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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)

EUROPEAN AND NORTH ATLANTIC OFFICE OF ICAO

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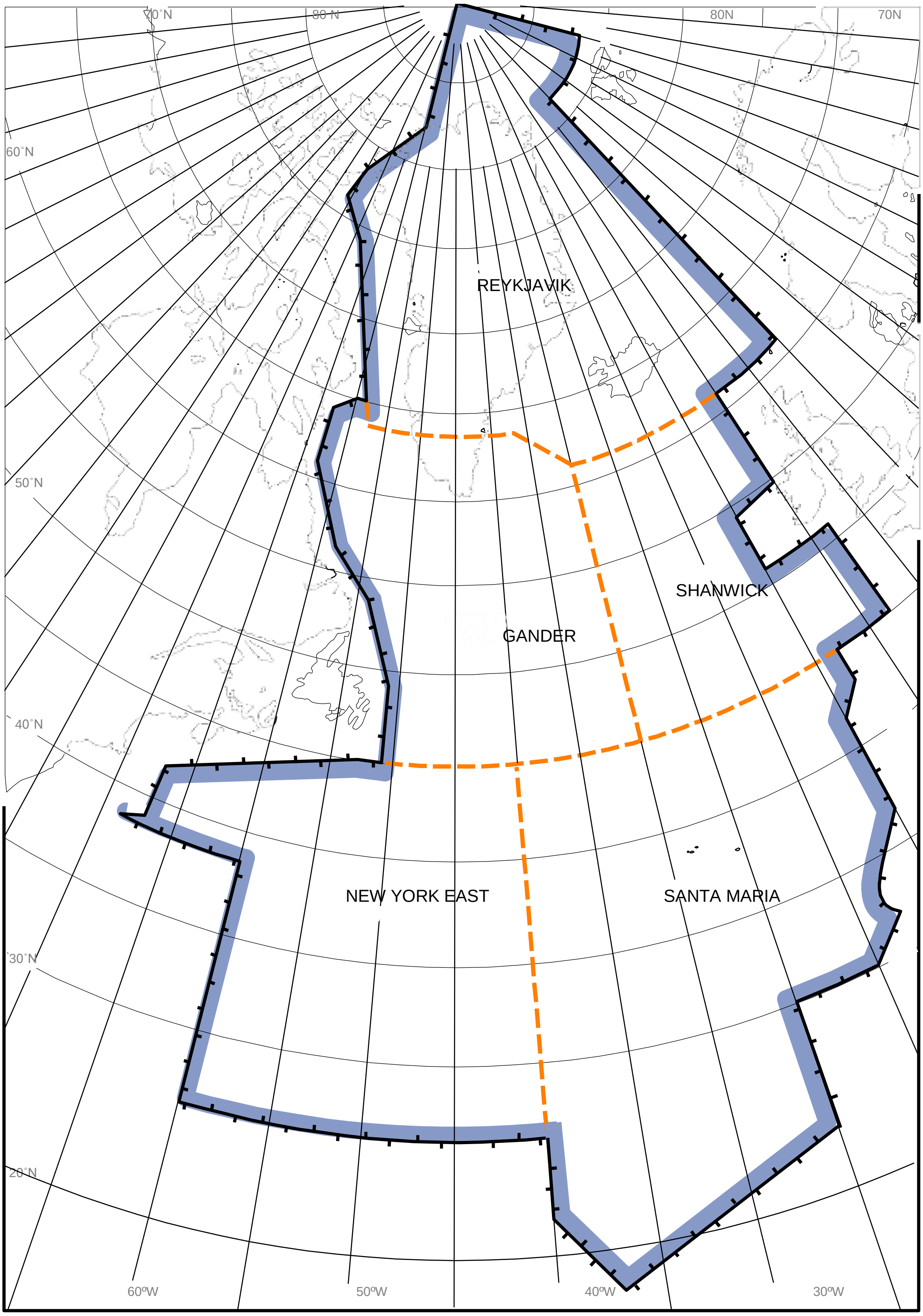

Figure 1 – The North Atlantic High Level Airspace (NAT HLA)

(Prior to February 2016 designated as "NAT MNPS Airspace") (Map to be updated)

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FOREWORD

This Document has been produced with the approval and on behalf of the North Atlantic Systems Planning Group (NAT 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. In 2012 approximately 460,000 flights crossed the North Atlantic. For the most part in the North Atlantic, Direct Controller Pilot Communications (DCPC) and ATS Surveillance are unavailable. Aircraft separation assurance and hence safety are nevertheless 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 altitudes FL290 – FL410. 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 North Atlantic Region, through which the majority of these North Atlantic crossings route between FLs 285 and 420 inclusive, is designated as the NAT High Level Airspace (NAT HLA). 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 crew procedures and training have been adopted. The lateral dimensions of the NAT HLA airspace include the following Control Areas (CTAs):

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

*Some idea of these dimensions can be obtained from the maps at Figure **1** and those in Chapters 2 and 3. However, for specific dimensions, reference should be made to ICAO Regional Air Navigation Plan and North Atlantic Regional Supplementary Procedures (Doc.7030) - NAT/RAC (available at www.icao.int/EURNAT/).*

Note that "NAT HLA Airspace" is a re-designation of the airspace formerly known as the "North Atlantic Minimum Navigational Performance Specifications Airspace (NAT MNPSA)" but excludes those portions of SHANWICK OCA which form the SOTA and BOTA areas and includes the BODO OCEANIC FIR. This re-designation is the third of the milestones of the "MNPS to PBN Transition Plan" for the North Atlantic Region and is effective from 04 February 2016. However, recognizing that ICAO Annex 6 allows for a "minimum navigation performance specification" to be regionally specified in Regional Supplementary Procedures Doc 7030, it has been determined to maintain reference to a "MNPS" in the NAT Region within NAT Doc 7030 and in this guidance material (Doc 007), within particular contexts. Thus, approvals initially issued to operate in the NAT MNPSA are referred to as "NAT MNPS" approvals and approvals issued to operate in the NAT HLA are referred to as "NAT HLA MNPS" approvals.

Pilots MUST NOT fly across the North Atlantic within NAT HLA airspace, nor at flight levels 290 to 410 inclusive anywhere within the NAT Region, unless they are in possession of the appropriate Approval(s) issued by the State of Registry or the State of the Operator. It should be noted that State Approvals for NAT

MNPSA operations granted prior to 04 February 2016 will be valid for NAT HLA operations. Except that those Approvals issued prior to 01 January 2015 and based upon the earlier "6.3 NMs" MNPS standard, will not be valid beyond January 2020.

Although aircraft and pilots may fly above the NAT HLA without the requisite of a NAT HLA MNPS Approval, it is important that 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, Pilots 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, pilots or dispatchers. It combines the guidance material contained prior to 2010 separately in the "North Atlantic MNPS Airspace Operations Manual", and the ICAO "Guidance Material for Air Navigation in the North Atlantic Region.

Aircraft without NAT HLA MNPS or RVSM Approvals may, of course, also fly across the North Atlantic below FL285. However, due consideration must be given to the particular operating environment. Especially by pilots/operators of single and twin engine aircraft. 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 was previously contained in the North Atlantic International General Aviation (NAT IGA) Operations Manual published by the FAA on behalf of the ICAO North Atlantic Systems Planning Group (NAT SPG). However, with effect from Edition 2013, such guidance has been subsumed into this document.

