnings or alerts, when first approaching any cleared flight level in NAT RVSM airspace, flight crews should ensure that the vertical closure speed is not excessive. It is considered that, with about 1500 ft to go to a cleared flight level, vertical speed should be reduced to a maximum of 1500 ft per minute and ideally, to between 1000 ft per minute and 500 ft per minute. Additionally, it is important to ensure, by manually overriding, if necessary, that the aircraft neither undershoots nor overshoots the cleared level by more than 150 ft.

7.1.13 It must also be recognised that even under normal operations when using such indirect communication methods, there does exist the potential for misunderstanding between flight crew and controller regarding the detail of any issued clearances or re-clearances. Occasionally, such "ATC Loop Errors" can lead to an aircraft being flown at a level other than that expected by the controller. In such circumstances separation safety margins may be eroded. To avoid possible risks from any of the foregoing situations, it is therefore essential in the NAT HLA that **flight crews not using CPDLC/ADS-C always report to ATC immediately on leaving the current cruising level and on reaching any new cruising level**.

7.2 EQUIPMENT FAILURES

7.2.1 The following equipment failures must be reported to ATC as soon as practicable following their identification:

a) loss of one or more primary altimetry systems; or

b) failure of all automatic altitude-control systems

7.2.2 The aircraft should then follow the appropriate procedure described in Chapter 9 – "Procedures in the Event of Navigation System Degradation or Failure", or as instructed by the controlling ATC unit.

7.3 VERTICAL NAVIGATION PERFORMANCE MONITORING

7.3.1 The vertical navigation performance of operators within the NAT HLA is monitored on a continual basis by the NAT CMA. Such monitoring includes both measurement of the technical height-keeping accuracy of RVSM approved aircraft and assessment of collision risk associated with all reported operational deviations from cleared levels. This monitoring process is described in Chapter 13.

Note: The most common causes of vertical navigation errors are found in the Oceanic Errors Safety Bulletin (NAT OPS Bulletin 2017_002).

CHAPTER 8 ATS SURVEILLANCE SERVICES IN THE NAT HLA

8.1 GENERAL

8.1.1 ATS Surveillance services are provided within the NAT HLA where radar, ADS-B or multilateration coverage exists in accordance with ATS Surveillance procedures in the *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444).

8.1.2 Although ADS-B coverage exists throughout a large section of the NAT, ADS-B equipage is not mandated except on routes T9 and T290 and in the Reykjavik FIR.

8.1.3 If ADS-B equipment B1 or B2 has been filed in Item 10b of the ICAO FPL, the pilot shall consider that the aircraft is identified when the aircraft is operating above FL 285 in the Gander OCA, Shanwick OCA, Santa Maria OCA and the Reykjavik OCA. The controller will not inform the pilot of the identification. The controller will inform the pilot if the aircraft is not identified. This procedure is established to facilitate application of ATS surveillance separation using CPDLC by eliminating the need to inform every aircraft via CPDLC that the aircraft is identified.

8.1.4 Regardless of whether or not ATC issues a termination of “surveillance/radar service”, when direct controller to pilot VHF Voice communication for the provision or air traffic control is no longer used, flight crew procedures as defined in Chapter 6 continue to be required while operating in the NAT region oceanic airspace.

8.2 OPERATION OF SSR TRANSPONDERS

8.2.1 All aircraft operating as IFR flights in the NAT region shall be equipped with a pressure-altitude reporting SSR transponder. All IFR aircraft operating within the Reykjavik FIR must be equipped with Mode S Elementary Surveillance (ELS) and all IFR fixed-wing aircraft of a maximum certified take-off mass exceeding 5 700 kg or that have a maximum cruising true airspeed capability greater than 250 kt, with an individual certificate of airworthiness first issued on or after 7 June 1995, must be equipped with Mode S Enhanced Surveillance (EHS) (refer to AIP Iceland for certain exemptions that apply).

8.2.2 Unless otherwise directed by ATC, pilots flying in NAT airspace shall operate transponders continuously in Mode A/C Code 2000, except that the last assigned code shall be retained for a period of 10 minutes after passing the OEP. Pilots should note that it is important to change from the last assigned domestic code to Code 2000 since the original domestic code may not be recognized by the subsequent Domestic Radar Service on exit from the oceanic airspace. The following exception applies:

a) Reykjavik OAC provides a radar control service in the south-eastern part of its area and consequently transponder codes issued by Reykjavik OAC must be retained throughout the Reykjavik OCA until advised by ATC.

b) New York OAC provides radar control service within a 180-mile radius of Bermuda and consequently transponder codes previously issued must be retained throughout the Bermuda RADAR airspace until advised by ATC.

8.2.3 This procedure does not affect the use of the special purpose codes (7500, 7600 and 7700) in cases of unlawful interference, radio failure or emergency. However, given the current heightened security environment flight 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.

8.3 OPERATION OF ADS-B TRANSMITTERS

8.3.1 ADS-B services are available in some continental airspaces immediately adjacent to the NAT region as well as within some portions of the NAT HLA. ADS-B equipage is not mandated except on routes T9 and T290 and in the Reykjavik FIR. All IFR aircraft operating within the Reykjavik FIR must be equipped with 1 090 MHz Extended Squitter (ES) ADS-B (refer to AIP Iceland for certain exemptions that apply).

8.3.2 Eligibility for ADS-B service in the NAT is based upon the provisions in the Doc 7030 section 5.5.

Note: The following documents provide guidance for the installation and airworthiness approval of the ADS-B OUT system in aircraft:

1. European Aviation Safety Agency (EASA) AMC 20-24 or CS-ACNS; or

2. FAA AC No. 20-165B — Airworthiness Approval of ADS-B; or

3. Configuration standards reflected in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia.

8.3.3 The Flight ID is the Aircraft Identification (ACID) and is used in both ADS-B and Mode S SSR technology. Up to seven characters long, it is usually set by the flight crew during pre-flight. The Flight ID is used by the ATC ground system to correlate the ADS-B information with the flight plan data and to identify the aircraft on the ATC situation display system. To allow correlation of a Flight ID to a flight plan, the Flight ID must exactly match the ACID entered in Item 7 of the ICAO flight plan. It is important that the Flight ID is correctly entered, or ADS-B service may be denied.

Note: The way in which ADS-B avionics are integrated into the cockpit may prevent changing of Flight ID once airborne. Some avionics may be wired to a weight-on-wheels switch that detects when the aircraft is airborne so that the Flight ID field is not editable after take–off.

8.3.4 Aircraft operators wishing to receive an exemption from the procedures specified in 8.3.2 above for an individual flight shall apply for an exemption to the ATS unit(s) in accordance with AIP directives. Any approvals for such exemptions may be contingent on specific conditions such as routing, flight level and time of day.

8.3.5 Some DO-260 compliant ADS-B transmitters incorporate a single emergency bit for the squawk codes 7500, 7600 and 7700 and therefore do not indicate the nature of the emergency. Thus, when activated, the flight crew will need to contact ATC to communicate the type of emergency. Such ADS-B transmitters are also unable to squawk ident while the general emergency mode is being transmitted.

8.4 NAT HLA ATS SURVEILLANCE COVERAGE

8.4.1 The figures below indicate the coverage of ATS surveillance systems (radar, ADS-B and multilateration) and Direct Controller Pilot VHF Voice Communications (DCPC VHF) in the NAT HLA.

Figure 8-1 NAT ATS surveillance coverage including radar, ADS-B and multilateration

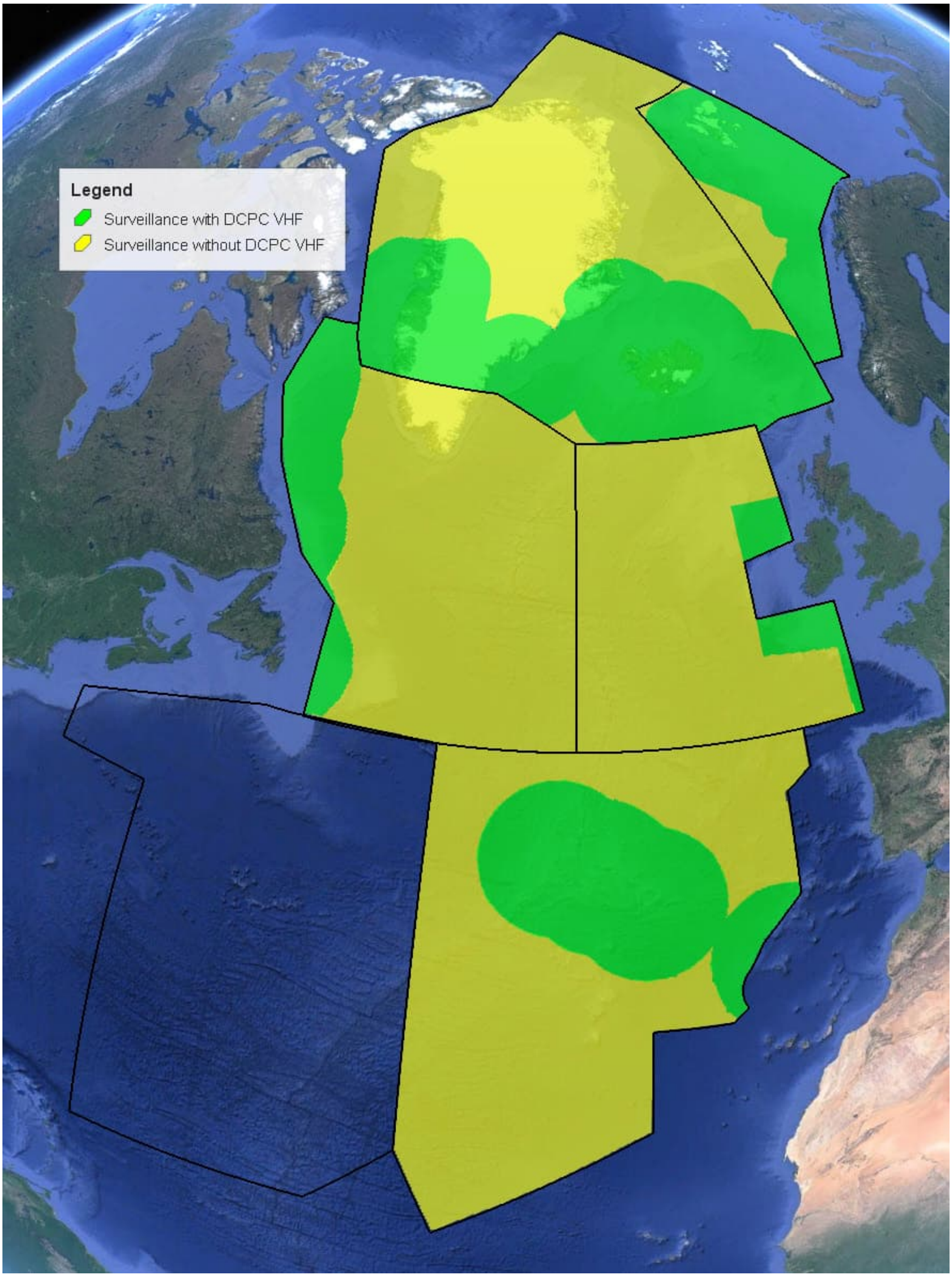
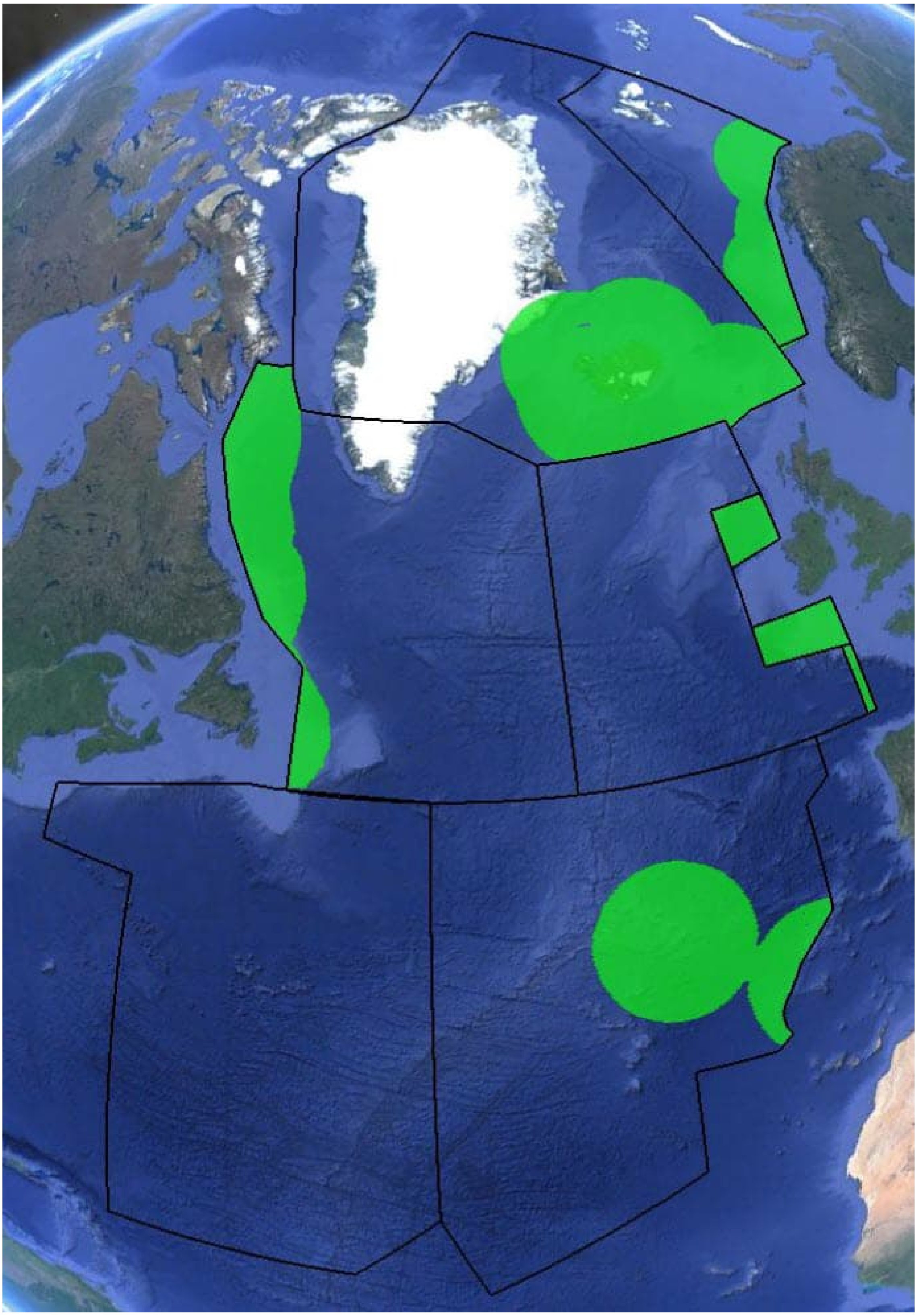


Figure 8-2 NAT ATS surveillance coverage for non-ADS-B equipped aircraft (radar and multilateration)



** Note: see State AIPs for detailed surveillance and communication coverage including coverage in the low level airspace.*

CHAPTER 9 PROCEDURES IN THE EVENT OF NAVIGATION SYSTEM DEGRADATION OR FAILURE

9.1 GENERAL

9.1.1 Aircraft navigation systems are generally very accurate and very reliable; as a result, GNEs due to system failures are rare in the NAT HLA. However, when failures do occur, their potential effects on the aircraft's navigation capability can be subtle or progressive, resulting in a gradual and perhaps not immediately discernible degradation of performance. The risks that such errors pose can be significant and flight 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. The majority are the result of human error, and diligent application by flight crews of operating procedures such as those described in Chapter 6 should help to minimise the frequency of such errors. 'Vigilance' must be the watchword when navigating in the NAT HLA. 'Complacency' has no place here.

9.1.2 For unrestricted operation in the NAT HLA an approved aircraft must be equipped with a minimum of **two fully serviceable** LRNSs. Aircraft not meeting these requirements can operate, in accordance with the provisions of section 1.4, within the three corridors described in section 1.7.5.

9.1.3 If abnormal navigation indications relating to INS or IRS systems occur after take-off, they should be analysed to discover their cause. Under no circumstances should a flight continue into oceanic airspace with unresolved navigation system errors, or with errors caused by inertial platform misalignment or initial position insertion.

9.1.4 Flight crew training and consequent approval for NAT HLA operations should include instruction on what actions are to be considered in the event of navigation system failures. This chapter provides guidance on the detection of failures and what flight crew action should be considered, together with details of the routes that may be used when the aircraft's navigation capability is degraded below that required for unrestricted operations in the NAT HLA.

Detection of Failures

9.1.5 Normally, navigation installations include comparator and/or warning devices, but it is still necessary for the flight crew to make frequent comparison checks. When an aircraft is fitted with three independent systems, the identification of a defective system should be straightforward. Any degradation of navigation capability should be reported to ATC immediately.

Methods of Determining which System is Faulty

9.1.6 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 of the following actions should be considered:

a) checking malfunction codes for indication of unserviceability;

b) obtaining a fix. It may be possible to use the following:

- the weather radar (range marks and relative bearing lines) to determine the position relative to an identifiable landmark such as an island; or
- the ADF to obtain bearings from a suitable long-range NDB, in which case magnetic variation at the position of the aircraft should be used to convert the RMI bearings to true; or
- 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 with reference to

true as opposed to magnetic north).

c) contacting a nearby aircraft on VHF, and comparing information on spot wind, or ground speed and drift; or

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.

Action if the Faulty System Cannot be Identified

9.1.7 Occasions may still arise when distance or cross track differences develop between systems, but the flight crew cannot determine which system is at fault. The majority of operators feel 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.

Guidance on What Constitutes a Failed System

9.1.8 Operations or navigation manuals should include guidelines on how to decide when a navigation system should be considered to have failed, e.g. failures may be indicated by a red warning light, or by self -diagnosis indications, or by an error over a known position exceeding the value agreed between an operator and its certifying authority.

Inertial System Failures

9.1.9 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 in itself 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.

GNSS Failures

9.1.10 GNSS are also very accurate and typically very reliable. Unlike inertial systems, GNSS failures can come about as a result of malfunctions outside of the aircraft, e.g., GNSS satellites. Some failures (e.g., loss of RAIM) may not affect navigation performance but rather affect the ability of the aircraft's GNSS equipment to monitor the reliability of the navigation solution. Similarly, a loss of fault detection and exclusion (FDE) capability may still allow accurate navigation but could also allow a defective satellite to provide faulty navigation data to the aircraft, without the flight crew's knowledge. In the event of loss of RAIM or FDE, flight crews should crosscheck the aircraft GNSS position by any means available, both on and off the aircraft. Procedures for responding to an aircraft GNSS malfunction should be provided in aircraft flight manuals. Flight crews should inform ATC of any GNSS malfunction. ATC aircraft separation minimums may be affected by the GNSS malfunction.

Satellite Fault Detection Outage

9.1.11 If the GNSS receiver displays an indication of a fault detection function outage (i.e. RAIM/FDE is not available), navigation integrity must be provided by comparing the GNSS position with the position indicated by another LRNS sensor (i.e. other than GNSS), 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 flight crew should adopt navigation system failure procedures as subsequently described, until the exclusion function or navigation integrity is regained. The flight crew should follow flight manual procedures specified for this type of malfunction.

Fault Detection Alert

9.1.12 If the GNSS receiver displays a fault detection alert (i.e. a failed satellite), the flight crew may choose to continue to operate using the GNSS-generated position if the current estimate of position uncertainty displayed on the GNSS from the FDE algorithm is actively monitored. If this exceeds 10 NM, the flight crew should immediately begin using the following navigation system failure procedures, until the exclusion function or navigation integrity is regained. The flight crew should follow flight manual procedures specified for this type of alert.