The resulting consolidated 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.

A separate document, "NAT Region Updates Bulletin", is also available from the website. This advises operators of any recent changes to procedures or associated operational information which may affect their conduct and planning of operations in the ICAO North Atlantic (NAT) Region.

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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.

In October 2012 UK NATS completed a publication titled 'Track Wise-Targeting Risk within the Shanwick OCA'. It was produced in collaboration with the Safety Partnership Agreement. It is available as a DVD or can be viewed on-line via You-Tube. Like this Manual, it is aimed at pilots, dispatchers and others concerned in flight operations in the North Atlantic. It follows the progress of a westbound NAT flight through the Shanwick OCA as well as exampling contingency and emergencies situations. While the operational procedures elements are specific to Shanwick, the majority of the DVD considers issues common to the whole ICAO NAT Region. It is available at no charge to bona fide operators on application to: customerhelp@nats.co.uk.

The complete DVD can be accessed from the European and North Atlantic (EUR/NAT) Office public pages on the ICAO website (www.icao.int/EURNAT/), following "EUR & NAT Documents", then "NAT Documents", then selecting "Trackwise for on-line U-Tube viewing". It is also available on YouTube™, looking for "**Trackwise - Targeting Risk Within The Shanwick OCA**", or directly at https://www.youtube.com/watch?v=EJTjwW5ZYas

As part of the continuing development within the operating environment of NAT HLA airspace, 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 pilots. For a listing of current initiatives and trials (if any) and participation details etc., reference should be made to the AIS documentation 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/).

DEVELOPMENT OF CONTENT

This is the fifth publication of this NAT Document 007.

History

This document was initially developed to incorporate updated elements from Edition 2009 of the "North Atlantic MNPS Airspace Operations Manual" and relevant elements from the 7th Edition (2002) of the NAT Doc 001 - "Guidance and Information Material Concerning Air Navigation in the North Atlantic Region". NAT Doc 007 format is based upon that of Edition 2009 of the MNPS Airspace Operations Manual. However, it includes the content modifications and additions, as listed below, most of the latter arising from the 7th Edition of NAT Doc 001. Additionally, subsequent to the publication of Edition 2009 of the NAT MNPS Airspace Operations Manual, various other guidance material documents in the NAT Library were designated as "NAT OPS Bulletins". Mostly they provide detail in respect of specific elements of NAT operations. Some are copies or paraphrases of NAT ATS Provider State AIS. Since individual States must retain the prerogative to revise their AIS, as and when dictated by infrastructure developments, experience or changes to regulations, it was determined that detailed information provided in these NAT OPS Bulletins should be omitted from NAT Doc 007. The Document does, however, include references to these Bulletins where appropriate.

Edition 2010 Title and Content Modifications and Additions

<u>Document Title</u>

Prior to 2010 guidance aimed at North Atlantic operators was split between the "NAT MNPS Airspace Operations Manual" and the "NAT International General Aviation Operations Manual". The latter of these documents dealt primarily with flights in the North Atlantic Region below turbojet levels, while the former concentrated on the unique requirements and procedures relating to flight through the NAT MNPS Airspace (FL290-410 inclusive). During the years preceding 2010 there was a significant growth in the numbers of flights in the NAT Region at flight levels above FL410. In part this was as a result of larger numbers of high flying business jets but also it followed from aerodynamic design improvements of the latest generation of commercial jet transports. Although aircraft and pilots may fly above the NAT MNPSA without the requisite of an MNPS Approval, it is important that crews of such aircraft have both an understanding of the operational procedures and systems employed in the MNPSA and also specific knowledge of the location of any active OTS structure. This is important to help mitigate risk associated with any planned or unplanned penetration of the NAT MNPS Airspace (viz. emergency descents). On this basis particular guidance material was included in NAT Doc 007 and it was entitled "GUIDANCE CONCERNING AIR NAVIGATION IN AND ABOVE THE NORTH ATLANTIC MNPS AIRSPACE".

<u>Content Modifications and Additions</u>

Note: Subsequent references in this section to "NAT Doc 001" refer to the 2002 7th Edition of the document entitled "Guidance and Information Material Concerning Air Navigation in the North Atlantic Region", which was previously included in the ICAO North Atlantic Regional Library. That document was withdrawn from that library with the publication of the first Edition of the subject NAT Doc 007 in 2010 and is no longer available on-line. The annotation "NAT Doc 001" has subsequently been re-allocated to the "NAT SPG Handbook", which contains information on the functions and working methods of the NAT SPG, together with the NAT Regional Safety Policy Statement. This document is itself now available in the European and North Atlantic (EUR/NAT) Office public pages on the ICAO website (www.icao.int/EURNAT/).

The recommendations for Crew Training for NAT MNPS Airspace operations, as were previously contained in section 3.13 of the Guidance and information Material Concerning Air Navigation in the North Atlantic Region NAT - Doc 001, were incorporated into NAT Doc 007 Chapter 1 - "Operational Approval and Aircraft System Requirements for Flight in the NAT MNPS Airspace".

Recommendations for the Presentation of Navigation Information previously contained in section 3.14 of the Guidance Information Material - NAT Doc 001 were incorporated into NAT Doc 007 Chapter 8 – “MNPS Flight Operation and Navigation Procedures”.

Elements of Part 4 of the Guidance Information Material - NAT Doc 001 dealing with recommended procedures for the adoption by State Regulators in the granting of MNPS Approvals were incorporated into NAT Doc 007 Chapter 1 – “Operational Approval and Aircraft System Requirements for Flight in the NAT MNPS Airspace”.

The contents of Parts 6 and 7 of the Guidance Information Material - NAT Doc 001, dealing with Temporary Airspace Reservations, Formation Flying and Missile Activity in the NAT Region are of direct interest only to State or Military Aircraft Operating Agencies and to NAT ATS Providers. Consequently they are referenced only in passing in Chapter 1 of NAT Doc 007. The future repository of the detail would be determined by the appropriate competent authorities.

Part 8 of the Guidance Information Material - NAT Doc 001 dealt with “Manned Balloon Flights in the NAT Region”. Such flights are specifically excluded from operating in NAT MNPS Airspace and each such flight must be meticulously co-ordinated far in advance with the relevant ATS Providers. Consequently only passing reference is made in Chapter 1 of NAT Doc 007.

Appendix A5 from the Guidance Information Material - NAT Doc 001 - “VHF Air/Ground Communications Coverage Existing in the NAT Region at FL 300” was incorporated as Attachment 5 to NAT Doc 007.

A Chapter (# 11), “Monitoring of Aircraft Systems and Crew Performance” was included in NAT Doc 007. This Chapter incorporates the contents of Sections 8.7 & 9.3 and Attachment 1 of Edition 2009 of the MNPS Airspace Operations Manual, together with further information on the Monitoring Methods employed and the Collision Risk Models used (including information from Appendix B and Appendix C19 of the Guidance Information Material - NAT Doc 001).