9.2 LOSS OF NAVIGATION CAPABILITY

9.2.1 The following guidance is offered for aircraft having State approval for unrestricted operations in the NAT HLA and which are equipped with two operational LRNSs:

One System Fails Before Take-Off

9.2.2 The flight crew must consider:

a) delaying departure until repair is possible;

b) obtaining a clearance above or below the NAT HLA;

c) routing through the corridors described in paragraph 1.7.5.

One System Fails Before the OCA Boundary is Reached

9.2.3 The flight crew must consider:

a) landing at a suitable aerodrome before the boundary or returning to the aerodrome of departure;

b) diverting via one of the corridors described in paragraph 1.7.5;

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

One System Fails After the OCA Boundary is Crossed

9.2.4 Once the aircraft has entered oceanic airspace, the flight crew should normally continue to operate the aircraft in accordance with the current flight plan or as amended by ATC, appreciating that the reliability of the total navigation system has been significantly reduced.

9.2.5 The flight crew should however,

a) assess the prevailing circumstances (e.g. performance of the remaining system, remaining portion of the flight in the NAT HLA, etc.);

b) advise and consult with ATC as to the most suitable action (e.g. request/expect clearance above or below the NAT HLA, turn-back, obtain clearance to fly within the corridors described in paragraph 1.7.5;

c) obtain appropriate re-clearance prior to any deviation from the last acknowledged clearance.

9.2.6 When the flight continues in accordance with its current flight plan or as amended by ATC (especially if the distance ahead within the NAT HLA is significant), the flight crew should begin a careful monitoring programme:

a) to take special care in the operation of the remaining system bearing in mind that routine methods of error checking are no longer available;

b) to check the main and standby compass systems frequently against the information which is still available;

c) to check the performance record of the remaining equipment and if doubt arises regarding its performance and/or reliability, the following procedures should be considered:

- attempting visual sighting of other aircraft or their contrails, which may provide a track indication;
- calling the appropriate OAC for information on other aircraft adjacent to the aircraft's estimated position and/or calling on VHF to establish contact with such aircraft (preferably same track/level) to obtain from them information which could be useful. (e.g. drift, groundspeed, wind details).

The Remaining System Fails After Entering the NAT HLA

9.2.7 The flight crew should:

a) immediately notify ATC;

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 look-out for possible conflicting aircraft, and make maximum use of exterior lights;

d) if no instructions are received from ATC within a reasonable period consider climbing or descending 500 feet, broadcasting action on 121.500 MHz and advising ATC as soon as possible.

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

Complete Failure of Navigation Systems Computers

9.2.8 A characteristic of the navigation computer system is that the computer element might fail and thus deprive the aircraft of steering guidance and the indication of position relative to cleared track, but the basic outputs of the IRS (LAT/LONG, Drift and Groundspeed) are left unimpaired. A typical drill to minimise the effects of a total navigation computer system failure is suggested below. It requires comprehensive use of the plotting chart.

a) use the basic IRS/GPS outputs to adjust heading to maintain mean track and to calculate ETOs.

b) draw the cleared route on a chart and extract mean true tracks between waypoints.

c) at intervals of not more than 15 minutes plot position (LAT/LONG) on the chart and adjust heading to regain track.

Note: EAG Chart AT (H) 1; No 1 AIDU (MOD) Charts AT(H)1, 2, 3 & 4; the Jeppesen North/Mid Atlantic Plotting Charts and the FAA North Atlantic Route Planning Chart are considered suitable for this purpose.

CHAPTER 10 SPECIAL PROCEDURES FOR IN-FLIGHT CONTINGENCIES

10.1 INTRODUCTION

10.1.1 Although all possible contingencies cannot be covered, the procedures in 10.2, 10.3 and 10.4 provide for the more frequent cases such as:

a) inability to comply with assigned clearance due to meteorological conditions, (10.4 refers);

b) en-route diversion across the prevailing traffic flow (for example, due to medical emergencies (10.2 and 10.3 refer)); and

c) loss of, or significant reduction in, the required navigation capability when operating in an airspace where the navigation performance accuracy is a prerequisite to the safe conduct of flight operations, or pressurization failure (10.2 and 10.3 refer).

Note: Guidance on procedures to follow when an aircraft experiences a degradation in navigation capabilities can be found in Doc 4444, Chapter 5, section 5.2.2.

10.1.2 The pilot shall take action as necessary to ensure the safety of the aircraft, and the pilot's judgement shall determine the sequence of actions to be taken, having regard to the prevailing circumstances. Air Traffic Control shall render all possible assistance.

10.2 GENERAL PROCEDURES

Note: Figure 10-1 provides an aid for understanding and applying the contingency procedures contained in paragraph 10.3.

10.2.1 If an aircraft is unable to continue the flight in accordance with its ATC clearance, a revised clearance shall be obtained, whenever possible, prior to initiating any action. If prior clearance cannot be obtained, the following contingency procedures should be employed until a revised clearance is received:

a) leave the cleared route or track by initially turning at least 30 degrees to the right or to the left, in order to intercept and maintain a parallel, same direction track or route offset 9.3 km (5 NM). The direction of the turn should be based on one or more of the following:

   1) aircraft position relative to any organized track or route system,

   2) the direction of flights and flight levels allocated on adjacent tracks,

   3) the direction to an alternate airport;

   4) any strategic lateral offset being flown, and

   5) terrain clearance;

b) the aircraft should be flown at a flight level and an offset track where other aircraft are less likely to be encountered.

c) maintain a watch for conflicting traffic both visually and by reference to ACAS (if equipped) leaving ACAS in RA mode at all times, unless aircraft operating limitations dictate otherwise;

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

e) keep the SSR transponder on at all times and, when able, squawk 7700, as appropriate;

f) as soon as practicable, the pilot shall advise air traffic control of any deviation from assigned clearance;

g) use whatever means is appropriate (i.e., voice and/or CPDLC) to communicate during a contingency or emergency;

h) if voice communication is used, the radiotelephony distress signal (MAYDAY) or urgency signal (PAN PAN) preferably spoken three times, shall be used, as appropriate;

i) when emergency situations are communicated via CPDLC, the controller may respond via CPDLC. However, the controller may also attempt to make voice communication contact with the aircraft;

Note: Additional guidance on emergency procedures for controllers and radio operators, and flight crew in data link operations can be found in the Global Operational Data Link (GOLD) Manual (Doc 10037).

j) establish communications with and alert nearby aircraft by broadcasting, at suitable intervals on 121.500 MHz (or, as a backup, on the inter-pilot air-to-air frequency 123.450 MHz) and where appropriate on the frequency in use: aircraft identification, the nature of the distress condition, intention of the person in command, position (including the ATS route designator or the track code, as appropriate) and flight level; and

k) the controller should attempt to determine the nature of the emergency and ascertain any assistance that may be required. Subsequent ATC action with respect to that aircraft shall be based on the intentions of the pilot and overall traffic situation.

10.3 ACTIONS TO BE TAKEN ONCE OFFSET FROM TRACK

Note: The pilot's judgement of the situation and the need to ensure the safety of the aircraft will determine the actions outlined in 10.3.2 a) or b), will be taken. Factors for the pilot to consider when diverting from the cleared route or track without an ATC clearance include, but are not limited to:

a) operation within a parallel track system,

b the potential for User Preferred Routes (UPRs) parallel to the aircraft's track or route,

c) the nature of the contingency (e.g. aircraft system malfunction) and

d) weather factors (e.g. convective weather at lower flight levels).

10.3.1 If possible, maintain the assigned flight level until established on the 9.3 km (5 NM) parallel, same direction track or route offset. If unable, initially minimize the rate of descent to the extent that is operationally feasible.

10.3.2 Once established on a parallel, same direction track or route offset by 9.3 km (5 NM), either:

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

Note: Descent below FL 290 is considered particularly applicable to operations where there is a predominant traffic flow (e.g. east-west) or parallel track system where the aircraft's diversion path will likely cross adjacent tracks or routes. A descent below

FL 290 can decrease the likelihood of: conflict with other aircraft, ACAS RA events and delays in obtaining a revised ATC clearance.

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

Note: Altimetry System Error may lead to less than actual 500 ft vertical separation when the procedures above are applied. In addition, with the 500 ft vertical offset applied, ACAS RAs may occur.

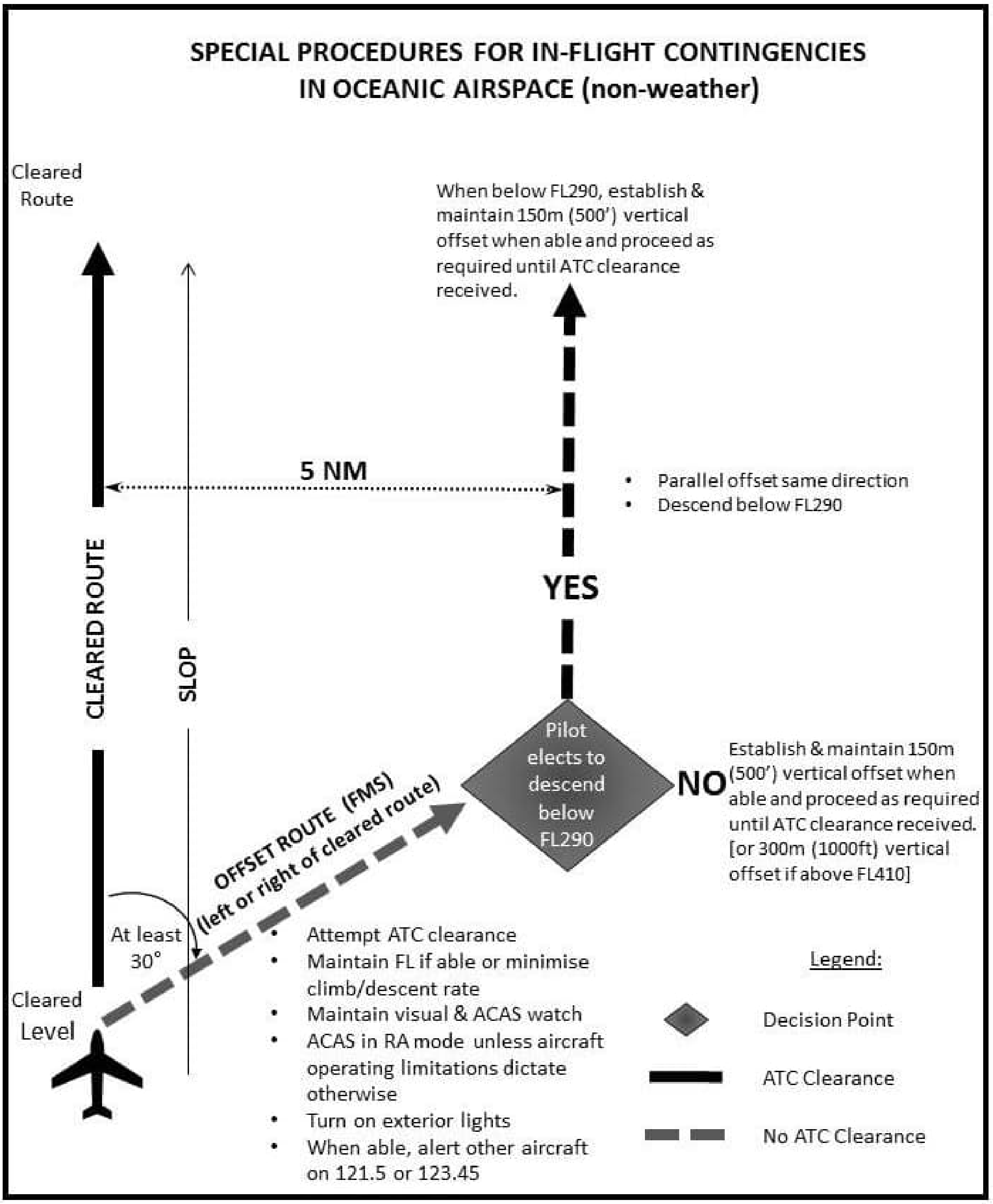


Figure 10-1 — Visual aid for understanding and applying the contingency procedures guidance.

10.4 WEATHER DEVIATION PROCEDURES

General

Note: The following procedures are intended for deviations around adverse meteorological conditions.

10.4.1 When weather deviation is required, the pilot should contact ATC via CPDLC or voice. A rapid response may be obtained by requesting a weather deviation using a CPDLC downlink message (Doc 4444, Appendix 5, Lateral Downlinks (LATD) refers) or stating "WEATHER DEVIATION REQUIRED" to indicate that priority is desired on the frequency and for ATC response. When necessary, the pilot should initiate the communications using CPDLC downlink message (Doc 4444, Appendix 5, Emergency/urgency downlink (EMGD) refers) or by using the urgency call "PAN PAN" (preferably spoken three times).

10.4.2 The pilot shall inform ATC when weather deviation is no longer required, or when a weather deviation has been completed and the aircraft has returned to its cleared route.

Actions To Be Taken When Controller-Pilot Communications Are Established

10.4.3 The pilot should contact ATC and request clearance to deviate from track or route, advising the extent of the deviation requested. The flight crew will use whatever means is appropriate (i.e., CPDLC and/or voice) to communicate during a weather deviation.

Note: Pilots are advised to contact ATC as soon as possible with requests for clearance in order to provide time for the request to be assessed and acted upon.

10.4.4 ATC should take one of the following actions:

a) when appropriate separation can be applied, issue clearance to deviate from track or route; or

b) if there is conflicting traffic and ATC is unable to establish appropriate separation, ATC shall:

1) advise the pilot of inability to issue clearance for the requested deviation;

2) advise the pilot of conflicting traffic; and

3) request the pilot's intentions.

10.4.5 The pilot should take the following actions:

a) comply with the ATC clearance issued; or

b) advise ATC of intentions and execute the procedures detailed in 10.4.6.

Actions To Be Taken If A Revised ATC Clearance Cannot Be Obtained

Note: The provisions of this section apply to situations where a pilot needs to exercise the authority of a pilot-in-command under the provisions of Annex 2, 2.3.1.

10.4.6 If the aircraft is required to deviate from track or route to avoid adverse meteorological conditions and prior clearance cannot be obtained, an ATC clearance shall be obtained at the earliest possible time. Until an ATC clearance is received, the pilot shall take the following actions:

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

b) establish communications with and alert nearby aircraft by broadcasting, at suitable intervals: aircraft identification, flight level, position (including ATS route designator or the track code) and intentions, on the frequency in use and on 121.500 MHz (or, as a backup, on the inter-pilot air-to-air frequency 123.450 MHz);

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

Note: If, as a result of actions taken under the provisions of 10.4.6 b) and c), the pilot determines that there is another aircraft at or near the same flight level with which a conflict may occur, then the pilot is expected to adjust the path of the aircraft, as necessary, to avoid conflict.

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

e) for deviations of less than 9.3 km (5 NM) from the originally cleared track or route remain at a level assigned by ATC;

f) for deviations greater than or equal to 9.3 km (5 NM) from the originally cleared track or route, when the aircraft is approximately 9.3 km (5 NM) from track or route, initiate a level change in accordance with Table 13-1;

g) if the pilot receives clearance to deviate from cleared track or route for a specified distance and, subsequently, requests, but cannot obtain a clearance to deviate beyond that distance, the pilot should apply a 300 ft vertical offset from normal cruising levels in accordance with Table 13-1 before deviating beyond the cleared distance.

h) when returning to track or route, be at its assigned flight level when the aircraft is within approximately 9.3 km (5 NM) of the centreline; and

i) if contact was not established prior to deviating, continue to attempt to contact ATC to obtain a clearance. If contact was established, continue to keep ATC advised of intentions and obtain essential traffic information.

Table 13-1

Originally cleared track or route centre line	Deviations ≥ 9.3 km (5.0 NM)	Level change
EAST 000° – 179° magnetic	LEFT RIGHT	DESCEND 300 ft (90 m) CLIMB 300 ft (90 m)
WEST 180° – 359° magnetic	LEFT RIGHT	CLIMB 300 ft (90 m) DESCEND 300 ft (90 m)

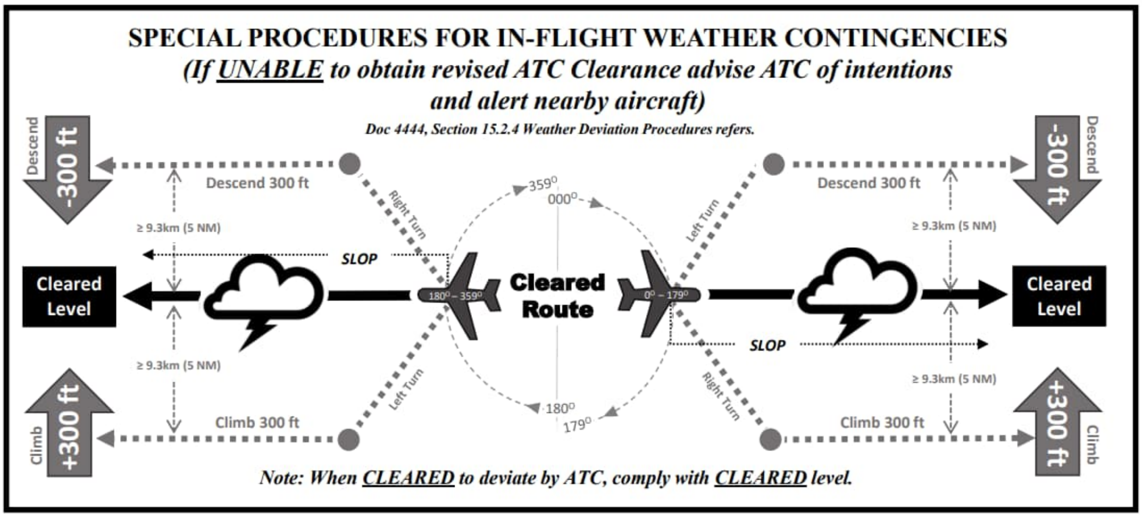


Figure 10-2. Visual aid for understanding and applying the weather contingency procedures guidance.

10.5 WAKE TURBULENCE

10.5.1 ICAO collects data on wake vortex encounters. Most encounters occur in terminal operations and this is where the aircraft type wake categorization scheme is used to regulate separations. Wake vortex encounters are, however, also experienced enroute, although less frequently. To accommodate the predominantly uni-directional diurnal traffic flows through the NAT, on many routes all adjacent flights levels are simultaneously used for a given traffic flow. While this arrangement may not be unique, it is not one that is commonly employed in many other areas of the world. As a result many, if not most, enroute wake vortex encounters outside the NAT arise from opposite direction passings or route crossing situations. In the NAT enroute wake vortices are encountered more commonly from a preceding aircraft following the same track, usually at the next higher level. Such encounters can thus be of a prolonged duration and mitigating flight crew action is desirable/necessary. Any application of lateral offsets to avoid wake turbulence should be made within the confines of SLOP, refer to paragraphs 6.5.3-6.5.4.

10.6 LOSS OR SUDDEN WITHDRAWAL OF AIR TRAFFIC CONTROL SERVICES IN THE NAT REGION

10.6.1 In the anticipation of situations arising which might result in the partial or total disruption of Air Traffic Services within the NAT region, NAT ATS providers have developed procedures which would ensure, as far as possible, the continued safety of air navigation. These procedures are detailed in the "**Air Traffic Management Operational Contingency Plan –North Atlantic Region**" (NAT Doc 006) which can be downloaded from www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT Doc 006 - NAT Contingency Plan".

Common ANSP procedures

10.6.2 The following are common ANSP procedures regarding loss or sudden withdrawal of air traffic services in the NAT:

a) In the event of a loss or sudden withdrawal of Air Traffic Services in the NAT, ANSPs will notify all affected agencies and operators appropriately.

b) In Limited Service situations the individual ANSP will decide upon the level of notification necessary and act appropriately.

c) In "No Service" situations, it is likely that the ATC facility involved will be subject to evacuation. In this instance the ANSP will issue NOTAMs and broadcast on appropriate frequencies that contingency procedures have been initiated.

d) The notification process employed by individual ANSPs is detailed in NAT Doc 006, however the general format will be as follows:

   i. Issue a NOTAM advising operators of the evacuation. The following is an example of the type of information which may be promulgated:

   "Due to emergency evacuation of (OAC) all ATC services are terminated. Flights within (OCA) FIR should continue as cleared and contact the next ATC agency as soon as possible. Flights that have not entered (OAC) FIR should land at an appropriate airfield or request clearance to avoid (OAC) FIR. Flights should monitor (defined frequencies)."

   ii. Broadcast an evacuation message on appropriate frequencies:

   "Emergency evacuation of (OAC) is in progress. No air traffic control service will be provided by (OAC). Use extreme caution and monitor (control frequencies), emergency frequencies and air to air frequencies. Contact the next air traffic control unit as soon as possible"

Pilot procedures for flights outside the NAT

10.6.3 Pilots are strongly advised not to enter the airspace. Request clearance to avoid the affected OCA or land at an appropriate aerodrome.

10.6.4 Flights can choose to continue using pilot's discretion. Continue in accordance with the current flight plan (what is loaded in the FMS) or as amended by ATC.

Pilot procedures for flights inside the NAT

10.6.5 The procedures outlined below are to be used as guidance for pilots following a loss or sudden withdrawal of the Air Traffic service as described above.

10.6.6 Although advised not to enter the NAT OCA without Air Traffic Services, which could entail significant reroutes, flights can continue with their current flight plan (what is loaded in the FMS) or as amended by ATC.

a) Pilots should continue with their current flight plan (what is loaded in the FMS) or as amended by ATC. Pilots shall use extreme caution and use all available means to detect any conflicting traffic.

b) On receipt of the contingency message, pilots are requested to broadcast to other flights on 121.500 MHz and 123.450 MHz and a listening watch on these frequencies must be maintained. Pilots should continuously monitor VHF frequencies 121.500 MHz and 123.450 MHz in order to exchange position information with other flights, in the event they are unable to communicate on HF.

c) Pilots should establish communication with the next OCA at the earliest opportunity stating current position, cleared flight level, next position and estimate and subsequent position. This also applies to flights using automatic position reports (ADS-C) as these reports may not have been received by the next OCA.

d) Where no contact with the next OCA can be established, HF radio or SATVOICE should be used. HF frequency congestion is likely. Communications should be kept to a minimum.

e) When ADS-C equipped flights are notified of a loss or sudden withdrawal of air traffic services, they must revert to voice position reporting until clear of current OCA, or notified otherwise. Pilots should note that they may be asked to log-on to other OCAs. Pilots should not initiate this action until instructed to do so.

f) Requests for changes to route, flight level, or speed should be limited to those required for flight safety.

g) Any flight conducting a flight level change should complete the FL change as soon as possible in accordance with the clearance.

h) If unable to establish radio contact, pilots may use SATVOICE to provide position reports.

i) Pilots may request their flight dispatch offices to forward position reports if they are otherwise unable to make position reports.

j) Pilots may also use other flights to relay their position reports, on 121.500 or 123.450 MHz, if necessary.

Contact details

Oceanic Centre	Telephone Number	SATVOICE Short Code
New York	+1 631 468 1413	436623
Gander	+1 709 651 5207	431613
Reykjavik, via Iceland Radio	+354 568 4600	425105
Bodø	+47 755 42900	425702

Oceanic Centre	Telephone Number	SATVOICE Short Code
Ballygirreen (Shanwick Radio)	+353 61 368241 Ground/Air Ops	425002
Santa Maria	+351 296 820 438 +351 296 886 042 (satellite link)	426305

Common broadcast procedures

10.6.7 In the event of a loss or sudden withdrawal of Air Traffic Service in the NAT, the following communication procedures have been developed in accordance with the Traffic Information Broadcast by Aircraft (TIBA) procedures recommended by ICAO (Annex 11 – Air Traffic Services, Attachment B).

At least 3 minutes prior to the commencement of a climb or descent, the flight should broadcast on the last assigned frequency, 121.500 MHz, 243.000 MHz and 123.450 MHz the following:

Note: 243.000 MHz is a UHF military frequency that can only be used and heard by other military aircraft/pilots.

"ALL STATIONS (callsign) (direction) DIRECT FROM (position) TO (position)

LEAVING FLIGHT LEVEL (number) FOR FLIGHT LEVEL (number) AT (distance)(direction) FROM (position) AT (time)".

When the flight level change begins, pilots should make the following broadcast:

"ALL STATIONS (callsign) (direction) DIRECTION FROM (position) TO (position)

LEAVING FLIGHT LEVEL (number) NOW FOR FLIGHT LEVEL (number)."

When level, pilots should make the following broadcast:

"ALL STATIONS (callsign) MAINTAINING FLIGHT LEVEL (number)."

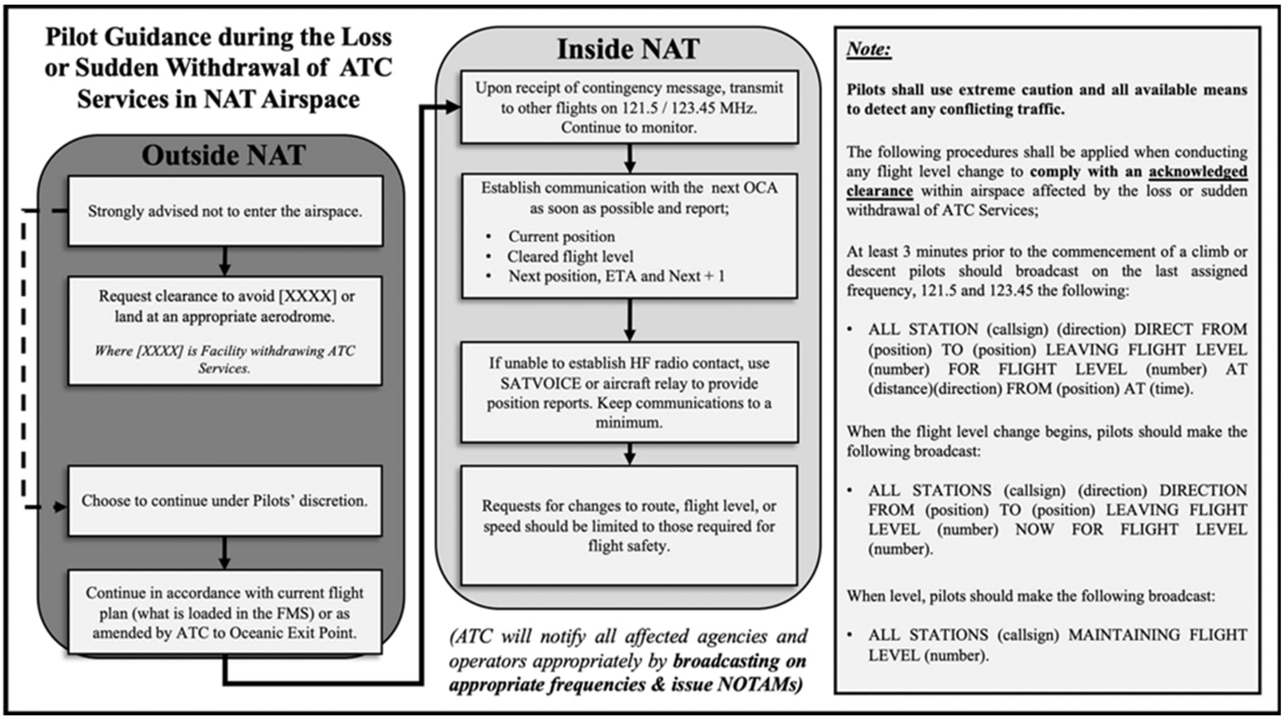


Figure 10-3 — Visual aid for pilot guidance during loss or sudden withdrawal of ATC services in NAT airspace.

10.7 SPACE WEATHER

General

10.7.1 This section provides an overview on the effects of space weather in the NAT Region and information on common/specific ANSP contingency processes that may be applied to minimize operational impacts.

10.7.2 Space Weather is a phenomenon associated with solar activity events such as Geomagnetic Storms, X-ray Flares, Solar Radiation Storms, Ionospheric Storms and Sunspots which present a recognized risk to air transport. Typically, the amount of solar radiation detected increases at higher altitudes but during a severe space weather event, increased levels of solar radiation can be experienced globally by aircraft both at altitude and at ground level.

10.7.3 Severe space weather events may cause degradation or loss of multiple ATC Systems, Aircraft Systems including GNSS, Microwave Links, Satellite reliant communications, RF issues (i.e., VHF Datalink) and may cause National Power Grid outages. Effects can be localized to only one FIR or may affect multiple FIRs, including the whole of the North Atlantic Region (NAT) and beyond.

10.7.4 Various space weather types are predictable; however, the operational impact of these phenomena is hard to quantify both in severity and in location. ANSPs are aware of communication problems, e.g., HF receive/broadcast issues, fadeout, and attenuation and due to these problems have of considerable experience with mitigating the operational impacts. The impact of GNSS radio frequency interference are more significant in the NAT Region and require contingency processes such as greater spacing between aircraft as a function of phase of flight or the use of alternative means of communication, navigation and/or surveillance.

10.7.5 ANSPs and Operators should be aware of the range of potential difficulties that space weather phenomena can cause and should monitor space weather forecasts and have in place contingency measures to mitigate possible negative effects.

10.7.6 Although the solar cycle is cyclical, peaking approximately every 11 years, incidences of significant events may occur at any time.

10.7.7 ICAO Document 10100, Manual on Space Weather Information in Support of International Air Navigation, provides more detail on what constitutes Space Weather, its nature, effects upon Air Navigation, and how Space Weather information should be promulgated by Space Weather Centres (SWXC) that users can employ for decision-making.

Hazards in the NAT Region

10.7.8 The following hazards may be expected during (severe) space weather events:

a) Unexpected loss of communication (HF / SATVOICE and CPDLC / SATCOM data).

b) Degraded performance of navigation and surveillance that rely on GNSS (such as ADS-B and or ADS-C).

c) Unanticipated non-standard performance of on-board electronics resulting in reboots and anomalies.

d) Issues related to radiation exposure by aircrew and passengers.

e) Increased frequency of flight crews adopting contingency procedures that may result in level change, re-routes, turn-backs and diversions.

Common NAT Region Space Weather Contingency Plans

10.7.9 The objective of this section is to provide an overview of the common contingency procedures that NAT Region ANSPs will adopt in response to a space weather event, to enable operators to make informed decisions when the event occurs in the North Atlantic Region.

Aircraft Operating Outside the NAT Region (prior to entry)

10.7.10 ATC will not know the expected duration of the event. Flight Crews will be advised of the situation with as much information as possible, which may include (but not restricted to) the following:

a) Confirmation of where no reliable ATC service will be available until contact with another VHF facility.

b) Information of where communications with adjacent ATSUs can be maintained.

c) Confirmation of where alerting service may be negatively impacted due to lack of communications.

d) Details of all other communications facilities and satellite navigation that, may be or become completely unavailable.

e) Confirmation that aircraft may be adopting contingency procedures and making level and route changes without reference to ATC.

f) Details of any route and level allocation scheme implemented in the NAT Region which will inevitably have economic consequences due to the need to reserve flight levels for opposite direction and crossing traffic.

10.7.11 When there is a significant space weather event reported in the NAT Region, ATC will expect most aircraft to elect to avoid the area of the event which may result in level changes, re-routes, turn-backs or diversions.

10.7.12 ATC will expect a significant increase in workload by managing profile change requests and relaying information to flight crews who require the latest update to make operational decisions.

Aircraft Operating Within the NAT Region

10.7.13 A severe space weather event may interfere with HF communications and degrade satellite navigations systems or render them inoperable. SATCOM is also likely to be unavailable.

10.7.14 ATC expect aircraft to continue in accordance with their ATC clearance but anticipate an increased likelihood of flight crews electing to adopt contingency procedures which may result in level changes, re-routes, turn-backs or diversions.

10.7.15 Flight crews which have rerouted of their own accord, should attempt contact adjacent ATSUs using all means possible to advise of their routing.

Air Traffic Flow Management Actions

10.7.16 Workload is likely to rise considerably during the reactive phase and therefore Air Traffic Flow Management measures will be considered as an immediate action. As much detail as possible will be issued to operators via all communication means possible to allow them to make informed decisions on their actions. Operators should refer to NAT Doc 006 Part III Space Weather Contingency Procedures North Atlantic Region for additional information.

10.8 GNSS INTERFERENCE

10.8.1 Most aircraft rely on GNSS for navigation and time source. GPS, Galileo, GLONASS and BeiDou are examples of GNSS.

10.8.2 Recently, a significant increase in GNSS jamming and spoofing has been reported by aircraft entering the NAT Region. The most affected regions are the Black Sea area, south and eastern Mediterranean area, the Baltic Sea and the Arctic Sea.

GNSS Jamming

10.8.3 When GNSS is jammed, the jammer sends out a signal designed to interfere with signals from satellites. Any equipment using a satellite signal to determine a location or time, including aircraft, will then be affected and the GNSS location might become unreliable.

10.8.4 To be able to use GNSS for navigation aboard an aircraft the quality of the GNSS data must be sufficient and the aircraft must be able to receive data from a minimum number of satellites. During GNSS jamming the aircraft must rely on alternative means of navigation such as VOR/DME or inertial reference systems.

GNSS Spoofing

10.8.5 Another type of GNSS interference is spoofing. A spoofer will send out a false signal pretending to be a satellite. The actual position of the aircraft may then be different from the position displayed to the pilot or used by the avionics. In some cases, the pilot might not be presented with an anomaly indication, and the aircraft could drift off course. Ground-based surveillance systems like radars and multilateration do not rely on GNSS and would be able to detect the actual position of the aircraft to alert air traffic controllers of a deviation.

10.8.6 ADS-B and ADS-C are, however, dependent on GNSS and those systems would report the incorrect spoofed position to air traffic controllers.

Effects of GNSS Interference on the NAT

10.8.7 Although GNSS interference inside the NAT Region is unlikely, parts of Europe and Middle East are subject to constant GNSS interference that affect aircraft that subsequently enter the NAT

Region The website https://gpsjam.org provides information about daily occurrences of GNSS interference. Guidance is provided in the *NAT OPS Bulletin NAT GNSS Interference Procedures* (Serial no 2025_001).

10.8.8 NAT ANSPs have noticed a significant increase of aircraft entering the NAT Region with degraded navigation capabilities after having been subject to GNSS interference earlier in the flight. The interference often occurred hours before the aircraft entered the NAT Region. The symptoms observed are:

a) ADS-B data either not transmitted by the aircraft or transmitted with low quality indicators.

b) ADS-C reports include low Figure of Merit (FOM), which will likely result in an ATC enquiry concerning navigational status.

c) Aircraft unable to log on to datalink (CPDLC), most likely due to incorrect clock on-board the aircraft.

10.8.9 The environment in the NAT region has dramatically changed in recent years with the Data Link Mandate and PBCS implementation. Separation between aircraft has decreased significantly allowing more aircraft to fly optimum routes and flight levels.

10.8.10 Those improvements are dependent on reliable GNSS data on-board the aircraft. When aircraft enter the NAT Region with degraded navigation and surveillance capabilities following GNSS interference, air traffic controllers are no longer able to provide the reduced separation for the aircraft. There are examples of aircraft having to accept reroutes and level changes on account of GNSS interference earlier in the flight.

Recommendation

10.8.11 The European Union Aviation Safety Agency (EASA) has issued a Safety Information Bulletin (SIB) regarding GNSS outage and alterations leading to navigation/surveillance degradation (https://ad.easa.europa.eu/ad/2022-02R2). The SIB includes recommendations for Civil Aviation Administrations (CAA), ANSP, aircraft operators and equipment manufacturers. The recommendations for aircraft operators relevant to the NAT Region are as follows:

a) Ensure that flight crews are aware of and trained on the importance of prompt reporting to air traffic services of any observed interruption, degradation or anomalous performance of GNSS equipment or related avionics (e.g. map shifts, suspected GNSS spoofing, position and duration of the GNSS interference);

b) Evaluate different possible scenarios based on the type of operations in order to provide the flight crew with timely information to increase awareness of jamming and spoofing;

c) Ensure that GNSS outage or spoofing topic is included in the flight crew training and flight manuals, highlighting the identified operational scenarios to recognize, react in a timely manner to different jamming and spoofing cases;

d) Assess operational risks and limitations linked to the loss of on-board GNSS capability, including any on-board systems requiring inputs from a reliable GNSS signal;

e) Ensure that operational limitations introduced by the dispatch of aircraft with inoperative radio navigation systems in accordance with the Minimum Equipment List, are considered before operating an aircraft in the affected areas;

f) Ensure, in the flight planning and execution phase, the availability of alternative conventional arrival and approach procedures (e.g. an aerodrome in the affected area with only GNSS, including augmentation, approach procedures should not be considered as destination or alternate); and

g) Concerning spoofing: contact aircraft or equipment manufacturers for instructions on how to deal with spoofing cases of their products and implement the recommendations in the Standard Operating Procedures.

CHAPTER 11 GUIDANCE FOR DISPATCHERS

11.1 GENERAL

11.1.1 The NAT is essentially divided into two distinct areas for flight operation, i.e. the NAT HLA and non-NAT HLA airspace. Operations within the NAT HLA require the user to adhere to very specific operating protocols. Refer to Chapter 1 for a description of NAT airspace.

11.2 REGULATORY REQUIREMENTS AND CONSEQUENTIAL ROUTING LIMITATIONS

State Approvals (NAT HLA /RVSM)

11.2.1 Before planning any operations within the NAT HLA, operators must ensure that the specific State NAT HLA and RVSM approvals are in place. These requirements are addressed in Chapter 1.

11.2.2 Before planning any operations of ADS-B equipped aircraft into airspace where ADS-B operation is required, operators must ensure that the aircraft is approved for such flights. These requirements are addressed in Chapter 1.

Minimum Equipage (Navigation/Altimetry/Communications)

11.2.3 Chapter 1 discusses the minimum navigation equipage requirements for unrestricted flight in the NAT HLA.

11.2.4 The Minimum Aircraft Systems Performance Specifications for RVSM operations are common world-wide standards and are contained in Doc 9574 (*Manual on a 300m (1 000ft) Vertical Separation Minimum between FL 290 and FL 410 inclusive*). They are also detailed in FAA Advisory Circular AC91-85B, and in EASA documentation (refer to paragraph 7.1.5). However, notwithstanding the worldwide nature of RVSM MASPS, it must be recognised, as indicated in Chapter 1, that special provisions apply in the North Atlantic HLA and in consequence all NAT flight crews/operators must **be State approved specifically for NAT RVSM operations**.

11.2.5 Many NAT air/ground ATC communications are still conducted on single side-band HF frequencies. For operations in the NAT region fully functioning HF communications equipment is required when operating outside VHF coverage.

Special non-compliance routings

11.2.6 Aircraft not equipped with two functioning long range navigation systems may only fly through the NAT HLA via one of the three corridors described in paragraph 1.7.5.

11.2.7 Aircraft not approved for NAT HLA /RVSM operations may climb and descend through NAT HLA/RVSM airspace and in very limited, specified circumstances a NAT HLA approved aircraft that is not approved for RVSM operations may be granted permission to flight plan and operate through the NAT HLA at RVSM levels. (See Chapter 1).

11.2.8 Routings that may be flight planned and operated through the NAT HLA by aircraft without functioning HF communications equipment may be limited by the State of Registry of the operator or by the ATC provider. This is discussed in more detail in Chapter 4.

11.3 ROUTE PLANNING

Route definition conventions

11.3.1 The letter 'X' must be included in Item 10 of the ICAO FPL to show that the aircraft satisfies NAT HLA lateral navigation performance requirements.

11.3.2 Outside ATS Surveillance coverage ATC depends upon aircraft supplied position reports for flight progress information. In order to provide separation assurance, ATC requires updates on the progress of flights at no more than hourly intervals. It has been determined that this criteria is met over a wide range of ground speeds if eastbound or westbound NAT flights report on passing each ten degrees of longitude. The criteria is also met by northbound or southbound flights reporting on passing each five degrees of latitude. In consequence, all flights which will generally route in an eastbound or westbound direction should normally be flight planned by specifying significant points at whole or half degrees of latitude at each crossed ten degrees of longitude (20°W, 30°W, 40°W etc.); 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. See Chapter 4.