In 2010 a number of NAT ATS Provider States were conducting or planning ADS-B Trials in the NAT Region and in immediately adjacent domestic airspace. Reference to these operations was included into NAT Doc 007 at Chapter 6 - “Communications and Position Reporting Procedures”.

In 2010 the sample “Oceanic Check List Proposals” and the “Expanded Oceanic Check List” which were previously included in Chapter 12 of the 2009 Edition of the MNPSA Operations Manual were published in full as NAT OPS Bulletins. Their details were consequently omitted from NAT Doc 007.

Edition 2011Content Modifications and Additions

A temporary corrigendum to Edition 2010 rescinding the guidance on the NAT Region-wide availability of SATCOM Voice for regular ATS voice communications was superseded following the adoption on 13 May 2011 of a relevant Amendment to the North Atlantic Supplementary Procedures 3.4. The corrigendum was consequently removed from the 2011 Edition.

In December 2010 new text was added to Paragraph 3.7 of Attachment 4 to highlight some of the Common Errors made by operators when providing NAV Equipment information in Field10 and Field 18 of a NAT flight FPL.

Also in December 2010 additions were made to NAT Doc 007 in Chapters 6 and 12 to apprise Operators of the existence and availability of the “*North Atlantic Air Traffic Management Operational Contingency Plan*” (NAT Doc 006) and to encourage all regular NAT Operators to ensure their familiarity with the content.

Reference was made in Edition 2011 to the plan to incorporate major changes to the content of the ICAO flight plan on 15 November 2012. Operators were encouraged to study these changes and develop plans for implementation.

An additional chapter was included in Edition 2011 (Chapter 10) describing the ATS surveillance services provided within the NAT Region.

Further references were made within Edition 2011 to implemented and planned ADS-B services within and adjacent to the NAT Region.

References to Traffic levels and error rates were updated to reflect more recent experience.

A new section 1.9 was added to Chapter 1 of NAT Doc 007 to draw the attention of NAT Operators and their Regulators to the planned developments of systems and procedures which will significantly affect flight operations within the NAT Region in the coming years.

Text modifications were made to NAT Doc 007 "Chapter 11 - Monitoring of Aircraft Systems and Crew Performance", to reflect adjustments to the NAT SPG working structure, which were effected in 2009 to accommodate the changes in emphasis to performance based requirements, as driven by the Global Air Navigation Plan (ANP), and to take account of the Global Aviation Safety Plan (GASP).

For further clarification of the Weather Deviations procedures, text revisions were made in NAT Doc 007 at "Chapter 13 – Special Procedures for In-flight Contingencies".

Text revisions and additions were included in NAT Doc 007 at "Chapter 13 - Special Procedures for In-flight Contingencies" to reference the potential for the appearance of ACAS/TCAS targets in circumstances relating to the trial implementations of 5 minutes longitudinal separations within parts of the NAT Region.

Edition 2012 Title Change and Content Modifications/Additions Incorporated

Document Title Change

The MNPS concept, together with the air traffic management systems and procedures employed, have served air safety well for four decades, in this the busiest of the world's oceanic airspaces. During more recent times, the underlying principles upon which MNPS was based have been developing toward a global Performance Based Navigation (PBN) concept, resulting in the formulation of RNAV and RNP specifications of air navigation performance. The provisions of RNP specifications are embodied into the "Performance Based Navigation (PBN) Manual" (ICAO Doc.9613). It is the intention of ICAO and the NAT SPG to transition from MNPS to PBN in the North Atlantic Region. The plan for this transition has been developed and is available available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents".

Eventually, MNPS will be eliminated as a requirement and basis for separation in this airspace, to be replaced by appropriate separation standards based upon RNP Navigation Specifications. However, to accommodate the high traffic levels here, the unique diurnal flexible track structure of the NAT OTS is expected to continue to be employed and specified crew procedures, training and system knowledge will remain an essential requirement. In consequence, State authorisations of operators and crews will continue to be required to operate in the airspace currently designated as NAT MNPS airspace and appropriate guidance documentation for both operators and States of Registry will be needed. Such guidance material will evolve directly from that provided by this NAT Doc 007 and to ensure a continuity of future reference the NAT SPG determined that the title of NAT Doc 007 should now be changed to the "North Atlantic Operations and Airspace Manual".

Content Modifications and Additions incorporated into Edition 2012

An addition to the Foreword drew the attention of the reader to the existence of the "NAT Region Updates Bulletin", available from the ICAO EUR/NAT website, which advised operators of recent changes which may affect their conduct and planning of operations in the ICAO North Atlantic (NAT) Region.

The Chapter 1 "Future Developments" section in Edition 2011 of NAT Doc 007 was extended to include more detail of the regional development plans and to include information on current trials.

The trials referred to in Chapter 1 included the "ENGAGE" trials of variable Mach and variable Altitude. Additional reference to these trials was included in Chapter 7 in an elaboration of the continuing requirement for adherence to the Mach Technique.

The first phase of the NAT Data Link Mandate was to come into effect on 07 February 2013 and Operators not meeting the mandate would be excluded from flight planning or operating on two specified OTS Tracks between FL360 and 390 inclusive, during the peak hours. Relevant Text additions were included in Chapters 1, 2, 4 and 17

Amendment No.1 to the Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM, Doc 4444) 15th Edition allowing the filed flight plan to accurately reflect the equipment on board the aircraft and the capabilities of both it and the crew and also changing the way certain other information elements are presented in the flight plan, became globally applicable on 15 November 2012. Text revisions were made to Chapters 4 and 17 to reflect this. Attachment 4 – ICAO FPL Completion for a NAT flight was extensively modified.

An Amendment to the ICAO NAT Regional Supplementary Procedures – Doc 7030 modifying and clarifying the method of definition of random routes was approved in November 2012. To reflect these changes text modifications and additions were included in Chapters 4 and 17 and in Attachment 4 – ICAO FPL Completion for a NAT Flight.

A chart showing the ATS Surveillance Services in BREST UIR & BOTA was added to Chapter 10 at Section 10.10.

An additional "Tango Route" No.13 (TAMEL – BERUX) had been recently implemented. Reference was included in Chapter 3 and the route is shown on the Chart of ATS Surveillance Services in BREST UIR & BOTA at Section 10.10. As is the case with T16, full State Unrestricted NAT MNPS Approval is required to plan and fly this route. The addition of this new route onto the Chart in Chapter 3 was still pending.

Since October 2012 the Westbound OTS Track Message, with minor exceptions, no longer designated specific NAR routes associated with each W/B OTS Track. Information to this effect, together with a more full explanation of the NAR System and the provisions governing NAR Route use was included in Chapter 4. The example W/B Track Message included in Chapter 2 was modified to reflect this change.

In September 2012, New York Centre changed the way in which Oceanic Clearances are delivered to aircraft that enter the NAT via the New York Oceanic CTA. Detailed information was included in Chapter 5.

The essential need for Flights using CPDLC or SATCOM Voice for ATS communications in the NAT Region to either maintain a SELCAL or listening watch on the assigned HF frequency and to complete a SELCAL check was re-emphasised in Chapter 6.