OTS – Rationale, Structure, CDM & NAT Track Message

11.3.3 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 crossing the 30W longitude between 1130 UTC and 1900 UTC and peak eastbound traffic crossing the 30W longitude between 0100 UTC and 0800 UTC.

11.3.4 The NAT HLA is consequently congested at peak hours and 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 altitude profiles. Due to the dynamic nature of the NAT weather patterns, including the presence of jet streams, consecutive eastbound and westbound minimum time tracks are rarely identical. The creation of a different organised track system is therefore necessary for each of the major flows. Separate OTS structures are therefore published each day for eastbound and westbound flows.

11.3.5 The construction of these OTS structures is accomplished through a formal process of cooperation between ATC and the operators, known as the Preferred Route Message system. Details of this process are explained in Chapter 2.

11.3.6 The resulting OTS structures are published (twice each day) in the form of a "NAT Track Message" via the AFTN. This Message and its correct interpretation are detailed in Chapter 2.

11.3.7 If orientation/location of the published OTS structure appear to be appropriate for the origin and destination of a particular flight, then the operator is encouraged to flight plan the NAT route segment via one of the published tracks.

Random Routings

11.3.8 Use of OTS tracks is not mandatory. The orientation/location of the published OTS may not be appropriate for the origin and/or destination of a particular flight. 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 while ATC will make every effort to clear random traffic across the OTS at published levels, re-routes or changes in flight level from those planned may be necessary during most of the OTS peak traffic periods.

11.3.9 Outside of the OTS periods operators may flight plan any random routing. During the hour prior to each OTS period some additional restrictions apply. These are detailed in Chapter 4.

Adjacent Airspace, Route Structures, Links & Constraints

11.3.10 A large majority of flights through the NAT HLA enter and/or leave it via the North American region. To facilitate these flows of traffic, various transitional airspaces and linking route structures have been established in and through the adjacent NAM region. These are described in Chapter 3 above. Of particular significance is the NAR structure. Details of these routes and associated procedures are contained in the AIP of the relevant State authorities and/or via their websites. The necessary Internet Links to obtain this information are listed in Chapter 3. Account must be taken of these route structures in planning any flight through the NAT region that starts or ends in the North American region.

11.4 ALTITUDE & SPEED

Flight Levels

11.4.1 During the OTS Periods (eastbound 0100-0800 UTC, westbound 1130-1900 UTC) aircraft intending to follow an OTS track for its entire length or following a "random route" (see above definition) or flying outside the OTS time periods, may plan any flight level(s) irrespective of direction (i.e. there is no need in the NAT HLA to plan in accordance with the ICAO Annex 2 Table of Cruising Levels). Flight Planners should note that ATC negotiates and assigns levels to flights based on flows and those specifically published on the OTS to ensure that the majority of the traffic can operate at their optimum flight levels. If a flight is expected to be level critical, operators should contact the initial OAC prior to filing the flight plan to determine the likely availability of specific flight levels.

Mach Number

11.4.2 In the NAT HLA the Mach number technique is used to manage longitudinal separations between aircraft following the same track. With the implementation of OWAFS, operators will have more efficiencies in the NAT. Chapter 4 provides details about ATC flight planning (ICAO FPL) requirements. Operators can flight plan cost index (ECON) provided that the planned true Mach number for any portion of the flight within the NAT is specified in Item 15 of the ICAO FPL.

11.5 FPL COMPLETION

11.5.1 It is important that all of the foregoing conventions and protocols are adhered to when planning a flight through the NAT HLA. Guidance on the flight planning requirements for specific routes is given in Chapter 4. Correct completion and addressing of the filed flight plan is extremely important. Non-observance of any of the NAT HLA planning principles, or even simple syntax errors in the filed FPL, can lead to delays in data processing and/or to the subsequent issuing of clearances to the flights concerned. Despite the growing use of automated flight planning systems, a significant proportion of flight plans submitted in respect of flights through the North Atlantic region continue to contain errors. In some instances, these errors are such that the flight plan is rejected, and the operator is required to re-submit a corrected version. Furthermore, it should be noted that a free text editor is available on the EUROCONTROL website that can validate any proposed ICAO flight plan before filing. It will advise if a flight plan is acceptable for routes, altitudes and transitions. If the flight plan would be rejected, this editor will describe what is wrong, thereby allowing the operator to repair it before filing.

11.5.2 The guidance in the paragraphs that follow here refer to the ICAO model flight plan form as described in Chapter 4.4 of the *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444).

11.5.3 If filing via an OTS track, particularly during peak traffic periods, it must be appreciated that ATC may not be able to clear the aircraft as planned. ATC will, if possible, first offer a clearance on the planned track but at a different flight level. If, however, no reasonable alternative level is available, or if the offered flight level is unacceptable to the flight crew, then ATC will clear the aircraft via another route/OTS track.

11.5.4 In order to signify that a flight is approved to operate in the NAT HLA, the letter ‘X’ shall be inserted, in addition to the letter ‘S’, 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.

11.5.5 With the exceptions listed in 1.7.2, the NAT Data Link Mandate (DLM) requires aircraft to be equipped with, and operating, CPDLC and ADS-C over Inmarsat or Iridium SATCOM in the NAT region from FL 290 to FL 410 inclusive. The ICAO flight plan should indicate data link equipage as follows:

- Item 10 (Equipment)
  - “J5” (CPDLC SATCOM FANS 1/A Inmarsat)
  - “J7” (CPDLC SATCOM FANS 1/A Iridium)
  - “D1” (ADS-C)

11.5.6 Approval for RNAV 10 (RNP 10), RNP 4, RCP 240 and RSP 180 is required in order to benefit from the reduced lateral separations employed in the NAT Region. Any NAT HLA aircraft should ensure that its PBN and PBCS approval status is included in the ICAO flight plan as follows:

- Item 10 (Equipment)
  - “R” (PBN approved)
  - “P2” (CPDLC RCP 240)
  - “G” (GNSS)
- Item 18 (Other Information)
  - “PBN/A1” (RNAV 10 (RNP 10) approval)
  - “PBN/L1” (RNP 4 approval)
  - “NAV/RNP2” (RNP 2 approval for operation on T9 and T290)
  - “SUR/RSP180” (ADS-C RSP 180)

11.5.7 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.

11.6 DISPATCH FUNCTIONS

General

11.6.1 All US FAR Part 121 carriers (domestic and flag operators) and many non-US carriers employ aircraft dispatchers or flight operations officers (hereafter referred to as dispatchers) to provide flight planning, flight watch and/or flight monitoring services. Most of the information presented here is included in other chapters of this manual but since this chapter deals with issues primarily important to dispatchers, the information is sometimes repeated here for emphasis and additional guidance.

11.6.2 Nothing in this chapter should be construed as to take precedence over appropriate government regulations or individual company policy.

11.6.3 The dispatcher is responsible for providing the pilot-in-command with information necessary to conduct a flight safely and legally under appropriate State civil aviation authority regulatory requirements. ICAO Annex 6 defines the requirement for an en route aircraft, but when operating under US FAR Part 121, and certain other State civil aviation rules, the dispatcher shares responsibility for exercising operational control with the pilot-in-command of the flight.

Flight Planning

Route Planning

11.6.4 The daily published OTS tracks provide optimal NAT segment routings for about half of all the flights between Europe and North America. For many other flights the location of the OTS structure on the day may constrain available random routings. Consequently, the development of a successful NAT flight plan almost always requires consideration of the detail of the relevant OTS structure. Operators can influence the OTS construction process by providing Preferred Route Messages and participating in this collaborative decision making (see Chapter 2).

11.6.5 The eastbound and westbound OTS structures are the subject of separate "NAT Track Messages" published via the AFTN. A detailed description of the NAT track message is provided in Chapter 2 above.

Planning on an OTS Track

11.6.6 Dispatchers must pay particular attention to defined coordinates, domestic entry and exit routings, allowable altitudes, track message identification number (TMI) and any other information included in the remarks section. They must also take care to be apprised of any amendments or corrections that may be subsequently issued. When such amendments are issued the TMI is appended with an alpha suffix (e.g. "123A"). Since NAT track messages are often manually entered into company flight planning systems, dispatchers should verify that all waypoints on flight plans comply with the current OTS message.

- With the exceptions listed in 1.7.2, the NAT Data Link Mandate (DLM) requires aircraft to be equipped with, and operating, CPDLC and ADS-C in the NAT region. Currently, the mandate incorporates FL 290 to FL 410 inclusive. For other details, see 1.7 **DATA LINK REQUIREMENTS** in Chapter 1.
- It is important for dispatchers to understand that transition routes specified in the NAT track message are as important as the tracks themselves. The transition route systems in North America – the North American Routes (NARs) and the US East Coast routes are described in Chapter 3. Dispatchers should comply with any specified transition route requirements in all regions. Failure to comply may result in rejected flight plans, lengthy delays and operating penalties such as in-flight re-routes and/or the flight not receiving requested altitudes.
- If (and only if) the flight is planned to operate along the entire length of one of the organized tracks, from oceanic entry point to oceanic exit point, as detailed in the NAT track message, should the intended track be defined in Item 15 of the ICAO flight plan using the abbreviation "NAT" followed by the code letter assigned to the track.
- The planned Mach number and flight level at the commencement point of the track should be specified at the organised track commencement point.
- Each point at which a change of Mach number or flight level is requested must be specified as geographical coordinates in latitude and longitude or as a "named" waypoint.

Planning a Random Route

11.6.7 A random route is any route that is not planned to operate along the entire length of the organised track from oceanic entry point to oceanic exit point. (See Chapter 4 for more information on filing a random route)

11.6.8 Random routes can be planned anywhere within the NAT HLA, but the dispatcher should sensibly avoid those routes that conflict directly with the OTS. Examples of sensibly planned random routes include routes that:

- Remain clear of the OTS by at least 1 degree;
- Leave or join outer tracks of the OTS;
- Are above or below the OTS flight level stratum;
- Are planned on track coordinates before/after valid OTS times.

11.6.9 Care should be taken when planning random routes and it would be prudent to plan sufficient fuel to allow for potential re-routes or non-optimum altitudes. The following examples illustrate particular issues to consider.

Examples:

- Flights planned to initially operate below the NAT HLA/RVSM flight levels at FL 280 on routes that pass under the OTS should not plan to climb until 1 degree clear of the OTS.
- Planning to join an outer track is allowable. However, the dispatcher should be aware that the clearance may not be given due to the adverse impact on track capacity. Leaving an outer track is seldom a problem as long as at least 1 degree of separation is subsequently maintained from other tracks.
- Random routes paralleling the OTS 1 or 2 degrees north or south can be as busy as the OTS itself.

11.6.10 Dispatchers planning NAT flights originating in south Florida or the Caribbean should consider the effect of traffic from South America operating north eastwards to the USA, when deciding on flight levels. Although the dispatcher should plan optimum flight levels, adequate fuel should be carried so that a NAT flight can accept a lower altitude (FL 260 or FL 280) until east of 70˚W.

11.6.11 Any flight planning to leave an OTS track after the oceanic entry point must be treated as a random route. The track letter must not be used to abbreviate any route segment description.

11.6.12 Flights operated against the peak traffic flows should plan to avoid the opposite direction OTS. Even if operating outside of the validity periods of the OTS some restrictions on routings may apply. These can affect Eastbound traffic crossing 30°W at 1030 UTC or later; and Westbound traffic crossing 30°W at 2400 UTC and later (See Chapter 4). If in any doubt it would be prudent to co-ordinate any such routes directly with appropriate OACs.

Flight Levels

11.6.13 Flight dispatchers should note that while all flight levels are available for flight planning purposes, ATC negotiates and assigns levels to flights based on flows and those specifically published on the OTS to ensure that the majority of the traffic can operate at their optimum flight levels.

11.6.14 Chapter 7 contains details on RVSM flight level guidance.

11.6.15 RVSM allows more flight levels for planning and therefore provides better opportunity to fly closer to an optimum route/profile. It is acceptable to plan and/or request any flight level, but because of traffic volumes and the difference in aircraft performance it is wise to plan conservatively. Flight crews should be encouraged to request a climb as aircraft decreasing weight permits.

Communications

11.6.16 Operations in the NAT outside VHF coverage require the carriage of two long range communication systems, one of which must be HF. A second HF, SATVOICE and/or CPDLC over SATCOM (appropriate to route of flight) may satisfy the requirement of the second-long range communication system.

11.6.17 Many operators now use ADS-C (Automatic Dependent Surveillance Contract) and CPDLC (Controller Pilot Data Link Communications) for oceanic position reporting and clearance updating. These features improve position reporting speed and accuracy. They also reduce the chance of errors. If the aircraft is equipped with FANS-1 or FANS-A it should be utilised during the NAT segment of the flight and the appropriate descriptor should be inserted into the filed flight plan.

11.6.18 SATVOICE can be used as a supplement to HF communications throughout the NAT region (see Chapter 5). If the aircraft is SATVOICE equipped, the SATVOICE numbers (both radio stations and ATC) for the areas that the aircraft is planning to fly through, should be made available for the flight crew.

MEL Compliance

11.6.19 Dispatchers planning flights within the NAT HLA must ensure that the allocated aircraft has the minimum required navigation, communications and altitude alerting/reporting equipment on board. Flight procedures for minimum equipment and standards can be found in Chapter 6 and Chapter 13 of this Manual. Particular attention must be paid to MEL Items that may affect the aircraft. Be aware that the company MEL or Operations Specifications may be more restrictive than general NAT HLA requirements.

11.6.20 Even though a flight that suffers a failure of a system (or component) once enroute, is not directly mandated to abide by MEL restrictions, it is important that any failures that will affect either NAT HLA or RVSM operations be promptly advised to, and closely coordinated with, the appropriate ATS facility.

11.6.21 An aircraft MEL (navigation, communications or altitude alerting/reporting system) may prohibit operating in the NAT HLA. Dispatchers may need to modify the flight plan and intended route of flight. Enroute failures can also affect what ATC will accept regardless of what was flight planned or filed. This situation could occur before departure or once enroute but before entering the NAT HLA. Options that should be considered by the dispatcher are:

- ➢ operate above or below the NAT HLA;
- ➢ fly within one of the three corridors described in paragraph 1.7.5..

ETOPS/EDTO

11.6.22 A large portion of NAT crossings are ETOPS operations. ETOPS rules require that one or more suitable enroute alternate airports are named prior to dispatch and then monitored while aircraft are enroute. Enroute alternate airports in the NAT region are limited to those in the Azores, Bermuda, Greenland and Iceland. In determining ETOPS alternate minima, the dispatcher must consider weather conditions, airport conditions (in addition to simple runway lengths), navigation approach aids, and the availability of ATS and ARFF facilities.

Note: The term EDTO (Extended Diversion Time Operations) is now used throughout Annex 6 Part I. Here it states that EDTO provisions for aeroplanes with two turbine engines do not differ from the previous *provisions for extended range operations by aeroplanes with two turbine engines (ETOPS). Therefore, EDTO may be referred to as ETOPS in some documents.*

11.6.23 Recent changes have begun to attach additional conditions to 3-4 engine aircraft long range operations. In situations requiring the aircraft to operate long distances from adequate enroute airports, more stringent planning conditions may apply. Guidance can be obtained from appropriate government and industry websites.

Collaborative Decision Making (CDM) Tools

11.6.24 It would not be practical to list all available CDM tools and available websites here. Refer to the bibliography at the end of this manual for a more complete list. The following are some of the most important sites for managing the daily operation of flights.

- Nav Canada TDA (Traffic Density Analyser) Website

  This tool was designed to introduce Collaborative Decision Making during the NAT OTS design phase. The OTS is posted in advance of formal publication so the user community can comment on whether or not they agree with the proposed OTS. A USER ID and password can be obtained from NAV CANADA. Track loading information is available and it is possible to view all filed flight plans on the OTS and random routes.

- EUROCONTROL Website – Network Manager function

  This website contains a wealth of tactical information regarding restrictions, delays, weather problems, military activity, CDRs, preferred routing schemes and transition routes.

  https://www.eurocontrol.int/network-operations

  There is a free text editor that will validate ICAO flight plan before filing and advise if the flight plan is acceptable for routes, altitudes and transitions. If the flight plan would be rejected, this editor will describe what is wrong, allowing the dispatcher to repair it before filing the ICAO flight plan.

- FAA Websites

  These websites contain complete FAR section, Airport information, airport capacity (real time) advisories with airport delays and status, NOTAMS, weather Information, RVSM and statistical data. They include www.faa.gov and https://nasstatus.faa.gov.

Flight Monitoring

ATC Clearances

11.6.25 It is important for dispatchers to verify the contents of any clearances. If the flight has received a re-route or a different altitude the Dispatcher may provide the flight with re-analysis data for fuel consumption along the revised route.

Transponder

11.6.26 All aircraft operating as IFR flights in the NAT region shall be equipped with a pressure-altitude reporting SSR transponder (see Chapter 8).

11.6.27 The following additional requirements apply to the Reykjavik FIR (refer to AIP Iceland for certain exemptions that apply):

a) All IFR aircraft must be equipped with Mode S Elementary Surveillance (ELS);

b) All IFR fixed-wing aircraft of a maximum certified take-off mass exceeding 5 700 kg or that have a maximum cruising true airspeed capability greater than 250 kt, with an individual certificate of airworthiness first issued on or after 7 June 1995, must be equipped with Mode S Enhanced Surveillance (EHS);

c) All IFR aircraft must be equipped with 1090 MHz Extended Squitter (ES) ADS-B.

En route Contingencies

11.6.28 Dispatchers must also be aware of special procedures for In-Flight Contingencies as published in Chapter 10 of this manual. They include procedures for use in the event that the aircraft is unable to maintain assigned altitude for weather, turbulence, aircraft performance or maintenance problems or loss of pressurization. The general concept of the in-flight contingency procedures is to parallel offset from the assigned track by 5 NM and descend below FL 290; or once on the 5 NM parallel offset, establish a 150 m (500 ft) vertical offset (or 300 m (1000 ft) vertical offset if above FL 410) from those flight levels normally used, and proceed as required by the operational situation.

11.6.29 Procedures for loss of communications and HF failure are contained in Chapter 5.

Dispatcher/pilot considerations for en-route diversions

11.6.30 Pilots and dispatchers should collaborate, when able, regarding where the flight diverts based on the nature of the en-route contingency and the viability of the otherwise adequate airports available to assure the airport is actually suitable for the diversion.

Dispatcher guidance for NAT RVSM operations.

References

11.6.31 The FAA Advisory Circular AC91-85() was developed by ICAO sponsored international working groups, to provide guidance on airworthiness and operations programmes for RVSM. ICAO has recommended that State CAA's use of AC91-85() or an equivalent State document for approval of aircraft and operators to conduct RVSM operations. Appendices 4 and 5 of AC91-85() contain practices and procedures for flight crews and dispatchers involved in RVSM operations. This particular dispatcher guidance was developed using those appendices as the reference. Available at:

https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1035328

Flight Planning

NAT RVSM Airspace

This is defined as any airspace between FL 290 - FL 410 inclusive where 1,000 ft vertical separation is applied.

Limits of Operational Authorisation

At the flight planning stage, the dispatcher is responsible for selecting and filing a route that is consistent with the carrier's operational authorisation (e.g. Operations Specifications), taking account of all route, aircraft and weather considerations, flight crew constraints and other limitations.

MEL

When planning and filing to fly within NAT RVSM airspace, the dispatcher must ensure that the route meets the requirements of the paragraph above and that the aircraft also meets certain MEL provisions.

Maintenance Flights

NAT ATS providers have established a policy to enable an aircraft that is temporarily non-RVSM compliant to fly in NAT RVSM airspace for the purpose of positioning the aircraft at a maintenance facility (see Chapter 1). This policy may vary and requires prior co-ordination with appropriate ATC centres so that 2,000 ft separation can be applied between the non-compliant aircraft and other aircraft. These requests must be co-ordinated with the initial OAC. The dispatcher must be aware of the policy for such operations, as published in NOTAMS, AIPs and other appropriate documents. States of Registry also vary in their policies on Maintenance Ferry Flights. Dispatchers should ensure that they fully understand any additional restrictions or limitations that may be imposed by their State of Registry.