In 2012 Satellite Voice Guidance Material (SVGM) was approved jointly by the ICAO Planning and Implementation Groups for the Asia/Pacific and North Atlantic Regions (APANPIRG & NAT SPG). This document provides a comprehensive update of various regional and State guidance material for ANSPs and aircraft operators to use SATVOICE for ATS communications. The document is available on the ICAO EUR/NAT website. Relevant information, together with the appropriate access link, was included in Chapter 6.

In 2012 following the scrutiny of particular reported navigation errors in the North Atlantic Region a safety issue was identified with the use of waypoints in the western portion of the North Atlantic Region when they are defined as a range and bearing from a significant point or a navigation aid. Elaboration of the problem, rationale and consequences was included in Attachment 4.

Further emphasis on the recommendation and rationale for use of a Plotting Chart was included in Chapter 8.

Minor text modifications were effected to clarify the crew guidance on the method of application of the Strategic Lateral Offset Procedure (SLOP) in Chapter 8.

Typographical errors in Chapter 11 of the Edition 2011 of NAT Doc 007 in the statement of the global RVSM Airworthiness Requirements were corrected.

The scope of the monitoring activities performed by the NAT CMA was extended to include the reviewing of all reported lateral deviations from cleared route, not just those of 25NMs or more. This activity will provide the information and statistics necessary for consideration of the safety aspects of the current initiative for increase airspace capacity through possible reductions in lateral separations in the Region. These additional monitoring activities were included in Chapter 11.

Traffic and Error rate statistics in Chapter 16 were updated to reflect the more recent situation.

Advice on the availability of a new North Atlantic Operations training DVD, "Track Wise", was included in the Foreword and Chapter 15. This material has superseded the now outdated "On the Right Track" DVD and references to the latter were consequently removed from the document.

A new Attachment 7 was included in Edition 2012. This attachment describes the format, content and method of delivery of Oceanic Clearances in the ICAO North Atlantic Region. It includes examples of typical clearances that could be received by flights operating in NAT Region oceanic airspace. The examples were 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. Additional text in Chapter 5 draws attention to this new attachment and promotes its study.

Edition 2013 Content Modifications/Additions Incorporated

The scope of the NAT Doc 007 has been expanded in this Edition to incorporate guidance for Operators and Regulators of flights within the North Atlantic Region at levels below FL285. The vast majority of this additional content was previously published in the North Atlantic International General Aviation Operations Manual.

Advice has been included in Chapter 1 Section 1.2 "Approval", that in accordance with Milestone 1 of the MNPS to PBN Transition Plan, existing RNAV 10 and RNP 4 Approvals now constitute MNPS Approval without further examination of the navigation component.

Advance notification has been included in Chapter 1, of the planned implementation of Milestone 2 of the MNPS to PBN NAT transition plan that with effect from January 2015 the longevity of 6.3NM based MNPS Approvals is limited.

Similarly advance notification of Milestone 3 of the MNPS to PBN NAT Transition Plan in which the current NAT MNPS airspace will be re-designated for PBN based operations has been included in the text of Chapter 1.

Additional text describing procedures relating to Phase 1 of the North Atlantic Data Link Mandate, including planning and operating restrictions on non-compliant aircraft has been included in Chapters 1, 2, 4, 6 and 17.

Advice is provided in Chapter 1, of the NAT SPG intentions regarding the proposed staged implementation of Phase 2 of the DLM and of its consequences for operators.

Reference is included in Chapter 1, to the concepts of Required Communications Performance (RCP) and Required Surveillance Performance (RSP). The NAT Performance Based Surveillance & Communications (PBSC) Implementation Plan, which includes proposals for Reduced Lateral Separation Minima (RLatSM) and Reduced Longitudinal Separation Minima (RLongSM) predicated upon RCP and RSP, is introduced.

Reference is included in Chapters 3, 4, 9, 17 and in Attachment 4 to the December 2013 implementation of reduced lateral and longitudinal separation minima between suitably equipped aircraft in the, "WATRS Plus", New York Oceanic FIR airspace adjacent to the NAT MNPSA.

Annual NAT traffic statistics and error rates are updated to include recent data.

Route T13, described in Chapter 3 was re-designated as T213. A depiction of Route T213 has been added to Figure 4 – Other Routes and Structures within NAT MNPS airspace.

The separate NAT OACCs and NOTA, SOTA and BOTA surveillance charts that were included in Chapter 10 of Edition 2012 have been replaced by two NAT-wide charts showing the radar and ADS-B coverage within the NAT Region and adjacent airspaces..

A new Chapter 18 and Attachment 8 are included with effect from this (2013) Edition providing guidance for pilots/planners and operators of NAT flights below the MNPS Airspace (i.e. below FL285). This material was previously contained in the "*North Atlantic International General Aviation Operations Manual*".

Edition 2014/2015 Content Modifications/Additions Incorporated

New York Oceanic FIR has been split into two OCAs, NYC OCA East and NYC OCA West. NYC OCA West is no longer included in the ICAO North Atlantic Region. Details of the geographical boundaries of the two OCAs are published in the ICAO Air Navigation Plans for the NAT and the CAR/SAM Regions (ICAO Docs 9634 & 8733). Throughout this Edition of the Manual necessary changes to NYC OCA references are effected. Particular note should be taken of the amended text relating to Oceanic Clearance delivery in Section 5.6 – "*Oceanic Flights Originating from the NAM, CAR or SAM Regions and Entering the NAT MNPS Airspace via the NEW YORK OCA EAST*".

One significant change which follows from the split of the NYC FIR is that only the airspace of NYC OCA East (North of 27N) is now included in the North Atlantic MNPS Airspace. The previously included small portion of airspace between 3830N and 3900N parallels, west of 60W, is now excluded from the NAT MNPSA. This change to the boundary of the NAT MNPS Airspace is reflected in this Edition in the Frontispiece Chart and in the description of the MNPSA lateral dimensions in the Foreword.

A 50 NM lateral separation minimum has been implemented in the Santa Maria OCA between aircraft with RNP4 or RNAV10 Approvals. As with NYC OCA East and the WATRS Plus area, aircraft wishing to benefit from this reduced separation, should ensure that their valid RNP/RNAV Approvals are included in Item 10a & 18 of their filed flight plans. This is reflected in this Edition in text modifications/additions in Chapters 4, 9 & 17 and in Attachment 4.

For flights operating north of 80°N, the rule on specifying tracks as previously expressed in ICAO NAT Supplementary Procedures Doc.7030, stated "that the planned tracks shall normally be defined by significant points formed by the intersection of parallels of latitude expressed in degrees and minutes with meridians expressed in whole degrees. The distance between significant points shall, as far as possible, not exceed 60 minutes flight time." This rule did not contain any limitation on how short a flight leg could be. Given the closeness of meridians this near to the north pole, the rule sometimes resulted in filed tracks with very short route segments between significant points. Multiple difficulties arose from this, including increased pilot and radio operator workloads (n.b. ADS-C and CPDLC use Inmarsat geostationary satellites which have limited coverage north of 80°N). Consequently, the Iceland AIP now includes an extra requirement that "the flight time between significant points should not be less than 30 minutes". This additional requirement is reflected in the text of Chapters 4 & 17 and in Attachment 4.