Delivery and Humanitarian Flights

ATS providers allow limited operations by aircraft not approved for RVSM but which are engaged on delivery or humanitarian flights. For such flights, the dispatcher must also comply with the policies published in State AIPs, NOTAMS and other appropriate documents. Co-ordinate directly with appropriate ATC facilities and the aircraft's State of Registry.

En Route Equipage Failures

Prior to entering NAT RVSM airspace

The following equipment is required to be operational:

i) two independent primary altimetry systems;

ii) one automatic altitude control system; and

iii) one altitude alerting device.

If any required equipment fails prior to entering NAT RVSM airspace, the pilot-in-command will notify ATC and obtain an amended clearance to fly above or below NAT RVSM airspace. The flight crew should accept the new clearance contingent upon review by the dispatcher. Dispatcher actions are based on the options, identified as OPTION 1 to OPTION 3, outlined later in this chapter.

After entering NAT RVSM airspace.

The appropriate State RVSM guidance material provides for flight crew and controller actions if RVSM required aircraft equipment fails after entry into NAT RVSM airspace, or the aircraft encounters turbulence that affects the aircraft's ability to maintain its level. Should any required RVSM equipment fail, or turbulence greater than moderate be encountered, then the pilot-in-command is expected to notify ATS of the intended course of action.

Pilot-in-command options are to:

(1) continue with the original clearance if ATC can apply another form of aircraft separation (i.e. lateral, longitudinal or 2,000 ft vertical separation); or

(2) request ATC clearance to climb above or descend below NAT RVSM airspace if ATC cannot provide adequate separation from other traffic; or

(3) execute contingency procedures to offset from track and flight level if ATC cannot provide adequate separation from other aircraft.

Dispatcher Actions

OPTION (1) – if the pilot-in-command elects for Option (1) then no Dispatcher's action is required.

OPTION (2) – if the pilot-in-command elects to follow Option (2) then the pilot-in-command should contact the dispatcher who will evaluate the clearance with due consideration for the effect on fuel consumption, time enroute, any MEL/CDL issues and/or other operational factors. The dispatcher shall make a recommendation to the pilot-in command on whether to continue on to the destination, or the dispatcher will amend the release to allow the aircraft to proceed to an intermediate airport or return back to the departure airport. The flight crew will then either confirm the new clearance with ATC or request a new clearance to another airport. The final decision rests with the pilot-in command.

OPTION (3) – if the pilot-in-command elects to follow Option (3), then when time permits, the pilot-in command will advise the dispatcher of any offset made from track or/and flight level. No action by the dispatcher is required since the effect on performance should be minimal.

Checklist for Aircraft Dispatch into NAT RVSM Airspace.

The dispatcher must:

i) Determine the minimum and maximum flight levels plus the horizontal boundaries of NAT RVSM airspace;

ii) Verify that the airframe is RVSM approved;

iii) Determine if any operating restrictions (e.g. speed or altitude limitations) apply to the aircraft for RVSM operation;

iv) Check the MEL for system requirements related to RVSM;

v) Check Item 10 (Equipment) of the ICAO ATS flight plan to ensure that it correctly reflects RVSM approval status. For North Atlantic operation, insertion of letter "W" indicates that the operator and aircraft are RVSM approved;

vi) Review reported and forecast weather enroute, with specific emphasis on conditions such as turbulence, which may affect an aircraft's ability to maintain its level; and

vii) Check the MEL for TCAS/ACAS requirements.

Flight of non-RVSM compliant aircraft

The dispatcher must comply with any ATS requirements regarding flight of non-RVSM compliant aircraft for maintenance, aircraft delivery or humanitarian flights (See Chapter 1).

CHAPTER 12 FLIGHT OPERATIONS BELOW THE NAT HLA

12.1 INTRODUCTION

12.1.1 This guidance is meant to assist international general aviation (IGA) flight crews with flight planning and operations across the North Atlantic. It is not intended to be a detailed listing of procedures or air regulations of the various States that provide air traffic service in the North Atlantic (NAT) region, and does not in any way replace the information contained in various national Aeronautical Information Publications (AIP's). Flight crews must consult relevant AIPs and Notices to Airmen (NOTAMs) when planning the flight and prior to departure.

12.2 ENVIRONMENTAL CONSIDERATIONS

Below FL 290

12.2.1 For flights at FL 290 and below, the North Atlantic weather can be far from benign. Extreme seasonal weather variations and rapidly changing weather conditions including severe icing, severe turbulence, and heavy precipitation are common, particularly in winter. Changes are often so rapid that they are difficult, if not impossible, to forecast. These harsh weather conditions, along with the rugged terrain and sparsely populated areas, make preparation, including route and emergency situation planning, important components for a successful flight. Attachment 3 provides further details of the general North Atlantic climate and the weather conditions and associated operational issues in particular areas.

12.3 NORTH ATLANTIC FLIGHT OPERATIONS

12.3.1 Most of the airspace in oceanic FIRs/OCAs is high seas airspace within which the Rules of the Air (ICAO Annex 2) apply without exception. The majority of the airspace is also controlled airspace, and instrument flight rules (IFR) apply when above FL 055.

12.3.2 This controlled airspace includes:

1. New York Oceanic East, Gander Oceanic, Shanwick Oceanic, Santa Maria Oceanic, Reykjavik Oceanic, GOTA and NOTA, and Bodø;
2. Bodø Oceanic above FL 195 and when operating more than 100 NM seaward from the shoreline;
3. Nuuk FIR when operating above FL 195:
4. Faroes Islands above 7500 ft;
5. Jan Mayen 2000 ft above ground level.

12.3.3 Canada, Denmark and Iceland require that the flight crew and aircraft be IFR rated for trans-oceanic flight, regardless of the altitude to be flown. It is highly unlikely that the flight will remain VMC when transiting the Atlantic.

12.4 REQUIREMENTS

12.4.1 Regulatory requirements are established by all States providing Air Traffic Services in the NAT. It is the responsibility of all operators to comply with these requirements and any others that may be separately imposed by the State of Registry of the aircraft or the State of the operator. Most eastbound trans-Atlantic flights by light aircraft commence their oceanic crossing from Canada. Transport Canada

Aviation Regulations (CARs) detail requirements for all flights beginning their trans-Atlantic crossing from Canada. Flights entering the NAT from any ANSP must review requirements as listed in each State AIP.

12.5 OPERATIONAL CONSIDERATIONS

Sparsely Settled Areas

12.5.1 The potential dangers associated with operating in sparsely settled areas should not be underestimated. The fact is that in sparely settled areas, aircraft operations require special considerations. In this area radio aids to navigation, weather information, fuel supplies, aircraft servicing facilities, accommodations and food are usually limited and often non-existent.

12.5.2 In addition to the regulations concerning flight crew qualifications and experience, it is recommended that the flight crew have:

a) flight experience with significant cross country, night and actual instrument time;

b) experience in using the same navigational equipment that will be used to cross the Atlantic; and

c) experience in the same type of aircraft that will be used to cross the Atlantic.

Icing Conditions

12.5.3 Freezing levels at or near the surface can be expected at any time of year over the NAT region. The dangers of airframe and/or engine icing must always be taken into account, so flight crews/planners should be prepared to wait for favourable conditions. If the flight is to be conducted when there is a threat of icing, keep clear of clouds, unless the aircraft is certified for operations in icing conditions. Remember, as a general rule, the freezing level should be 3,000 feet AGL or higher to allow for ridding the aircraft of ice, if it becomes necessary.

12.6 FLIGHT PLANNING

12.6.1 It is rare to be able to conduct a flight across the Atlantic and remain in visual meteorological conditions (VMC) for the entire flight. VFR flight in this airspace deprives the flight crew of the flexibility of using the altitudes above FL 055. The higher altitudes may enable a smoother flight, free of precipitation, icing or turbulence.

12.6.2 IFR Flights (i.e. those operating in the NAT region at FL 060 or above), or VFR Flights intending to cross an international border, need to file an ICAO flight plan. Detailed instructions for completion of the ICAO flight plan are found in the PANS-ATM (Doc 4444), Appendix 2; and in State AIPs. Chapter 4 also provides necessary guidance, with particular emphasis on NAT flight requirements.

12.6.3 Generally, all eastbound or westbound aircraft in the NAT region must flight plan so that specified tens of degrees of longitude (60°W, 50°W, 40°W, 30°W, etc.) as applicable, are crossed at whole or half degrees of latitude. Generally northbound or southbound aircraft must flight plan so that specified parallels of latitude spaced at five degree intervals (65°N, 60°N, 55°N, 50°N, etc.) are crossed at whole degrees of longitude. More detailed information can be found in NAT provider State AIPs.

12.6.4 Plan the flight using current aeronautical charts, the latest edition of pertinent flight supplements, and NOTAMs, both domestic and international.

Note: *Flight crews should familiarize themselves with the nature of the terrain over which the flight is to be conducted. If unfamiliar with the area, the flight crew should consult the aviation authority officials at appropriate local aviation field offices before departure. Such officials, as well as flight crews and* *operators, can provide a great deal of useful advice, especially on the ever-changing supply situation, the location and condition of possible emergency landing strips, potential hazards, and enroute weather conditions. Pre-flight planning must ensure the availability of fuel, food, and services that may be required at intermediate stops and at destination.*

12.6.5 Planning a trans-Atlantic flight for the summertime will allow the flight crew/operator to take advantage of the most favourable conditions. Not only are the ground (and water) temperatures less menacing, but also the amount of available daylight is considerably greater.

12.6.6 Depth perception is poor at night. North of 60°N Latitude, which includes the most common trans-Atlantic routes flown by general aviation aircraft, there are only about 4 hours of daylight during December. To this is added an additional complication: VFR flights at night are prohibited in Greenland. Given also the increased possibility of storms during the winter it is earnestly recommended that flight crews plan to make trans-Atlantic flights preferably during the summer months.

12.7 PHYSIOLOGICAL FACTORS

12.7.1 Crossing the North Atlantic in a general aviation aircraft is a long and physically demanding task. Provisions must be made to eat, drink, and take care of all necessary bodily functions.

12.8 CLEARANCES

12.8.1 All flights entering OCAs are required to have an IFR clearance. When transitioning from uncontrolled airspace into controlled airspace, an IFR clearance must be obtained before entering controlled airspace.

12.8.2 When operating on an IFR clearance, any change of altitude requires re-clearance from ATC. Clearances for VMC climb or descent will not be granted. Changes in true airspeed must be coordinated. Review specific AIPs for details. Weather deviations of a mileage that exceeds the limits outlined in the Strategic Lateral Offset Procedure (SLOP) i.e. 2 NM right of track, require a re-clearance from ATC. If a flight crew cannot obtain a clearance in a timely manner and needs to execute pilot-in-command authority for safety of flight, they shall inform ATC of the maneuver as soon as practicable.

12.8.3 Flight crews are required to obtain a clearance from the ATS unit responsible for their area of operation prior to entering controlled airspace and to follow the procedures specified in appropriate AIPs. Where possible, clearance to enter controlled airspace should be obtained prior to take-off, as communication problems are often encountered at low altitudes.

12.9 NAVIGATION

12.9.1 Navigation in the North Atlantic, or in any oceanic area for that matter, is considerably more difficult than over land. There are no landmarks, and short range navigational aids (VOR/NDB) are few and far between. Aircraft must be equipped with some type of Long Range Navigation (LRNS) equipment. (See applicable AIPs and ICAO Annexes for details.)

12.10 ROUTE CONCERNS

12.10.1 There are a few VOR/NDB routes in the North Atlantic and there is little NAVAID coverage at the low altitudes in the NAT.

12.11 COMMUNICATIONS

12.11.1 The following text highlights a number of issues particular to air-ground ATS communications in the NAT region. Further referral should be made to Chapter 5.

12.11.2 As mentioned earlier, VHF radio coverage is very limited in the NAT. Charts in section 8.4 depict theoretical VHF coverage in the NAT HLA. Refer to State AIPs for detailed surveillance and communication coverage including coverage in the low level airspace. Radio equipment should be tested prior to departure. For VHF equipment this is best done by calling the tower or ACC on the proper frequency for a ground radio check. HF equipment can be tested by calling the nearest Aeronautical Radio or Flight Service Station for a ground radio check. If contact cannot be made on the initial test frequency, try others. If no contact is made, have the equipment checked. Do not leave the ground until everything is working satisfactorily.

12.11.3 Flight crews should be aware that on most occasions when they communicate with Oceanic Air Traffic Control Centres on HF and, on some occasions VHF, they do not talk directly to controllers. Radio Communicator staff relay messages between aircraft and ATC. Such units are not always co-located with an ACC. For example, Shanwick Radio is in the Republic of Ireland while Shanwick Control is based at Prestwick, Scotland. Also, it is important to note that controller workload associated with low level IGA flights is usually high, so some delays can be expected for responses to requests for a change of flight level, route, etc.

12.11.4 Remember, flights above FL 055 must be operated under IFR procedures and therefore a continuous air-ground communication watch on appropriate frequency must be maintained.

12.11.5 An HF SELCAL device will ease the strain of a continuous air-ground communication watch on the designated HF R/T Frequency. Ensure that the SELCAL code selected in the aircraft is valid for the NAT region (see Chapter 5). Also ensure that the Code is included in Item 18 of the filed ICAO flight plan.

12.11.6 Aeronautical Mobile Satellite (Route) Service (AMS(R)S), more commonly referred to as SATVOICE, may be used for any routine, non-routine or emergency ATS air/ground communications throughout the NAT region. Remember to carry the SATVOICE numbers for the areas (both ATC and radio) you are flying through. Requirements and procedures for use are detailed in Chapter 5.

12.11.7 A continuous air-ground communication listening watch should be maintained on the 121.500 MHz emergency frequency unless communications on another frequency prevents it. 121.500 MHz is not authorized for *routine* use.

Communications failures

12.11.8 Procedures to follow in the event of radio communications failures in the NAT region **are not** those which are used in domestic airspaces. Chapter 5 and relevant national AIPs provide detail of the procedures to follow.

12.11.9 Although HF coverage exists throughout the NAT, there are a few associated problems. Depending on atmospheric conditions, it can be relatively noisy with the signal fading in and out. Sometimes several attempts are required to successfully transmit or receive a single message. Additionally, sunspot activity can completely disrupt HF communications for considerable periods of time, varying from a few minutes to several hours. Notices are published whenever disruptive sunspot activity is expected. It may be possible to relay VHF or UHF communications through other aircraft operating in the NAT. 123.450 MHz should be used for air-to-air communications. Do not plan to use other aircraft as primary means of communication. There is no guarantee there will be another aircraft within range when needed. Consider this an emergency procedure and plan accordingly.

12.12 SURVEILLANCE

12.12.1 Radar and/or ground-based ADS-B coverage in the NAT region is limited. Space-based ADS-B surveillance has been implemented in the NAT Region except for New York Oceanic East. It should however be noted that identification of aircraft by space-based ADS-B can be limited if the aircraft has only a bottom mounted antenna. All aircraft operating as IFR flights in the NAT region shall be equipped with a pressure-altitude reporting SSR transponder and ADS-B and Mode S transponder is mandated in the Reykjavik FIR with some conditions (refer to section 1.6). Some radar sites that do cover portions of the NAT are secondary radar equipped only. In any emergency situation (lost, out of fuel, engine failure, etc.) your chances of survival are vastly increased if you are radar or ADS-B identified and SAR services can be vectored to your position. NAT ATS Surveillance is discussed in Chapter 8 and coverage charts are shown in section 8.4 and in individual national AIPs.

12.13 SEARCH & RESCUE (SAR)

12.13.1 SAR alert procedures are initiated when:

a) no communication has been received from an aircraft within a period of thirty minutes after the time a communication should have been received, or from the time an unsuccessful attempt to establish communication with such aircraft was first made, whichever is the earlier, or when,

b) an aircraft fails to arrive within thirty minutes of the estimated time of arrival last notified to or estimated by air traffic services units, whichever is the later except when,

c) no doubt exists as to the safety of the aircraft and its occupants.

12.13.2 Flight crews should request advisories or assistance at the earliest indication that something may be wrong. Most search and rescue facilities and international air carriers monitor VHF frequency 121.500 MHz continuously. SAR aircraft are generally equipped with homing devices sensitive to VHF 121.500 MHz. If unable to reach any facility, flight crews should attempt contact with other aircraft on the NAT air-to-air frequency 123.450 MHz or distress frequency 121.500 MHz. Most international carriers are also able to receive Emergency Locator Transmitter (ELTs) transmissions. In the event that manual activation of your ELT is possible, the ELT should be activated and left on continuously. The 406.000 MHz beacon provides a more accurate position and identification data, improving SAR response efficiency.

12.13.3 With excellent satellite coverage of the region, SAR services can ordinarily determine the general location of an aircraft in distress, provided that the ELT functions. Search and recovery may be conducted by various craft. Helicopters operate out to a maximum of 300 NM from base without air-to-air re-fueling and the latter is a very scarce enhancement. Long range SAR aircraft can localize an ELT, but their time on task in the area, on low level visual search, should that be necessary, is only in the order of 2 to 3 hours. A 24 hour search would require 8 aircraft and a visual search for a single seat life raft, even with a comparatively good datum, is a needle-in-a-haystack problem. Oceanic Air Traffic Control Centres will contact rescue coordination centres with all available details. SAR coordination centres may request other aircraft assistance while also utilizing surface craft in the area. This would often include ships or boats.

Hypothermia

12.13.4 Hypothermia is the most significant danger to the survivors of any ditching or forced/precautionary landing in the NAT region. The causes, symptoms and preventative measures are covered in detail in Attachment 3.

12.14 IN-FLIGHT CONTINGENCIES

12.14.1 Do not deviate from your current flight plan unless you have requested and obtained approval from the appropriate air traffic control unit, or unless an emergency situation arises which necessitates immediate action. After such emergency authority is exercised, the appropriate air traffic services unit must be notified of the action taken and that the action has been taken under emergency authority.

12.14.2 Make all position reports, as required, and report any problems to Air Traffic Control agencies as soon as possible. It is also good policy to report fuel remaining in hours and minutes when passing position or other relevant flight information.

12.14.3 If you encounter difficulty, report immediately on the appropriate VHF/HF frequency or on VHF 121.500 MHz, VHF 123.450 MHz, SATVOICE or any other communication device you may have. Don't delay in making this call, as it could take SAR forces up to four hours to reach your position.

12.14.4 Remember that commercial airline traffic over the North Atlantic is heavy. Do not hesitate to enlist the assistance of these aircraft in relaying a position report or discussing a problem. The VHF frequency 123.450 MHz is for exclusive use as an air-to-air communications channel. The bulk of this commercial traffic uses the Organised Track Structure (Chapter 2). During daylight hours a Westbound OTS is in effect and at night an Eastbound structure is used. The location/coordinates of these structures changes each day. Knowledge of the location of the OTS structure which is active during your flight may provide re-assurance of the proximity of such assistance. The moral support alone may be enough to settle nerves and return the thought processes to normal.

12.14.5 The weather at your destination should be well above IFR minimums and forecast to remain so or improve. After 10 to 14 hours at altitude, your ability to handle marginal weather conditions may be in serious doubt. Therefore, your personal weather minimums should be well above the published minimums. Alternate airports should be chosen with the same care.

CHAPTER 13 MONITORING OF AIRCRAFT SYSTEMS AND FLIGHT CREW PERFORMANCE

13.1 NAT REGION MONITORING

13.1.1 To ensure compliance with minimum navigation and height-keeping performance specifications, ICAO has established procedures for systematic and periodic monitoring of the actually achieved aircraft systems performance. Formal reporting by flight crews, operators and ATS providers, of specified deviations from assigned track or flight level supports this.

13.1.2 The NAT CMA (http://natcma.com/) is operated on behalf of the NAT SPG by United Kingdom National Air Traffic Services Limited (NATS) and is responsible for the collection, analysis and dissemination of all data relevant to operational errors and vertical and horizontal navigation performance in the NAT region. It provides participating States, ICAO and selected organisations with regular summaries of operational performance to promote awareness of NAT system safety, and with any other pertinent information. On those occasions that summary statistics show that the TLS, in either the horizontal or vertical planes, has been exceeded, the NAT SPG is informed; in which case the NAT SPG will take appropriate action.

13.1.3 The NAT Scrutiny Group (NAT SG) is a separate body comprising the NAT CMA, Regulators, ATS providers and airspace user representatives. The NAT SG reports to the NAT SOG and its function is to ensure correct categorisation of all reported occurrences in the NAT region for the purpose of mathematical analysis and other safety management activities.

13.1.4 The detailed circumstances of all operational errors, both in the vertical and horizontal planes, are thoroughly reviewed by the NAT CMA, together with the NAT SG. Any lessons learned from this review, which may help to limit the possibility of recurrences of such errors, are communicated back to NAT operators and ATS authorities. The intent is to improve standard operating procedures, thereby reducing the future frequency of operational errors and thus contribute to the safety of the overall system.

13.1.5 Operational errors can have a significant effect on the assessment of risk in the system. For their safety and the safety of other users, flight crews are reminded of the importance of co-operating with the reporting OAC in the provision of incident information. It is important that all agencies react promptly to reports of operational errors.

13.2 MONITORING OF HORIZONTAL NAVIGATION CAPABILITY

Monitoring by the Operators

13.2.1 Decisions regarding the monitoring of aircraft navigation performance are largely the prerogative of individual operators. In deciding what records should be kept, operators should take into account the stringent requirements associated with the NAT HLA. Operators are required to investigate all lateral deviations of 10 NM or greater, and it is imperative that the cause(s) of track deviations be established and eliminated. **Therefore, it will be necessary to keep complete in-flight records so that an analysis can be carried-out.** In order that deviation reports can receive prompt attention, it is useful for each airline/operator to make available generic contact details for safety related enquiries.

13.2.2 Operators should review their documentation to ensure that it provides all the information required to reconstruct any flight, if necessary, some weeks later. Specific requirements could include:

a) details of the initial position inserted into the Flight Management System, IRS or INS equipment plus the original flight planned track and flight levels;

b) all ATC clearances and revisions of clearance;

c) all reports (times, positions, etc.) made to ATC;

d) all information used in the actual navigation of the flight: including a record of waypoint numbers allocated to specific waypoints, plus their associated ETOs and ATOs;

e) comments on any problems (including that to do with matters concerning navigation) relating to the conduct of the flight, plus information about any significant discrepancies between INS/IRS displays, other equipment abnormalities and any discrepancies relating to ATC clearances or information passed to the aircraft following ground radar observations;

f) detailed records of any contingency manoeuvres/procedures undertaken by the flight crew;

g) sufficient information on accuracy checks to permit an overall assessment of performance. Records of terminal (i.e. residual) errors and of checks made against navigation facilities immediately prior to entering oceanic airspace; details of any manual updates made to IRS/INS units;

h) where available, navigational and performance data contained in the aircraft's flight data recorders; and

i) retention of aircraft flight data records whenever a flight crew or operator are aware of a possible report of a vertical or lateral deviation. Such records will assist in quantifying the magnitude and/or duration of any deviation.

Direct Action by ATS Provider States and the NAT CMA in the Monitoring Process

13.2.3 The overall lateral navigation performance of all aircraft in the NAT HLA is continually assessed and compared to the standards established for the region, to ensure that the TLS is being maintained. The navigation accuracy achieved by NAT HLA aircraft is periodically measured and additionally all identified instances of significant deviation from cleared track are subject to thorough investigation by the NAT CMA. The NAT CMA also maintains a database of all NAT RVSM and PBCS approvals. The NAT CMA runs a continuous monitoring process to compare this approvals list with the records of all aircraft flying in Shanwick, Reykjavik and Santa Maria FIRs

13.2.4 When a navigation error is identified, follow-up action after flight is usually taken with the operator to establish the circumstances and contributory factors.

Follow-up Action on Observed, Reported, and Prevented Lateral Deviations

13.2.5 Follow-up action on lateral deviations should, in general terms, be as indicated in the following paragraphs.

13.2.6 For aircraft operating within the NAT HLA:

a) the observing ATC unit should inform the flight crew of the aircraft concerned, and others as required, of the observed error and also that an error report will be processed; any comment made by the flight crew at the time of notification should be recorded;

13.3 MONITORING OF HEIGHT-KEEPING PERFORMANCE

13.3.1 The overall vertical navigation performance of all aircraft in NAT RVSM airspace is continually assessed by the NAT CMA and compared to the standards established for the region, to assess whether the relevant TLS is being maintained. . Such monitoring includes both measurement of the technical height-keeping accuracy of RVSM approved aircraft and assessment of collision risk associated with all reported operational deviations from cleared levels.

13.3.2 All identified operational situations or errors which lead to aircraft deviating from ATC cleared levels are subject to thorough investigation. Follow-up action after the flight is usually taken with the operator of the aircraft involved, to establish the reason for the deviation or cause of the error.

13.3.3 Flight crews and ATC units should report all deviations of 90 m (300 ft) or more from the cleared flight level, whatever the cause.The technical height-keeping accuracy of aircraft flying at RVSM levels is passively monitored by analyses of ADS-B data collected by the NAT ATS providers. This monitoring allows the height-keeping accuracies of aircraft types and individual operator's fleets to be assessed. Individual airframes which do not meet required performance standards can also be identified. On such occasions the operator and the State of Registry are advised of the problem and corrective action must be undertaken before further flights in RVSM airspace are conducted. Minimum Monitoring Requirements for RVSM approval, are specified in ICAO Annex 6. Operators are required to ensure that a minimum of two aircraft from each of its type groupings are monitored at least once every two years (See Annex 6 Part I para 7.2.7 and Part II para 2.5.2.7).

13.3.4 The NAT CMA will take follow-up action in the following circumstances:

a) when reports are received from height monitoring systems indicating that aircraft altimetry system performance may not be compliant with the RVSM airworthiness requirements. i.e. measurements which are in magnitude equal to, or greater than, the following criteria:
   - Total Vertical Error (TVE): 90 m (300 ft);
   - Altimetry System Error (ASE): 75 m (245 ft); or
   - Assigned Altitude Deviation (AAD): 90 m (300 ft).

13.4 MONITORING OF COMMUNICATION AND SURVEILLANCE PERFORMANCE

13.4.1 A number of aircraft separation minima require a specified communication and surveillance performance to be achieved. The performance-based communication and surveillance (PBCS) specifications that are applicable in the NAT Region are Required Communication Performance 240 (RCP 240 applicable to CPDLC) and Required Surveillance Performance 180 (RSP 180 applicable to ADS-C).

13.4.2 To ensure compliance with the RCP 240 and RSP 180 performance specifications, ICAO has established procedures for systematic and periodic monitoring of the achieved end-to-end CPDLC and ADS-C communication performance. Those procedures are described in NAT Doc 011, which is available on the ICAO Paris website.

13.4.3 NAT ATSPs collect statistical data on RCP 240 and RSP 180 performance on all aircraft that use FANS data link in the NAT Region. Each month, a report is sent to the NAT CMA listing those aircraft that are not meeting the PBCS performance requirements and have achieved at least 100 data points in a rolling three-month sample. The NAT CMA forwards those reports to the RMA or regulators responsible for each of those under-performing aircraft.

13.4.4 In addition, the PBCS performance of all aircraft that have used data link in the NAT Region is posted every six months on the FANS-CRA website (https://www.fans-cra.com), which is accessible to aircraft operators.

13.5 OPERATIONAL REPORTS TO THE NAT CMA

13.5.1 Details of the following occurrences should also be reported to the NAT CMA by the ATS provider units:

13.5.2 Large Height Deviation (LHD) which are height deviations of 300 ft or greater.

13.5.3 Lateral deviations, when the aircraft actually deviates from the cleared track other than those covered by the Strategic Lateral Offset Procedures (SLOP).

13.5.4 Coordination errors, where coordination between two Units has not been correctly carried out, leading to a vertical, lateral or time event.

13.5.5 Longitudinal Loss of Separation (LLoS), where a flight loses prescribed longitudinal separation which is not related to an LHD or lateral deviation.

13.5.6 Where ATC intervened and prevented an event from actually occurring, the ANSP shall report the event with the relevant event type and record within the report that it was Prevented.

ATTACHMENT 1

SAMPLE OCEANIC CHECKLIST

Note: ICAO North Atlantic Working Groups composed of industry, ATC and state regulators have created this checklist **for reference only.** It is not intended to replace an operator's oceanic checklist. Operators should use an Oceanic Checklist as part of their Safety Management System. Operators without an oceanic checklist are encouraged to use this sample and tailor it to their specific needs and approvals. This checklist provides an orderly flow of tasks designed to assist in reducing oceanic errors. Operators should review Chapter 6 NAT HLA FLIGHT OPERATIONS & NAVIGATION PROCEDURES.

FLIGHT PLANNING

- Communication/Navigation/Surveillance (CNS) Flight Plan Codes and planning documents
- Plotting/Orientation Chart/EFB/Tablet – plot route OEP to OXP
- Equal Time Points (ETP) - plot
- EDTO (/ETOPS) – Complete analysis
- Track message (current copy available for all crossings)
- Note nearest tracks on plotting chart/EFB/Tablet
- Weather Analysis – Note enroute temperature and turbulence forecasts as well as divert airport weather
- Review possible navigation aids for accuracy check prior to OEP (AS / IF APPLICABLE)
- Review contingency procedures and plans

PREFLIGHT

- Master Clock for all ETOs/ATOs
- Maintenance Log – check for any navigation/ communication/surveillance or RVSM issues
- RVSM Altimeter checks (tolerance)
- Master Flight Plan (check routing, fuel load, times, groundspeeds)
- Dual Long Range NAV System (LRNS) for remote oceanic operations
- LRCS (HF, SATVOICE) check (including SELCAL
- Confirm Present Position coordinates (best source)
- Master Flight Plan (symbols②, ✓, \, X)
- LRNS programming
  - Check currency and software version
  - Independently verify waypoint entries
  - Check expanded coordinates of all oceanic waypoints
  - Upload winds, if applicable

TAXI AND PRIOR TO TAKE-OFF

- Present Position check

CLIMB OUT

- Verify ETOs above FL 180

PRIOR TO OCEANIC ENTRY

- If required, send an RCL message. Verify and crosscheck any route amendment independently. Confirm the ATC route clearance is properly programmed into LRNS
- Check expanded coordinates of all oceanic waypoints
- Confirm flight level, Mach and route for crossing
- Ensure aircraft performance capabilities for maintaining assigned altitude/assigned Mach
- If clearance is not what was filed – update LRNS, OFP and plotting/ orientation chart/EFB/Tablet. Independently crosscheck and confirm new route
- Navigation Accuracy Check – record as applicable
- Confirm HF check, if not done during pre-flight
- Confirm SATCOM/SATVOICE is operational, as applicable
- Log on to CPDLC and ADS-C 10 to 25 minutes prior, if equipped
- Verify RNP value
- Altimeter checks – record readings
- Compass heading check – record

AFTER OCEANIC ENTRY

- Squawk 2000 – 10 minutes after entry, except for Reykjavik OCA and Bermuda
- Maintain assigned Mach, or RESUME NORMAL SPEED if cleared
- VHF radios - set to air-to-air (123.450 MHz) and guard frequency (121.500 MHz)
- Strategic Lateral Offset Procedures (SLOP) – SOP fly centreline or up to 2NM to the **right** of ATC cleared track (in 0.1 NM increments); left offsets are **prohibited**
- Altimeter checks - hourly (AS / IF APPLICABLE)
- Routine monitoring – assign tasks

APPROACHING WAYPOINTS

- Confirm latitude/longitude of next and subsequent points – expanded coordinates, using scratch pad of FMS if applicable

OVERHEAD WAYPOINTS

- Confirm aircraft transitions to next waypoint
  - Check track and distance against Master Document
- Confirm time to next waypoint

  Note: 3-minutes or more change requires ATC notification (NAT Region & voice reporting only)
- Position report – fuel

10-MINUTES AFTER WAYPOINT PASSAGE

- Record time and latitude/longitude on plotting/orientation chart – non steering LRNS

- or -

- Use "nav display method" (FMS aircraft only, smallest scale)

MID POINT

- Midway between waypoints compare winds from OFP, LRNS and upper millibar wind charts (AS / IF APPLICABLE)
- Confirm ETO

COAST IN

- Compare ground based NAVAID to LRNS (AS / IF APPLICABLE)
- Remove SLOP offset prior to oceanic exit point
- Confirm routing beyond oceanic airspace

DESTINATION/BLOCK IN

- Navigation Accuracy Check (AS / IF APPLICABLE)
- RVSM write-ups

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ATTACHMENT 2

CLEARANCE DELIVERY/FORMAT/CONTENT

REVISIONS/AMENDMENTS

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

Format of an amended clearance delivered via voice

"AMENDED <change> CLEARANCE. <atc unit> CLEARS <acid>, <clearance>"

where <change> can be one or more of the following:

LEVEL, ROUTE, SPEED.

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

Delivery Method for a clearance delivered via voice

1. *Controller/radio operator:*

   "DLH458- (ATC/radio operator's unit callsign) - AMENDED LEVEL AND SPEED CLEARANCE."

   Pilot:

   "(ATC /radio operator´s unit callsign) DLH458."

2. *Controller/radio operator:*

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

EXAMPLE CLEARANCES:

Following are examples of typical clearances that could be received by flights operating in NAT region oceanic airspace. These examples have been chosen with a view to explaining certain elements that are unique to the ICAO NAT region operational environment, or which have been shown to be subject to errors or misinterpretation.

Example 1 – Re-route clearances

Example 1a – Revised route clearance delivered via voice (radio)	**Meaning**
ABC123 AMENDED ROUTE CLEARANCE SHANWICK OCEANIC RE-CLEARS ABC123 AFTER 57 NORTH 20 WEST TO REROUTE VIA 58 NORTH 015 WEST, GOMUP, GINGA.	The previously cleared route is to be followed until 57N020W. After passing 57N020W the flight is cleared direct to 58N015W, then direct to GOMUP and then direct to GINGA

Example 1b – Revised route clearance delivered via voice (DCPC) ABC123 AMENDED ROUTE CLEARANCE ABC123 AFTER PASSING 57 NORTH 20 WEST CLEARED REROUTE VIA 58 NORTH 015 WEST, GOMUP, GINGA.	**Meaning** The previously cleared route is to be followed until 57N020W. After passing 57N020W the flight is cleared direct to 58N015W, then direct to GOMUP and then direct to GINGA.
Example 1c – Revised route clearance delivered via CPDLC ABC123 ROUTE HAS BEEN CHANGED AT 44N030W CLEARED 47N020W OMOKO GUNSO	**Meaning** The previously cleared route is to be followed until 44N030W. After passing 44N030W the flight is cleared direct to 47N020W, then direct to OMOKO and then direct to GUNSO.
Example 1d – Revised route clearance delivered by CPDLC using UM79 ABC123 CLEARED TO 42N040W VIA ROUTE 42N020W 42N030W	**Meaning** The previously cleared route is to be followed until 42N020W. After passing 42N020W the flight is cleared direct to 42N030W, then direct to 42N040W

Example 2 – level clearances – no restrictions

Example 2a – Revised level clearance delivered via voice (radio) ABC456 AMENDED LEVEL CLEARANCE. SANTA MARIA OCEANIC CLEARS ABC456 CLIMB TO AND MAINTAIN FLIGHT LEVEL 340. REPORT LEAVING, REPORT REACHING. **Note- the instruction to "Report Leaving" is not a requirement, and may not always be included in clearances issued by New York ARTCC**	**Meaning** ABC456 is cleared to climb to and maintain FL 340. If the instruction to "report leaving" is included, flight is to report leaving its current level. The flight is to report reaching FL 340.
Example 2b – Revised level clearance delivered via voice (DCPC) ABC456 CLIMB TO AND MAINTAIN FLIGHT LEVEL 340. REPORT LEAVING, REPORT REACHING. **Note- the instruction to "Report Leaving" is not a requirement, and may not be included in all clearances**	**Meaning** ABC456 is cleared to climb to and maintain FL 340. If the instruction to "report leaving" is included, flight is to report leaving its current level. The flight is to report reaching FL 340.
Example 2c – the same clearance delivered via CPDLC CLIMB TO AND MAINTAIN F340 REPORT LEAVING F320 REPORT LEVEL F340 **Note- the instruction to "Report Leaving" is not a requirement, and may not always be included in clearances issued by New York ARTCC**	**Meaning** ABC456, which is currently at FL 320, is cleared to climb to and maintain FL 340. The flight is to send a CPDLC downlink message to report leaving FL 320 and to send another CPDLC downlink message to report when the flight has levelled at FL 340.

Example 3 – level clearances – with geographic restrictions/conditions

Example 3a –Revised level clearance delivered via voice (radio) – geographic restriction to reach level by POINT ABC123 AMENDED LEVEL CLEARANCE. SANTA MARIA OCEANIC CLEARS ABC123 CLIMB TO REACH FLIGHT LEVEL 320 BEFORE PASSING 41 NORTH 020 WEST. REPORT LEAVING, REPORT REACHING.	**Meaning** ABC123 is cleared to climb to and maintain FL 320. Climb must be arranged so that the flight is level in sufficient time to cross 41N020W already level at FL 320. The flight is to report leaving its current level and also to report reaching FL 320.
Example 3b – clearance with the same intent, using different phraseology ABC123 AMENDED LEVEL CLEARANCE. GANDER OCEANIC CLEARS ABC123 CLIMB TO AND MAINTAIN FLIGHT LEVEL 320. CROSS 20 WEST LEVEL. REPORT LEAVING, REPORT REACHING.	**Meaning** ABC123 is cleared to climb to and maintain FL 320. Climb must be arranged so that the flight is level in sufficient time to cross 41N020W level at FL 320. The flight is to report leaving its current level and also to report reaching FL 320.
Example 3c –Revised level clearance delivered via voice (DCPC) – geographic restriction to reach level by POINT ABC123 CLIMB TO REACH FLIGHT LEVEL 320 BEFORE PASSING 41 NORTH 020 WEST. REPORT LEAVING, REPORT REACHING.	**Meaning** ABC123 is cleared to climb to and maintain FL 320. Climb must be arranged so that the flight is level in sufficient time to cross 41N020W already level at FL 320. The flight is to report leaving its current level and also to report reaching FL 320.
Example 3d - same clearance delivered via CPDLC CLIMB TO AND MAINTAIN F320 CROSS 41N020W AT F320 REPORT LEAVING F310 REPORT LEVEL F320	**Meaning** ABC123, which is currently at FL 310, is cleared to climb to and maintain FL 320. Climb must be arranged so that the flight is level in sufficient time to cross 41N020W already level at FL 320. The flight is to send a CPDLC downlink message to report leaving FL 310 and to send another CPDLC downlink message to report when the flight has levelled at FL 320.