A great majority of the aircraft flying in the NAT Region now have the capability to automatic offsets. Consequently, previous SLOP guidance for these aircraft to "preferably not fly the centerline but rather elect to fly an offset of one or two nautical miles to the right of the centerline", in order to aim to achieve an equal distribution of traffic across the three available positions, is no longer appropriate. Section 8.5.3 in this Edition is modified to reflect this development and the consequently changed guidance.

The North Atlantic European Routing Scheme (NERS) has been discontinued and the UK AIP and AIP Ireland now no longer specify the domestic routes to be used for westbound NAT traffic, based upon entry points into oceanic airspace. Consequently the "NERS" and the "Irish/UK Domestic Route Structures" sections in Chapter 3 have been deleted in this Edition and all subsequent references to such flight planning requirements (previously in Chapters 4 & 17) have been eliminated from this Edition.

The technique of Multilateration is being used in the Region by some NAT ANSPs for ATS Surveillance. The term has been added to the Glossary and appropriate references have been included variously throughout this Edition. Reflecting this and that ADS-B service is widely available in the Region, some of the references to "Radar" or "SSR" services or areas throughout the document, have also been updated to refer generically to "ATS Surveillance".

Information on the planned Milestones of the NAT MNPS to PBN Transition Plan has been added in Section 1.10 – "Trials and Future Development Plans". Milestones 2, 3 and 4 are planned for Jan 2015, Feb 2016 and Jan 2020, respectively. These are significant changes which affect the State Approvals of Operators for flight in the NAT MNPS Airspace (which will be re-designated as "NAT High Level Airspace" with effect from 04 Feb 2016). Subsequent references are also included appropriately in this Edition.

Revised procedures in respect of the occasional publication of a split westbound OTS structure have been adopted following trials in 2014. These procedures are described here in Section 2.2.6

The aircraft equipage requirements and operational standards to benefit from ADS-B ATS service in the NAT Region are now included in ICAO NAT Supplementary Procedures (Doc.7030). They are also fully described in Section 1.7 below, together with information on the maintenance of an exclusion list of non-compliant aircraft and procedures to be employed by operators to request exemption from the full provisions.

Reykjavk ACC has commissioned additional DCPC VHF Stations in Greenland. Thereby extending its provision of tactical control and ATS Surveillance services to its West Sector. Section 6.1.14 provides detail along with a revised coverage chart.

Phase 2A of the NAT Data Link Mandate, is planned for implementation 05 February 2015, the definition of the airspace included by the Mandate in this Phase is clarified as "all OTS tracks" as opposed to "within the entire OTS". *Inter alia,* this is to ensure that it is clear that the airspace entirely between the branches of a split OTS is available for planning and operation by aircraft not equipped with FANS1/A. The vertical limits of the Mandate will be extended in this Phase to include FL350 (i.e. FL350 – 390, inclusive). See Section 4.2.7.

In Section 1.10 – "Trials and Future Developments", an update is provided on the results of the "ENGAGE" trials. The fuel savings obtained have provided further impetus to allow, when traffic permits, more flexibility in varying assigned flight level and/or mach number. In this regard a new Section 5.7 is included in this Edition describing the availability of and the differences between "cruise climb" and a "block of flight levels".

In Section 1.10 – "*Trials and Future Developments*", information is provided on the planned first phase of North Atlantic trials of reducing the lateral separation minimum to 25 NM. This is scheduled to commence in November 2015. In this "RLatSM" Phase 1, 25 NM lateral separation will be implemented by establishing ½ degree spacing between two specified core OTS tracks, for use by RNP4 Approved aircraft logged-on for ADS-C & CPDLC within the vertical limits applicable to the airspace associated with the NAT Region Data Link Mandate.

In Section 1.10 – "*Trials and Future Developments*", information is included concerning plans for trialing LEO satellite based ADS-B ATS surveillance in the NAT Region. Relevant satellite launches are expected during 2015 and operational use of this service may begin as early as mid-2017.

Reference is added in the SOTA and BOTA descriptions in Chapter 3, that despite their inclusion in NAT MNPS Airspace, ICAO NAT Supplementary Procedures Doc.7030 specifies that aircraft on routes through SOTA or BOTA, such that they do not require Oceanic Clearances, may plan and operate there without a need for a State MNPS Approval.

A description of the newly created Gander Oceanic Transition Area (GOTA) is included in Chapter 3 and an appropriate reference is included in Chapter 17 – Guidance for Dispatchers at Section 17.6.9. Some new Oceanic Entry/Exit Points have been created on the GOTA boundary, resulting in minor revisions to three of the "Blue Spruce Routes" listed in paragraph 12.2.2 c).

In Section 6.1.21 additional text encourages FANS equipped aircraft to "log on" with the appropriate ATS unit, even when the aircraft is being provided with ATS surveillance service (e.g. SSR, ADS-B or multilateration). This permits the use of CPDLC for air-ground communications.

Reference to regulations about RVSM equipment and performance requirements for aircraft flying in the ICAO NAT Region have been updated (paragraphs 9.1.5 and 17.2.4 refer).

A misleading reference in Chapter 17 – Guidance for Dispatchers, to the provision of MEL relief for inoperative ACAS has been removed from this Edition.

In Chapters 6, 10 and 17 a caveat to the requirement to select Transponder Code A/C 2000 30 mins after entering NAT airspace is noted with regard to flights routing on Tango 9.

In "Chapter 18 – Flight Operations Below the NAT MNPS Airspace", newly introduced to this Manual in Edition 2013, some minor updates/clarifications and additions have been included. These relate to

Environmental Conditions; Clearance for Weather Deviations; Oceanic Clearances issued by USA; Description of CPDLC service. An inappropriate reference to the "Carriage of Arms" has also been deleted.

Figure 3 is updated to reflect the establishment of GOTA and changes to some of the "Blue Spruce" routes.

Annual NAT traffic statistics and error rates are updated to include recent data.

Two Charts showing the Radar and ADS-B coverage in the NAT Region are intended for inclusion at Attachment 9. These will provide a general guidance to the airspace south of 80 N through which aircraft plan and fly without being equipped with ADS-C and CPDLC. (i.e. airspace excluded from the NAT Data Link Mandate).

Most of the maps illustrating this edition have to undergo a major update. This has taken longer than expected, hence "*(Map to be updated)*" in the caption of the some of the maps and Attachment 9 is pending.

All the web links in the whole document have been updated, some due to the former Paris office website having been integrated into the ICAO global website, some to correct links that were no longer valid.

2016 Content Modifications/Additions Incorporated

V.2016-1 changes

In accordance with the MNPS to PBN Transition Plan for the ICAO North Atlantic Region, with effect from 04 February 2016 that airspace formerly known as the "North Atlantic Minimum Navigational Specifications Airspace" (MNPSA), but excluding the BOTA and SOTA areas and with the addition of the BODO Oceanic FIR (FL285-420 inclusive), is re-designated as the "North Atlantic High Level Airspace" (NAT HLA). However, recognizing that ICAO Annex 6 allows for a "minimum navigation performance specification" to be regionally specified in Regional Supplementary Procedures Doc 7030, it has been determined to maintain reference to a "MNPS" in the NAT Region within NAT Doc 7030 and in this guidance material (Doc 007), within particular contexts. Thus, approvals initially issued to operate in the NAT MNPSA are referred to as "NAT MNPS" approvals and approvals issued to operate in the NAT HLA are referred to as "NAT HLA MNPS" approvals. Otherwise, except in respect of historical references, from Edition 2016 of this document (NAT Doc.007) and subsequently, previous references to "Minimum Navigation Performance Specifications" and "MNPS" are replaced by "North Atlantic High Level Airspace Specifications" and "NAT HLA".