Example 3e – Revised level clearance delivered via voice (radio) – geographic restriction to maintain current level until POINT ABC456 AMENDED LEVEL CLEARANCE. SANTA MARIA OCEANIC CLEARS ABC456 MAINTAIN FLIGHT LEVEL 300. AFTER PASSING 41 NORTH 020 WEST CLIMB TO FLIGHT LEVEL 320. REPORT LEAVING, REPORT REACHING. **Note- the initial phrase "maintain flight level 300" is not a requirement, and may not always be included in such clearances delivered via voice**	**Meaning** ABC456, which is currently at FL 300, is cleared to climb to and maintain FL 320; however, climb must not commence until after the flight has passed 41N020W. The flight is to report leaving its current level and also to report reaching FL 320. The initial phrase "MAINTAIN FLIGHT LEVEL 300" may be included to bring attention to the fact that the clearance is a conditional level clearance; the level change cannot commence until the specified condition has been met.
Example 3f – Revised level clearance delivered via voice (DCPC) – geographic restriction to maintain current level until POINT ABC456 MAINTAIN FLIGHT LEVEL 300. AFTER PASSING 41 NORTH 020 WEST CLIMB TO FLIGHT LEVEL 320. REPORT LEAVING, REPORT REACHING. **Note- the initial phrase "maintain flight level 300" is not a requirement, and may not always be included in such clearances delivered via voice**	**Meaning** ABC456, which is currently at FL 300, is cleared to climb to and maintain FL 320; however, climb must not commence until after the flight has passed 41N020W. The flight is to report leaving its current level and also to report reaching FL 320. The initial phrase "MAINTAIN FLIGHT LEVEL 300" may be included to bring attention to the fact that the clearance is a conditional level clearance; the level change cannot commence until the specified condition has been met.
Example 3g – the same clearance delivered via CPDLC MAINTAIN F300 AT 41N020W CLIMB TO AND MAINTAIN F320 REPORT LEAVING F300 REPORT LEVEL F320	**Meaning** ABC456, which is currently at FL 300, is cleared to climb to FL 320; however, climb must not commence until the flight reaches 41N020W. The flight is to send a CPDLC downlink message to report leaving FL 300 and to send another CPDLC downlink message to report when the flight has levelled at FL 320. The initial message element "MAINTAIN F300" is intended to bring attention to the fact that the clearance is a conditional level clearance; the level change cannot commence until the specified condition has been met.

Example 4 – level clearances – with time restrictions/conditions

Example 4a – Revised level clearance delivered via voice (radio) –restriction to reach level by TIME ABC123 AMENDED LEVEL CLEARANCE. SANTA MARIA OCEANIC CLEARS ABC123 CLIMB TO FLIGHT LEVEL 320 TO BE LEVEL AT OR BEFORE 1337. REPORT LEAVING, REPORT REACHING.	**Meaning** ABC123 is cleared to climb to and maintain FL 320. Climb must be arranged so that the flight is level at FL 320 no later than 1337 UTC. The flight is to report leaving its current level and also to report reaching FL 320.
Example 4b – Revised level clearance delivered via voice (DCPC) – restriction to reach level by TIME ABC123 CLIMB TO REACH FLIGHT LEVEL 320 AT OR BEFORE 1337. REPORT LEAVING, REPORT REACHING.	**Meaning** ABC123 is cleared to climb to and maintain FL 320. Climb must be arranged so that the flight is level at FL 320 no later than 1337 UTC. The flight is to report leaving its current level and also to report reaching FL 320.
Example 4c – the same clearance delivered via CPDLC CLIMB TO REACH F320 BY 1337 REPORT LEAVING F310 REPORT LEVEL F320	**Meaning** ABC123, which is currently at FL 310, is cleared to climb to and maintain FL 320. Climb must be arranged so that the flight is level at FL 320 no later than 1337 UTC. The flight is to send a CPDLC downlink message to report leaving FL 310 and to send another CPDLC downlink message to report when the flight has levelled at FL 320.
Example 4d – Revised level clearance delivered via voice (radio) – restriction to maintain current level until TIME ABC456 AMENDED LEVEL CLEARANCE. SANTA MARIA OCEANIC CLEARS ABC456 MAINTAIN FLIGHT LEVEL 300. AT 1337 OR AFTER CLIMB TO AND MAINTAIN FLIGHT LEVEL 320. REPORT LEAVING, REPORT REACHING. **Note- the initial phrase “maintain flight level 300” is not a requirement and may not always be included in such clearances delivered via voice.**	**Meaning** ABC456, which is currently at FL 300, is cleared to climb to and maintain FL 320; however, climb cannot be commenced until 1337 UTC, or later. The flight is to report leaving its current level and also to report reaching FL 320. The initial phrase “MAINTAIN FLIGHT LEVEL 300” may be included to bring attention to the fact that the clearance is a conditional level clearance; the level change cannot commence until the specified condition has been met.

Example 4e – Revised level clearance delivered via voice (DCPC) –restriction to maintain current level until TIME ABC456 MAINTAIN FLIGHT LEVEL300. AT OR AFTER 1337 CLIMB TO AND MAINTAIN FLIGHT LEVEL 320. REPORT LEAVING, REPORT REACHING. **Note- the initial phrase "maintain flight level 300" is not a requirement and may not always be included in such clearances delivered via voice.**	**Meaning** ABC456, which is currently at FL 300, is cleared to climb to and maintain FL 320; however, climb cannot be commenced until 1337 UTC, or later. The flight is to report leaving its current level and also to report reaching FL 320. The initial phrase "MAINTAIN FLIGHT LEVEL 300" may be included to bring attention to the fact that the clearance is a conditional level clearance; the level change cannot commence until the specified condition has been met.
Example 4f – the same clearance delivered via CPDLC MAINTAIN F300 AT 1337 CLIMB TO AND MAINTAIN F320 REPORT LEAVING F300 REPORT LEVEL F320	**Meaning** ABC456, which is currently at FL 300, is cleared to climb to FL 320; however, climb must not commence until 1337 UTC. The flight is to send a CPDLC downlink message to report leaving FL 300 and to send another CPDLC downlink message to report when the flight has levelled at FL 320. The initial message element "MAINTAIN F300" is intended to bring attention to the fact that the clearance is a conditional level clearance; the level change cannot commence until the specified condition has been met.

Example 5 – time restrictions/conditions – reach a point no later than a specified time

Example 5a – time restriction delivered via voice (radio), speed amended – AT OR BEFORE ABC123 AMENDED SPEED CLEARANCE. REYKJAVIK OAC CLEARS ABC123 CROSS 63 NORTH 030 WEST AT OR BEFORE 1428.	**Meaning** ABC123 is to adjust its speed to ensure that the flight will reach 63N030W no later than 1428 UTC.
Example 5b – time restriction delivered via voice (DCPC), speed amended – AT OR BEFORE ABC123 AMENDED SPEED CLEARANCE. ABC123 CROSS 63 NORTH 030 WEST AT OR BEFORE 1428. **Note - the initial phrase "amended speed clearance" may not always be included in clearances issued via DCPC**	**Meaning** ABC123 is to adjust its speed to ensure that the flight will reach 63N030W no later than 1428 UTC.
Example 5c – the same clearance delivered via CPDLC CROSS 63N030W AT OR BEFORE 1428	**Meaning** ABC123 is to adjust its speed to ensure that the flight will reach 63N030W no later than 1428 UTC.

Example 5d – time restriction delivered by radio via voice (using different phraseology) – AT OR BEFORE, then a speed instruction GANDER OCEANIC CLEARS ABC123 CROSS 50 NORTH 040 WEST AT TIME 1428 OR BEFORE. AFTER 40 WEST RESUME MACH 082.	**Meaning** ABC123, which is currently assigned Mach 082, is to adjust its speed to ensure that the flight will reach 50N040W no later than 1428 UTC. After reaching 50N040W, the flight is to resume maintaining Mach 082.
Example 5e – the same clearance delivered via CPDLC ABC123 CROSS 50N040W AT OR BEFORE 1428 AFTER PASSING 50N040W MAINTAIN MACH 082	**Meaning** ABC123 is to adjust its speed to ensure that the flight will reach 50N040W no later than 1428 UTC. After passing 50N040W, the flight is to maintain Mach 082.

Example 6 – time restrictions/conditions – cross a point no earlier than a specified time

Example 6a– time restriction delivered via voice (radio) – AT OR AFTER ABC456 AMENDED SPEED CLEARANCE. REYKJAVIK OAC CLEARS ABC456 CROSS 63 NORTH 030 WEST AT OR AFTER 1337.	**Meaning** ABC456 is to adjust its speed to ensure that the flight will not reach 63N030W earlier than 1337 UTC.
Example 6b– time restriction delivered via voice (DCPC) – AT OR AFTER ABC456 AMENDED SPEED CLEARANCE. ABC456 CROSS 63 NORTH 030 WEST AT OR AFTER 1337. **Note - the initial phrase “amended speed clearance” may not always be included in clearances issued via DCPC**	**Meaning** ABC456 is to adjust its speed to ensure that the flight will not reach 63N030W earlier than 1337 UTC.
Example 6c – the same clearance delivered via CPDLC CROSS 63N030W AT OR AFTER 1337	**Meaning** ABC456 is to adjust its speed to ensure that the flight will not reach 63N030W earlier than 1337 UTC.
Example 6d – time restriction delivered by radio via voice (using different phraseology) – AT OR LATER, then a speed instruction GANDER OCEANIC CLEARS ABC456 CROSS 50 NORTH 040 WEST AT 1337 OR LATER. AFTER 40 WEST RESUME MACH 082.	**Meaning** ABC456, which is currently assigned Mach 082, is to adjust its speed to ensure that the flight will not reach 50N040W earlier than 1337 UTC. After reaching 50N040W, the flight is to resume maintaining Mach 082.
Example 6e – same clearance delivered via CPDLC CROSS 50N040W AT OR AFTER 1337 AFTER PASSING 50N040W MAINTAIN MACH 082	**Meaning** ABC456 is to adjust its speed to ensure that the flight will not reach 50N040W earlier than 1337 UTC. After reaching 50N040W, the flight is to maintain Mach 082.

ATTACHMENT 3

WEATHER CONDITIONS & CONSIDERATIONS

1. GENERAL

1.1. The following text is concerned primarily with the North Atlantic region north of 27°N. The general flow of air masses and weather systems through the Atlantic are described. Followed by more detailed information on the anticipated local conditions in Greenland, Iceland and the United Kingdom.

2. NORTH ATLANTIC WEATHER SYSTEMS

2.1. The weather situations affecting the safety of aviation weather services in the northern part is mainly dominated by depressions and frontal systems, but in the southern part by hurricanes and tropical storms, particularly in the Caribbean sector and the area between Cape Verde and the Leeward and Windward Islands.

2.2. Semi-permanent Pressure Systems

2.2.1. The Azores or Bermuda High is a region of subsiding warm air, usually oriented in an east-west line near 30°N in the winter and about 40°N during the summer. This high reaches its peak intensity in the summer months.

2.2.2. The Icelandic Low is a feature of the mean pressure charts of the North Atlantic. It is the result of frequent low pressure systems which, after deepening off the east coast of North America, move into the Iceland region.

2.2.3. The statistical average will show low pressure, but on a daily chart it may not even exist. On occasions the subtropical high is greatly displaced. This alters the main storm track resulting in abnormal weather conditions over large sections of the Atlantic.

2.3. Migratory Pressure Systems

2.3.1. Most in-flight weather is produced by frontal depressions. The North Atlantic is a region where new storms intensify or old storms redevelop. New storms may form off the Atlantic Seaboard and intensify as they move north-eastward across the ocean. These storms in particular are most intense in the winter months and have a wide variation in their tracks. Hurricane force winds may be expected near the surface. Sudden deepening of the depressions or changes in the estimated tracks can cause dramatic changes in upper air winds and consequently serious errors in wind forecasts. Winter storms over the North Atlantic should lead to extra careful planning of flights.

2.3.2. Sometimes storms develop west of the Azores and move northward or north-eastward toward Iceland and the United Kingdom. These storms are usually associated with warm highs over western Europe.

2.3.3. Secondary lows often develop west of Greenland when a low moves northeastward across the southern tip. These lows in the Davis Strait-Baffin Bay area result in poor weather conditions in the southeastern Arctic. With the tracks of the main low pressure systems lying to the south of Greenland and Iceland from east to west towards Scotland, cold and often stationary lows form frequently over the Greenland Sea between Iceland and South Greenland. Although these lows are without typical frontal zones, active CB-clouds with snow showers often tend to join into the "semi-front" with continuous snowfall. The same happens in the so- called polar-lows which during winter may develop in arctic air masses around Iceland and between Iceland and Norway.

2.3.4. Tropical storms and hurricanes originate in the Caribbean or eastern Atlantic during the late summer and early fall. They often curve northward around the Bermuda High onto the northern portions of the Atlantic producing severe in-flight and terminal weather.

2.3.5. High pressure areas found over the Atlantic have a variety of paths. Those that move eastward off the North American continent are usually cold domes. In winter these weaken or disappear entirely after they reach the warmer waters of the Gulf Stream. During the summer they generally merge with the Bermuda-Azores High. Occasionally, a high moving eastward off the Labrador coast will continue to build up for two or three days and spread more or less straight eastward to Europe.

2.3.6. Another important facet of the North Atlantic is the effect of the Siberian High. In winter this high may extend southwestward so that its western point reaches across northern Europe and out over the northeastern Atlantic. On rare occasions this high may dominate the entire region of the North Atlantic from Greenland to Europe.

2.3.7. The Azores low is a development that is most widely divergent from the normal conditions. During periods of meridional flow, cold air from northern Canada will advance well southward into the region between Bermuda and the Azores, breaking away from the main body and causing a cold low to develop in that region. These lows usually move very slowly and can become extensive. At the same time high pressure may build up to the Iceland area producing easterly winds over the entire region north of 30N.

2.3.8. On occasions an extensive high pressure area builds up over Europe. This blocks the eastward motion of lows and forces them to curve northward, resulting in the trough over the eastern Atlantic. A ridge then develops in the mid-Atlantic. This ridge in turn blocks lows moving off North America and causes a trough to form near the east coast. These troughs and ridges may persist for days with little motion. In the trough, lows develop, deepen, move northward, and occlude. Development of these low pressure systems is often very rapid, causing sudden, unpredictable weather to occur. One of the most treacherous situations for eastern Canadian terminals occurs when lows deepen or form rapidly south of the Maritimes with a trough northward over the Gulf of St. Lawrence and Labrador.

2.4. Upper Air Circulation

2.4.1. The main flow is generally from west to east, but many variations do exist. The winds are stronger in winter when greater horizontal gradients exist. Inevitably, the strongest winds will be located in the western Atlantic. As the air masses traverse the oceanic area considerable modification occurs resulting in weaker thermal gradients, producing lighter winds over the eastern Atlantic.

2.5. Air Masses

2.5.1. The air masses usually found over the Atlantic are those that have moved across the eastern United States, or southeastward across Canada or the Davis Strait. As these air masses move out over the Atlantic, they rapidly assume maritime characteristics. The greatest change in these air masses occurs while crossing the Gulf Stream or the North Atlantic Drift either northward or southward. This modification may be sharp and very noticeable especially during winter months, when the air becomes very unstable with snow or hail showers or even thunderstorms.

2.6. Oceanic Currents and Temperatures

2.6.1. The dominant feature of the North Atlantic is the warm Gulf Stream and its eastward extension, the North Atlantic Drift. As the drift reaches the European sector it branches out. One portion moves northward along the Norwegian coast, known as the Norwegian Current. Another branch flows into the English Channel area. This produces relatively warm sea temperatures along the European shores during the winter months.

2.6.2. A southward flowing branch of the North Atlantic Drift, combined with up-welling, results in a cool current along the west coast of Africa, called the Canarias Current. Cold Arctic water from the Davis Strait reaches the North American coast as far south as New England. This current is referred to as the Labrador Current.

2.6.3. The effect of these currents on the terminal weather around the coastal area of the Atlantic varies with the time of year, the type of air mass involved, and the direction of flow.

3. GREENLAND LOCAL CONDITIONS

3.1. Seasonal Variation

3.1.1. Within the Søndrestrøm FIR, Arctic weather conditions such as intense storms, severe icing, severe turbulence, heavy precipitation, snow and water in various forms may be encountered throughout the year. Weather conditions change rapidly. Due to the mixture of warm air over the oceans and cold air over the icecap, heavy fog may build up over the coasts, closing down all of Greenland's airports simultaneously. Changes will often take place within a few minutes and will not always be included in the forecast received in your briefing prior to departure.

3.2. Sea Conditions

3.2.1. The waters around Greenland are not influenced by warmer waters such as the Gulf Stream. They are arctic waters with winter temperatures close to 0° Celsius. During the summer period the water temperatures may rise to 3-6° Celsius at the warmest. This is why you may encounter huge amounts of floating ice in the form of icebergs and ice floes at any time of year.

3.3. Terrain

3.3.1. The elevation of the highest point in Greenland is 13,120 ft, (4,006m), and the general elevation of the icecap is about 10,000 ft, (3,053m). The combination of low temperatures and high winds may under certain conditions create a lowest usable flight level of FL 235 in the area near the highest terrain, and FL 190 over the icecap. On the route between Søndrestrøm and Kulusuk the lowest usable flight level in general is about FL 130. An equally high flight level can be encountered to and from Narsarsuaq from Canada or Iceland, as crossing the icecap will require a minimum altitude of FL 130. On the route from Nuuk/Godthaab towards Iceland either direct or via Kulusuk NDB, the lowest usable flight level will often be FL 150. On the direct route via the Prince Christian Sound NDB (OZN) to and from Canada or Iceland, the lowest usable flight level to be expected and planned is FL 110.

3.4. Wintertime Darkness/Summertime Daylight

3.4.1. VFR flight at night is not allowed in Greenland. This means you are prevented from flying into Narsarsuaq or Kulusuk VFR at night. VFR flight is only permitted from the beginning of the morning civil twilight until the end of civil twilight. Civil twilight ends in the evening when the centre of the sun's disc is 6 degrees below the horizon and begins in the morning when the centre of the sun's disc is 6 degrees below the horizon. Additional information may be acquired from the airport of your destination or your flight planned alternate.

4. ICELAND LOCAL CONDITIONS

4.1. Seasonal Variation

4.1.1. The climate in Iceland is largely influenced by both warm subtropical air and cold polar air currents, as well as ocean currents. The mean January (the coldest month) temperature is about 2°C to 0°C (28°F to 32°F). The mean July (the warmest month) temperature is 9°C to F 11°C (48°F to 52°F).

4.1.2. Do not be misled, however, into expecting balmy temperatures and unlimited visibility. Extreme seasonal variations are to be anticipated. Like the majority of the North Atlantic, rapidly changing weather conditions involving severe icing, severe turbulence, and heavy precipitation are common, particularly during the wintertime. Again, these rapid changes make accurate forecasts extremely difficult.

4.2. Sea Conditions

4.2.1. Iceland is located near the border between warm and cold ocean currents. The North Atlantic Drift passes just to the south on its course northeastwards, and one of its branches, the Irminger Current encircles the south, west and partly the north coasts. On the other hand, a branch of the cold East Greenland Current, known as the East Iceland Current, flows in a southerly and south-easterly direction along the east coast. The sea surface temperatures are highest off the south and southwest coasts, 7°C to 8°C in winter, but 8°C to 12°C in summer.

4.3. Terrain

4.3.1. Iceland is a mountainous country with an average elevation of about 1,650 ft. The highest peak is 6,952 ft. (2119 m.) located near the southernmost edge of the island's largest glaciers. Due to the extreme variances in barometric pressure, coupled with high winds, the lowest usable flight level may be FL 120.

4.4. Wintertime Darkness/Summertime Daylight

4.4.1. The shortest period of daylight falls in December. A typical day includes approximately 4 hours of daylight with long twilight periods. During summer nights, the sun remains 6° or more above the horizon, thus experiencing continuous daylight from 2 May to 25 July.

5. UNITED KINGDOM (SCOTLAND) LOCAL CONDITIONS

5.1. Seasonal Variation

5.1.1. The climate over Scotland and the northern part of the UK is influenced by warm maritime and cold polar air masses, modified by the Gulf Stream current. Seasonal variations are to be anticipated, particularly during the wintertime with severe icing, high winds, severe turbulence and heavy precipitation.

5.2. Sea Conditions

5.2.1. The average Mean Sea Surface Temperatures extrapolated for 60N 10W range from 8°C (47°F) in February to 12°C (54°F) in August.

5.3. Terrain

5.3.1. The whole of Scotland is designated as a "sparsely populated area". To the west of the mainland are many groups of islands with few airstrips or NAVAIDS. Scotland is mountainous with the highest peak 4,406 ft. The lowest usable flight level may be FL 075.

6. HYPOTHERMIA

6.1. Causes

6.1.1. Hypothermia can develop quickly and kill you. Sometimes referred to as exposure sickness, it is a condition of the body when its inner-core temperature falls to a level at which the vital organs no longer function effectively.