MNPS Approvals granted prior to this (04 Feb 2016) change will continue to be valid for NAT HLA operations. However, those issued prior to 01 January 2015 and based on the "6.3 NM" MNPS standard will no longer be accepted beyond January 2020. From then NAT HLA Approvals, if required, will need to have been based on appropriate PBN specifications.DLM Phase 1 references have been removed from the text since Phase 2A has been in effect since 05 February 2015.

The RLatSM Trials were commenced in December 2015. Text edits to reflect this have been included in Chapters 1, 2, 4 & 8,

In 2015 the NAT ANSPs agreed to some minor changes to the North Atlantic Flight Level Allocation Scheme (FLAS). The revised scheme is included here at Attachment 6.

GLOSSARY OF TERMS

ACARS	Aircraft Communications Addressing and Reporting System
ACAS	Airborne Collision Avoidance System
ACC	Area Control Centre
ADC	Air Data Computer
ADF	Automatic Direction Finding
ADS	Automatic Dependant Surveillance
ADS-B	Automatic Dependant Surveillance - Broadcast
ADS-C	Automatic Dependant Surveillance - Contract
AFTN	Aeronautical Fixed Telecommunication Network
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation and Control
AIS	Aeronautical Information Service
ARINC	ARINC - formerly Aeronautical Radio Incorporated
ASR	Aviation Safety Report
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Services
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. *Note.— A comparable ground-based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than mono-pulse SSR.*
AWPR	Automatic Waypoint Position Reporting
BOTA	Brest Oceanic Transition Area
BRNAV	Basic Area Navigation
CAR	Caribbean
CDL	Configuration Deviation List
CDM	Collaborative Decision Making
CDR	ConDitional Route
CDU	Control Display Unit
CMA	Central Monitoring Agency
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.
CPDLC	Controller Pilot Data Link Communications
CTA	Control Area
DCPC	Direct Controller/Pilot Communications
DME	Distance Measuring Equipment
DR	Dead Reckoning
DVD ROM	Digital Video Disk Read-Only Memory
EDTO	Extended Diversion Time Operations (cf ETOPS)
ELT	Emergency Locator Transmitter
ETA	Estimated Time of Arrival
ETOPS	Extended Range Twin-engine Aircraft Operations
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
FIR	Flight Information Region
FL	Flight Level
FLAS	Flight Level Allocation Scheme
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
HMU	Height Monitoring Unit
HSI	Horizontal Situation Indicator
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
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
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
MTT	Minimum Time Track
Multilateration	A system of surveillance using the differences in times of arrival of replies to SSR interrogations at several ground stations to determine aircraft position.
NAM	North America
NAR	North American Route
NAT	North Atlantic
NAT HLA	North Atlantic High Level Airspace (formerly NAT MNPSA)
NAT SPG	North Atlantic Systems Planning Group
NDB	Non Directional Beacon
NM	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
NOTA	Northern Oceanic Transition Area
NOTAM	Notice to Airmen
OAC	Oceanic Area Control Centre
OCA	Oceanic Control Area
Oceanic Entry Point	Point on the FIR boundary where the aircraft enters the first oceanic control area
Oceanic Exit Point	Point on the FIR boundary where the aircraft leaves the last oceanic control area
OESB	Oceanic Errors Safety Bulletin
OTS	Organized Track System
PRM	Preferred Route Message
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)
RA	Resolution Advisory (per ACAS/TCAS)
RAIM	Receiver Autonomous Integrity Monitoring
RMI	Radio Magnetic Indicator
RNP	Required Navigation 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
Strategic Control	As used in this manual, control techniques employed in an environment where the level of surveillance and intervention capability requires that each oceanic clearance be planned and issued prior to the flight's entry into oceanic airspace, in order to provide safe separation between known traffic from oceanic entry to oceanic exit.
TA	Traffic Advisory (per ACAS/TCAS)
Tactical Control	As used in this manual, control techniques employed in an environment where the surveillance and intervention capabilities allow conflicts between flights to be resolved nearer the time they would occur, rather than prior to the oceanic clearance being issued.
TAS	True Airspeed
TCAS	Traffic (Alert and) Collision Avoidance System
TLS	Target Level of Safety
TMI	Track Message Identification
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

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CHAPTER 1

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

Pilots 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.

1.1 GENERAL

1.1.1 With effect from 04 February 2016 the airspace previously designated as NAT MNPSA, but excluding the SOTA and BOTA areas, is re-designated as NAT HLA. This NAT HLA will also additionally include the airspace of the BODO OCEANIC FIR (FL285 to FL420, inclusive). State Approvals for NAT MNPSA operations granted prior to that date will be valid for NAT HLA operations. Except that those Approvals issued prior to 01 January 2015 and based upon the earlier "6.3 NMs" MNPS standard will not be valid beyond January 2020. Any NAT MNPS Approvals granted using PBN specifications for navigation equipment performance will continue to be valid.

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). Target maxima set for these estimates are expressed in terms of potential collisions per flight hour and are known as "Target Levels of Safety (TLSs)".

1.1.3 Aircraft operating within NAT HLA airspace are required to meet specified navigation performance in the horizontal plane through the carriage and proper use of navigation equipment that meets 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.

1.1.4 Since January 2002 when the final phase implementation of RVSM at all levels in NAT MNPS Airspace took place, all aircraft intending to operate within NAT MNPS/HLA Airspace have had to be equipped with altimetry and height-keeping systems which meet RVSM Minimum Aircraft System Performance Specifications (MASPS). RVSM MASPS are contained in *ICAO Doc 9574* and detailed in designated FAA document, *AC91-85*, and in Joint Aviation Authority (JAA) Temporary Guidance Leaflet (TGL No.6), Revision 1. These documents can be downloaded from:

www.faa.gov/air_traffic/separation_standards/rvsm/documentation/
and
www.skybrary.aero/bookshelf/books/157.pdf
respectively.

1.1.5 This NAT Doc 007, together with the above referenced global RVSM MASPS documents, are provided to assist States of Registry, operators, owners and planning staff who are responsible for issuing or obtaining NAT HLA/RVSM approvals for aircraft. However, 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 pilots 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 pilots of non-approved flights, from within these user groups, flight planning or requesting clearance within NAT HLA airspace. 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 MNPS approval, pilots 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 2.4 requires carriage of Emergency Locator Transmitters (ELTs) by all commercial and IGA aircraft, respectively. It should be further noted that new specifications for these beacons to operate exclusively on frequency 406 MHz (but with a 121.5 MHz search and rescue homing capability) have been in effect since January 2005. New aircraft have been required to be so equipped since 2005.

Exceptions - Special Operations

1.1.7 NAT ATS Providers may approve moving or stationary temporary airspace reservations within NAT HLA Airspace, for the benefit of State or Military Aircraft Operating Agencies to accommodate Military Exercises, Formation Flights, Missile Firing or UAV 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.

1.1.8 Manned Balloon flights can be operated in or through the NAT Region. They are, however, required to avoid NAT HLA airspace and must be meticulously co-ordinated with affected ATS Authorities many months in advance.

1.2 APPROVAL

1.2.1 All flights within NAT HLA airspace 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 crew navigation procedures employed and the crew training requirements.

1.2.2 Since NAT HLA airspace is now designated as RVSM airspace at all levels (i.e. FL290-410 inclusive) **specific State RVSM Approval is also required to operate within NAT HLA airspace**. RVSM Approvals prescribe both airworthiness requirements to ensure aircraft height-keeping performance in accordance with the RVSM MASPS, and also crew operating procedures. In general, RVSM Approvals granted by most States are not regionally specific but are valid for world-wide operations. However, some crew operating procedures, particularly those to be followed in contingency situations, are specific to the airspace environment. Such procedures for use in NAT HLA airspace vary from those adopted in a domestic airspace environment in which radar surveillance and DCPC are available (see Chapter 9 & Chapter 12). States provide approval of these procedures specific to NAT HLA or Oceanic airspace operations in different ways. It may be explicitly addressed in the general RVSM Approval. It may be included as an element of the NAT HLA MNPS Approval or it may be a stated item of the Operations Specifications. Nevertheless, however provided, all NAT crews/operators must be State approved specifically for NAT RVSM operations and each aircraft intended to be flown in NAT HLA airspace must have State RVSM Airworthiness Approval.

1.2.3 There are times when NAT HLA MNPS 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 NAT HLA airspace, State aviation authorities shall maintain a database of all NAT HLA and RVSM approvals that they have granted for operations within NAT HLA airspace. States must also provide data on RVSM approved airframes to the North Atlantic Regional Monitoring Agency (RMA), which is maintained by the North Atlantic Central Monitoring Agency (NAT

CMA). The 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 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 AIRSPACE 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 airspace are assessed in terms of differences in ATAs/ETAs at common points. The time-based longitudinal separation minima currently used in the NAT HLA airspace are thus expressed in clock minutes. The maintenance of in-trail separations is aided by the application of the Mach Number Technique (See Chapter 7 – "Application of Mach Number Technique"). However, aircraft clock errors resulting in waypoint ATA errors in position reports can lead to an erosion of actual longitudinal separations between aircraft. It is thus vitally important that the time-keeping device intended to be used to indicate waypoint passing times is accurate, and is synchronised to an acceptable UTC time signal before commencing flight in NAT HLA airspace. 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. A non-exhaustive list is shown in Chapter 8 of this Document.

Lateral Navigation

Equipment

1.3.2 There are two navigational equipment requirements for aircraft planning to operate in NAT HLA airspace. 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), Part I para 7.2.9 and Part II, para 2.5.2.9* refer).

1.3.3 In terms of accuracy, an aircraft which is approved for operations within NAT MNPS/HLA Airspace prior to January 2015 shall have a navigation performance capability such that:

a) the standard deviation of lateral track errors shall be less than 6.3 NM (11.7 km);

b) the proportion of total flight time spent by the aircraft 30 NM (56 km) or more off the cleared track shall be less than 5.3×10^{-4};

c) the proportion of total flight time spent by the aircraft between 50 and 70 NM (93 and 130 km) off the cleared track shall be less than 13×10^{-5}.

1.3.4 For (MNPS) Approvals issued before January 2013, the State of Registry or the State of the Operator, as appropriate, should have verified that the lateral navigation capability of approved aircraft meets the above specified requirements. For Approvals issued between January 2013 and January 2015 Approvals can have been based on these foregoing navigational performance capabilities or based on the PBN specifications, RNP 10 (PBN application of RNAV 10) or RNP 4. For Approvals issued after January 2015 the navigation system accuracy requirements for NAT MNPSA/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 MNPS/NAT HLA airspace, States should take account of the RNP 10 time limits for aircraft equipped with dual INS or inertial reference unit (IRU) systems.

Note. – (RNP 10 time limits are discussed in (Doc 9613) Part B, Volume II Chapter 1.

Additionally, in order for the 50 Nms lateral separation minimum to be utilized in the New York Oceanic East the following navigation performance criteria must also be met by aircraft with RNAV 10 (RNP 10) Approvals: -

a) the proportion of the total flight time spent by aircraft 46 km (25 NM) or more off the cleared track shall be less than 9.11 × 10-5; and

b) the proportion of the total flight time spent by aircraft between 74 and 111 km (40 and 60 NM) off the cleared track shall be less than 1.68 × 10-5.

And similarly the additional criteria which must be met by aircraft approved as RNP 4 are as follows : -

c) the proportion of the total flight time spent by aircraft 28 km (15 NM) or more off the cleared track shall be less than 5.44 × 10-5; and

d) the proportion of the total flight time spent by aircraft between 44 and 67 km (24 and 36 NM) off the cleared track shall be less than 1.01 × 10-5.

1.3.5 Furthermore, when granting approval for operations in NAT HLA airspace on the basis of PBN navigational standards, States of Registry should also ensure that in-flight operating drills are approved which include mandatory navigation cross-checking procedures aimed at identifying navigation errors in sufficient time to prevent the aircraft inadvertently deviating from the ATC-cleared route.

Note:- In Summary : - From February 2016 the NAT MNPSA is re-designated as NAT HLA. Previously granted MNPS Approvals are valid for NAT HLA operations. Milestone 2 of the MNPS to PBN NAT transition plan was achieved in January 2015. From that date all ***new*** *North Atlantic MNPS Operational Approvals should have been based upon RNAV 10 (RNP 10) or RNP 4 navigation specifications. Previously issued 6.3NM based MNPS Approvals will continue to be valid for NAT HLA operations but it is important to note that their longevity will be limited. Since subsequently, from January 2020, Milestone 4 of the MNPS to PBN NAT Transition Plan will take effect and the NAT HLA airspace will be re-designated for "PBN Based Operations" and thus from then Aircraft Approvals based on the earlier 6.3NM MNPS standard will no longer be valid.*

1.3.6 In most cases, Operators will be able to select equipment for which performance capability has already been established to the satisfaction of a State of Registry. However, where a completely new navigation system is proposed for use, or where major changes have been made in the technology of an existing system, an evaluation will be necessary, to establish its quality of performance, before authorisation for use as a primary means system can follow. Currently, it has been demonstrated that the requisite accuracies may be achieved using Long Range Navigation Systems, namely INS, IRS or GNSS. Consequently, State approval of unrestricted operation in the NAT HLA airspace 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: *A GPS installation must be approved as follows:*
If the two required LRNSs are both GPS, they must be approved in accordance with the current version of FAA Advisory Circular AC-20-138D Appendix 1. AC- 20-138 requires that GPS systems used in Oceanic airspace must have a FDE function. States other than the USA may set their own standards for operational approval of GPS to provide Primary Means of Navigation in Oceanic and remote areas but in all cases these approvals will include the requirement to carry out Pre-Departure Satellite Navigation Prediction Programs (See Chapter 8 - *GNSS (GPS) Systems for further details). If, however, GPS serves as only one of the two required LRNSs, then it must be approved in accordance with FAA TSO- C129 or later standard as Class A1, A2, B1, B2, C1 or C2, or with equivalent European Aviation Safety Programme (EASA) documentation ETSO-C129a. In this instance individual States vary in their insistence upon the need for the conduct of pre-departure satellite navigation prediction programs (viz.FDE /RAIM).*

Note 3: *Currently equivalent approval material for GLONASS is not under development but it will need to be available prior to approval of any GLONASS equipped aircraft for NAT HLA operations.*

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

c) it is 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.*

Data Presentation

1.3.7 It is important that navigation data provided to crews in the form of charts, flight plans, master documents, track messages, etc. are presented in a format suitable for error-free use in the cockpit environment. A significant proportion of navigation errors result from the use of incorrect or misinterpreted data. To minimize the problem, source data must be clearly legible under the worst cockpit lighting conditions. More detailed recommendations are included in Chapter 8 of this Document.