6.1.2. Hypothermia is caused by cold, wetness, and/or wind chilling the body so that it loses heat faster than it can produce it. Frequently the advent of hypothermia is hastened by a deficiency of energy producing food in the body. However, the greatest single contributing factor to hypothermia is improper clothing.

6.1.3. Hypothermia can occur anywhere that the environmental temperature is low enough to reduce the body temperature to a dangerous level. It occurs most frequently at sea or in rugged mountain terrain where a person on foot can pass from a calm and sunny valley to a wind and rain-lashed mountain ridge in a few hours. Most hypothermia accidents occur in outdoor temperatures between 1° and 10° C (30° to 50°F).

6.2. Symptoms

6.2.1. Fortunately the approach of hypothermia is easily noticeable and its advance marked by recognizable steps or stages. If the warning signs are heeded and counter-measures taken, tragedy can be avoided.

6.2.2. Noticeable symptoms normally occur in the following stages:

1. A person feels cold and has to exercise to warm up.

2. He starts to shiver and feel numb.

3. Shivering becomes more intense and uncontrollable.

4. Shivering becomes violent. There is a difficulty in speaking. Thinking becomes sluggish and the mind begins to wander.

5. Shivering decreases and muscles begin to stiffen. Coordination becomes difficult and movements are erratic and jerky. Exposed skin may become blue or puffy. Thinking becomes fuzzy. Appreciation of the seriousness of the situation is vague or nonexistent. However, the victim may still be able to maintain the appearance of knowing where he is and what is going on.

6. The victim becomes irrational, loses contact with the environment, and drifts into a stupor.

7. Victim does not respond to the spoken word. Falls into unconsciousness. Most reflexes cease to function and breathing becomes erratic.

8. Heart and lung centres of the brain stop functioning. The individual is now a fatality.

Note: Although the above symptoms are those typically noted, one of the editors of this manual has experienced hypothermia and he recalls that his symptoms were NOT easily noticeable. In fact, he was not aware at all that he was slipping into hypothermia. His symptoms were observed by a climbing partner who took appropriate action.

6.3. Treatment

6.3.1. A person who is alert and aware of the potential dangers can help himself in stages 1 through 3. But once the condition has advanced to stage 4 and the person's mind begins to wander, he may not realize what is happening and may well need assistance. Further deterioration will definitely require outside aid. Anyone showing any of the above-mentioned symptoms, including the inability to get up after a rest, is in trouble and needs your help. He may not realize and deny there is a problem. Believe the symptoms, not the victim. Even mild symptoms demand immediate and positive treatment.

1. Get the victim out of the cold, wind, and rain.

2. Strip off all wet clothes.

3. If the person is only mildly impaired;

   (a) give him warm, non-alcoholic, drinks.

   (b) get him into dry clothes and a warm sleeping bag;

4. If the victim is semi-conscious or worse;

   (a) try to keep him awake and give him warm drinks.

   (b) leave him stripped: put him in a sleeping bag with another person (also stripped); skin to skin contact is the most effective treatment.

5. If he has recovered sufficiently to eat, feed him. Make sure he is dressed in warm clothing and well rested before starting on again.

6. If the victim has to be carried out, make sure his body temperature has been brought up to normal and wrap him in a good sleeping bag before starting out.

6.4. Prevention

6.4.1. With the exception of cases involving bodily injury, most hypothermia accidents may be prevented. The first thing to remember is that hypothermia can occur anywhere and at any time that the air temperature drops low enough so that if a body is exposed, its inner-core temperature can be reduced to the danger level. Remember, wind chills the air.

6.4.2. Wet clothing in cold weather extracts heat from the body nearly 200 times faster than dry clothing. Wool clothing provides better protection than cotton in wet weather. In inclement weather, an uncovered head can account for up to 60% of body heat loss. A good wool cap is essential. The most common contributors of the development of problems during cold, wet, and windy weather are lack of proper clothing, inadequate shelter, and exhaustion. The best defense against the advent of hypothermia is to avoid exposure by being prepared.

1. Dress appropriately.

2. Carry rainwear, extra dry clothes, food, and matches.

3. Bring potential dangers to the attention of anyone inappropriately dressed. It could save their life.

4. Make the basic rules of conduct for trail safety clear, and that you expect them to be observed.

5. Travel at the speed of the slowest member of your party.

6. Break frequently for rest and gear check.

7. Distribute candies or other nibble food.

8. Keep watching all members of your party for signs of fatigue or discomfort.

Note: Items 5. and 6. above refer to the action of journeying on foot. In the case of having had to land or crash-land an aircraft in inhospitable and unpopulated territory, unless circumstances dictate otherwise, it is generally better to remain with the aircraft rather than attempting a trek to safety. The aircraft hull may be able to provide some degree of shelter and importantly, SAR services will have an easier job of locating a downed aircraft than a small group of individuals.

ATTACHMENT 4

CHECKLIST FOR PRIVATE PILOTS

This Attachment supplements the information in this manual by providing a general checklist for pre-flight preparation, inspection and in-flight contingencies.

Be prepared for systems failure. Know what to do in advance. Always plan a way out of a situation. If a borderline decision must be made, take the safest course of action. Don't exceed pilot or aircraft limitations. If anything, including weather, equipment, or your health, is not up to par, DON'T GO.

Position survival gear so that it is readily available, but clear of controls. The best survival techniques include thorough planning, knowledge of the route, and reliable weather information. There is no room for error in trans-oceanic flight, so plan accordingly, then re-check.

Allow sufficient time for a thorough briefing, planning, and administrative details. Have airplane ready the night before, avoiding the possibility of last minute mistakes.

Pre-Flight Preparation

The following checklist, cross-referenced to text appearing in this manual, will assist you during the preparation stages of your oceanic flight.

1. Current departure, en-route, arrival and topographical charts (Chapter 12)
2. An instrument rating (Chapter 12)
3. Long range NAVAIDS (Chapter 6)
4. Available daylight on your route (Chapter 12)
5. Aircraft inspected by a licensed mechanic for suitability for a long, over water crossing. The necessary aircraft documents (Chapter 12)
6. If transiting Canadian airspace, the required Sea/Polar Survival equipment necessary to adhere to Canadian Air Regulation 540 (Chapter 12)
7. Format to be used when filing an oceanic flight plan (Chapter 4)
8. The proper procedures to be used in obtaining an IFR clearance (Chapter 6 & Chapter 12)
9. How to prevent hypothermia (Chapter 12)
10. VHF radio coverage in the NAT Region (Chapter 5 & State AIPs)
11. A position report and a revised estimate (Chapter 5)
12. SELCAL Code (Chapter 5)
13. Flight planned for FL 285 or above approval from the State of Registry (Foreword & Chapter 1)
14. Approval for flight in ADS-B airspace (Chapter 8).
15. Search and Rescue services. The importance of an ELT (Chapter 1 & Chapter 12)
16. The relevant meteorological information (Chapter 12)
17. Current NOTAMs with special regard to the status of radio-navigation aids and airport restrictions. (Chapter 12)

Pre-Flight Inspection

Pull the cowling and inspect for leaks and general overall condition.

Inspect:

1. Fuel system and management
2. Radio equipment and condition
3. Engine condition
4. Oil pressure, temperature, and consumption
5. Instruments

Check compass on nearest runway heading to your course.

1. Swing compass with radios and navigation lights ON
2. Check compass deviation with master switch off
3. Check compass deviation with VHF off
4. Check compass deviation with HF both ON and OFF
5. Check compass deviation with pilot heat ON
6. Check compass deviation with rotating beacon ON and OFF
7. Make notes on all deviations
8. Keep alternator load at 50% or less if possible
9. DO NOT assume compass card is accurate ADF may be affected by the alternator, VHF, HF, pilot heat, rotating beacon, autopilot, coastal refraction, or atmospheric conditions. Check and re-check all NAVAIDs receivers.

After a long flight, pilot's ability to handle marginal weather conditions may be in serious doubt. Therefore, weather minimums should be well above the published minimums. Alternate airports should be chosen with the same care.

In-flight contingencies.

Deviations:

Obtain clearance for deviations unless in an emergency, then the appropriate air traffic services unit must be notified of the action taken and that the action has been taken under emergency authority.

Reports:

Report any problems to Air Traffic Control agencies or on VHF 121.500 MHz as soon as possible.
Use the VHF frequency 123.450 MHz as an air-to-air communications channel to ask for assistance if needed.

ATTACHMENT 5

CHECKLIST FOR DISPATCHERS

This Attachment supplements the guidance found in the Guidance for Flight Dispatchers Chapter of NAT Doc 007. It is intended as a checklist for those planning and monitoring/tracking flights in the NAT.

Index

1. Know your Airspace - Regulatory requirements and consequential routing limitations
2. Minimum Equipage (Navigation/Altimetry/Communications)
3. Special non-compliance routings
4. Flight planning
5. Flight Monitoring
6. En-route Equipage Failures
7. Document References
8. Separation Requirements

Checklist for Flight Dispatchers

1. Know your Airspace - Regulatory requirements and consequential routing limitations

Recall Item	Check	Timelines	Reference	
HLA Boundaries	Does my Routing enter the vertical & lateral boundaries of HLA Airspace	4 February 2016	Ensure: » HLA Ops Specs Approval	
PBCS Compliance - I	Understand PBCS requirements	29 March 2018	These standards require your airline to be in compliance with the required communication performance (RCP) 240 and required surveillance performance (RSP) 180.	ICAO Doc 9869, Performance-based Communication and Surveillance (PBCS) Manual Appendices B and C
PBCS Compliance - II	Is my aircraft and crew PBCS Compliant?	29 March 2018	ICAO FPL Filings: **PBC**: Insert the appropriate descriptor (**P2**) in Item 10a **PBS**: Insert relevant required surveillance performance (RSP) specification(s) (**RSP180**) in Item 18 of the flight plan following the SUR/ indicator. **CPDLC**: Insert the appropriate descriptor (**J5 or J7**) in Item 10a	

Recall Item	Check	Timelines	Reference	
			of the FPL **ADS-C**: Automatic Dependent Surveillance — Contract (ADS-C) services shall insert the **D1** descriptor in Item 10b of the FPL.	
Mandatory Mode S Carriage	BIRD FIR	1 July 2025	All IFR aircraft operating within the Reykjavik FIR must be equipped with Mode S Elementary Surveillance (ELS). All IFR fixed-wing aircraft of a maximum certified take-off mass exceeding 5 700 kg or that have a maximum cruising true airspeed capability greater than 250 kt, with an individual certificate of airworthiness first issued on or after 7 June 1995, must be equipped with Mode S Enhanced Surveillance (EHS).	(refer to AIP Iceland for certain exemptions that apply)
Mandatory ADS-B Carriage	T9 T290 BIRD FIR Northern boundary: 65N000W - 67N010W - 69N020W - 68N030W - 67N040W - 69N050W - 69N060W - BOPUT. Southern boundary: GUNPA (61N000W) - 61N007W - 6040N010W - RATSU (61N010W) - 61N020W - 63N030W - 64N040W - 64N050W – EMBOK		Aircraft not equipped with FANS 1/A (or equivalent) systems will be allowed to operate within this area at DLM designated flight levels, provided the aircraft is suitably equipped (transponder with ADS-B extended squitter transmitter). ICAO FPL Filings: Item 10b **EB1** or **EB2** or **LB1** or **LB2**.	
T9 and T290	a) VHF 8.33 KHz		ICAO FPL Filings:	

Recall Item	Check	Timelines	Reference	
Requirements	equipped b) NAT HLA certified c) RNP 2 certified, GNSS, RNP d) Surveillance equipment - SSR Mode S - Transponder - Mode S, including aircraft identification, pressure altitude and extended squitter (ADS-B) capability ADS-B with dedicated 1090 MHz ADS-B 'out' capability		a) Item 10a **Y** b) Item 10a **X** c) Item 10a **GRZ** and Item 18 **NAV/RNP2** d) Item 10b **EB1** or **EB2** or **LB1** or **LB2**.	
Datalink Mandate Compliance	FL 290 to FL 410 (inclusive) throughout the ICAO NAT Region.		**CPDLC**: Insert the appropriate descriptor (**J5 or J7**) in Item 10a of the FPL **ADS-C**: Automatic Dependent Surveillance — Contract (ADS-C) services shall insert the **D1** descriptor in Item 10b of the FPL.	

- State Approvals (NAT HLA /RVSM) See: Chapter 1.
- Approval for flight in NAT ADS-B airspace. See: Chapter 1.

2. Minimum Equipage (Navigation/Altimetry/Communications)

- ✓ NAT HLA See: Chapter 1
- ✓ RVSM. See: Chapter 1 and Chapter 11
- ✓ HF Communications. See: OpSpecs
- ✓ DLM. ADS-C (Automatic Dependent Surveillance Contract) and CPDLC (Controller Pilot Data Link Communications) over SATCOM. See: OpSpecs
- ✓ ETOPS/EDTO. See Annex 6 Part 1
- ✓ MEL provisions. See: OpSpecs

3. Special non-compliance routings

- ✓ Long Range Navigation Systems. See: Chapter 1 and Chapter 9.
- ✓ Not approved for NAT HLA/RVSM. See Chapter 1.
- ✓ Routings without functioning HF Communications. See: Chapter 4.
- ✓ Maintenance Flights, temporarily non-RVSM. See: State AIPs.
- ✓ Delivery and Humanitarian Flights. See: State AIPs.

4. Flight planning

- ✓ Eastbound or westbound flights should be flight planned by significant points at whole degrees of latitude at each crossed ten degrees of longitude (10°W, 20°W, 30°W, 40°W etc.);
- ✓ Northbound or southbound flights should be flight planned by parallels of latitude spaced at five degree intervals (65°N, 60°N, 55°N etc.). See Chapter 4 and Chapter 11.
- ✓ Separate Organised Track System (OTS) structures. See: Chapter 2 and Chapter 3.
- ✓ North American Region., transitional airspaces and linking route structures in and through NAM Region. See: Chapter 3 and AIS of the relevant State authorities and/or via their websites.
- ✓ Flight Levels on OTS Track may plan at any of the levels as published for that track. Aircraft on a random route may plan any flight level(s) irrespective of direction. See: North Atlantic Flight Level Allocation Scheme (NAT FLAS **Error! Reference source not found.**). States AIPs and NOTAMs.
- ✓ Mach Number and cost index (ECCON) See: Chapter 4.
- ✓ FPL completion. A free text editor is available on the EUROCONTROL website.
- ✓ Approvals:
    - NAT HLA, the letter 'X', in addition to the letter 'S', within Item 10.
    - RVSM operations, the letter 'W' must also be included in Item10.
    - RNP approval; in Item 10 (Equipment) with the letter "R" and annotate Item 18, PBN/A1 (RNAV 10 (RNP 10) Approval) or PBN/L1 (RNP 4 Approval) NAV/RNP2 (RNP 2 approval for operation on T9 and T290). See: Chapter 4.
    - ADS-B, B1 or B2 in Item 10b.
    - PBCS operations, P2 in Item 10a and RSP180 in Item 18 following SUR/.

5. Flight Monitoring

- ✓ ATC clearances. See: Chapter 6
- ✓ Transponder Use. See: Chapter 11
- ✓ Re-Routes. See: Chapter 11
- ✓ En-route Contingencies. Chapter 11
- ✓ Loss of communications and HF failure. See Chapter 11 and Chapter 5.
- ✓ Normal Flight Tracking. See ICAO Annex 6 Part 1 Chapter 3.5.1
    - o 3.5.1 For appropriate aircraft, track every 15 minutes
    - o 3.5.4 Retention of tracking data
        - ▪ Note to 3.5.4 regarding 3rd party normal aircraft tracking…must comply with the policies and procedures of the operator
    - o ICAO Circular 347 Normal Flight Tracking – Guidance for Operators

6. En-route Equipage Failures

- ✓ Prior to entering NAT RVSM Airspace See: OPTION 1 to OPTION 3, Chapter 11
- ✓ After entering NAT RVSM Airspace. See: State AIPs.

7. Document References

Reference	Check
PBCS Manual (ICAO Doc 9869)	
PANS ATM Doc.4444	
ICAO Global Operational Data Link (GOLD) Manual (Doc 10037).	
EUR-NAT Supps. Doc 7030	
ICAO Annex 6 Part I	
ICAO Circular 323	
ICAO Circular 347 Normal Flight Tracking	

ATTACHMENT 6

BIBLIOGRAPHY AND OTHER REFERENCE MATERIAL

ICAO Annex 2* – Rules of the Air

www.icao.int

ICAO Annex 6* Operation of aircraft

www.icao.int

ICAO Annex 10* Aeronautical communications

www.icao.int

ICAO Doc 4444* Procedures for Air Navigation Services – Air Traffic Management (PANS–ATM)

www.icao.int

ICAO Doc 7030* (Regional Supplementary Procedures (SUPPS)

www.icao.int

ICAO Doc 8168* Procedures for Air Navigation Services – Aircraft Operations (PANS–OPS)

www.icao.int

ICAO Doc 8643* Aircraft Type designators

www.icao.int

ICAO Doc 9574* Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive

www.icao.int

ICAO Doc 9613* Performance-Based Navigation Manual (PBN)

www.icao.int

ICAO Doc 10037* Global Operational Data Link (GOLD) Manual

www.icao.int

ICAO Doc 9869* Performance-based Communication and Surveillance (PBCS) Manual

www.icao.int

* ICAO saleable documents - Please contact ICAO Headquarters, Montreal sales@icao.int

ICAO Doc 9849* Global Navigation Satellite System (GNSS) Manual

www.icao.int

ICAO Doc 10100* Manual on Space Weather Information In Support of International Air Navigation

www.icao.int

ICAO NAT HF Guidance Material (NAT Doc 003)

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > NAT Doc 003

Oceanic Errors Safety Bulletin

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > NAT OES Bulletins

NAT OPS Bulletins

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > NAT OPS Bulletins

ICAO NAT Planning Documents Supporting Separation Reductions and Other Initiatives

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > Planning documents supporting separation and other initiatives

Canada AIP

www.NAVCANADA.ca/

Canadian Flight Supplement - A saleable document which can be ordered via**:**

http://products.navcanada.ca

EASA CS-ACNS - Certification Specifications and Acceptable Means of Compliance for Airborne Communications, Navigation and Surveillance

https://www.easa.europa.eu/en/document-library/easy-access-rules/easy-access-rules-airborne-communications-navigation-and

EASA AMC 20-24

https://www.easa.europa.eu/en/certification-specifications/amc-20-general-acceptable-means-compliance-airworthiness-products-parts

ETSO- CS-ETSO

https://www.easa.europa.eu/en/certification-specifications/cs-etso-european-technical-standard-orders

Iceland AIP

http://eaip.samgongustofa.is/

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* ICAO saleable documents - Please contact ICAO Headquarters, Montreal sales@icao.int

Ireland AIP

https://www.airnav.ie/air-traffic-management/aeronautical-information-management/aip

RTCA DO 260/A/B

https://standards.globalspec.com/std/1994503/rtca-do-260

UK AIP

https://nats-uk.ead-it.com/cms-nats/opencms/en/Publications/AIP/

USA FAA TSO-C145, TSO-C146, TSO-C196 (GPS Certification)

https://drs.faa.gov

USA FAA AC 20-138() (Airworthiness Approval of GPS)

https://drs.faa.gov

USA FAA AC 20-165() (Airworthiness Approval of ADS-B)

https://drs.faa.gov

USA FAA AC91-85() (RVSM MASPSs)

https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1035328

USA FAA NAT Resource Guide for U.S. Operators

https://www.faa.gov/about/officeorg/headquartersoffices/avs/nat-resource-guide

USA US Airport Facility Directory (NARs)

https://www.faa.gov/air_traffic/flight_info/aeronav/productcatalog/supplementalcharts/
https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dafd/

USA US AIP

https://www.faa.gov/air_traffic/publications/

USA US Coastguard GPS advisory

http://navcen.uscg.gov/gps-nanu-almanacs-opsadvisores-sof

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