Crew Training

1.3.8 It is essential that crews obtain proper training for NAT HLA and RVSM operations. Current navigation systems, because of their precision and reliability, can induce a sense of complacency, which in turn tends to obscure the value of standard procedures, and in particular of cross-checks. Under these circumstances errors occur more easily. To prevent them, a special training programme for flight crews should be devised, which includes instructions on the efficient use of equipment, with emphasis on how to avoid mistakes. Crew members should be trained to develop a meticulous method of using Control Display Units (CDUs), with careful cross-checking at all operational stages, in line with procedures described in Chapter 8 of this Document.

1.3.9 The Operator should thereafter seek to retain the interest and co-operation of flight crews by ensuring that a high standard of navigation performance be maintained. This may be achieved during ground refresher courses, routine checks, or/and by issuing periodic newsletters that include a focus on fleet navigation performance - hopefully indicating that standards are being maintained or are being improved upon. Newsletters might also include analyses of error reports volunteered by crews (i.e. covering instances of equipment being mishandled). However, periodic reminders should not be so frequent as to be self-defeating.

1.3.10 Crew training should stress the need for maintaining accuracy both along and across track (i.e. the careful application of Mach Number Technique, accurate reporting of positions and the use of accurate time in reporting positions).

1.3.11 The following items should also be stressed in flight crew training programmes:

a) knowledge and understanding of standard ATC phraseology used in each area of operations;

b) importance of crew members cross-checking each other to ensure that ATC clearances are promptly and correctly complied with;

c) use and limitations, in terms of accuracy, of standby altimeters during contingency situations. Where applicable, the pilot should review the application of Static Source Error Correction/Position Error Correction (SSEC/PEC) through the use of correction cards;

d) characteristics of aircraft altitude capture systems which may lead to the occurrence of overshoots;

e) relationships between the altimetry, automatic altitude control and transponder systems in normal and abnormal situations; and

f) aircraft operating restrictions related to airworthiness approval.

g) familiarity with the recommendations to reduce oceanic errors as contained in the current version of the "Oceanic Errors Safety Bulletin" (OESB) published by ICAO EUR/NAT Office as a NAT Oceanic Error Safety Bulletin and available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", then "NAT OES Bulletins".

1.3.12 Finally, crew training should be extended to include instruction on what action should be considered in the event of systems failures. Chapter 11 of this Document provides assistance in establishing such action.

1.4 ROUTES FOR USE BY AIRCRAFT NOT EQUIPPED WITH TWO LRNSS

Routes for Aircraft with Only One LRNS

1.4.1 A number of special routes have been developed for aircraft equipped with only one LRNS and carrying normal short-range navigation equipment (VOR, DME, ADF), which require to cross the North Atlantic between Europe and North America (or vice versa). It should be recognised that these routes are within NAT HLA Airspace, and that State approval must be obtained prior to flying along them. These routes are also available for interim use by aircraft normally approved for unrestricted NAT HLA operations that have suffered a partial loss of navigation capability and have only a single remaining functional LRNS. Detailed descriptions of the special routes known as 'Blue Spruce Routes' are included in paragraph 12.2.2 of this Document. Other routes also exist within NAT HLA airspace that may be flown by aircraft equipped with only a single functioning LRNS. These include routings between the Azores and the Portuguese mainland and/or the Madeira Archipelago and also routes between Northern Europe and Spain/Canaries/Lisbon FIR to the east of longitude 009° 01' W (viz.T9). Other routes available for single LRNS use are also established in NAT HLA airspace, including a routing between Iceland and the east coast of Greenland and two routings between Kook Islands on the west coast of Greenland and Canada.

Note: if this single LRNS is a GPS it must be approved in accordance with FAA TSO-C129 or later standard as Class A1, A2, B1, B2, C1 or C2, or with equivalent EASA documentation ETSO- C129a. Some States may have additional requirements regarding the carriage and use of GPS (e.g. a requirement for

FDE RAIM) and pilots should check with their own State of Registry to ascertain what, if any, they are. These above mentioned documents can be found at:

www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgWebcomponents.nsf

and

www.easa.europa.eu/ws_prod/g/doc/Agency_Mesures/Certification Spec/CS-ETSO.pdf

Routes for Aircraft with Short-Range Navigation Equipment Only

1.4.2 Aircraft that are equipped only with short-range navigation equipment (VOR, DME, ADF) may operate through NAT HLA airspace but only along routes G3 or G11. However, once again formal State Approval must be obtained. (See paragraph 12.2.2 for details of these routes.)

1.4.3 The filed ATS Flight Plan does not convey information to the controller on any such NAT HLA MNPS Approval limitation. Hence, it is the responsibility of those pilots with "less than unrestricted" (i.e. with limited) Approval to reject any ATC clearances that would otherwise divert them from officially permitted routes.

1.5 SPECIAL ARRANGEMENTS FOR THE PENETRATION OF NAT HLA AIRSPACE BY NON- NAT HLA MNPS APPROVED AIRCRAFT

1.5.1 Aircraft not approved for operation in NAT HLA airspace may be cleared by the responsible ATC unit to climb or descend through NAT HLA airspace provided NAT HLA MNPS Approved aircraft operating in that part of the NAT HLA airspace affected by such climbs or descents are not penalized.

1.5.2 Details of other required provisions will be found in the AIS publications of the appropriate ATS Provider State.

1.6 SPECIAL ARRANGEMENTS FOR NON-RVSM APPROVED AIRCRAFT

To Climb/Descend Through RVSM Levels

1.6.1 NAT HLA MNPS 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 FL430 either Eastbound or Westbound above NAT HLA airspace.

To Operate at RVSM Levels

1.6.2 ATC may provide special approval for a NAT HLA MNPS approved aircraft that is not approved for RVSM operation to fly in NAT HLA airspace 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.

1.6.3 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. Operators must appreciate that the granting of any such approval does not constitute an oceanic clearance, which must be obtained from ATC, by the pilot, in the normal manner. **The service will not be provided to aircraft that are not approved for NAT HLA operations.**

1.6.4 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 pilot to circumvent the RVSM approval process. Operators or pilots are required to provide written justification for the request, upon completion of the flight plan, to the NAT Central Monitoring Agency (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.

Note: 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 2000ft separation. Additionally, Pilots 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

1.7 ATS SURVEILLANCE SERVICE AREAS IN THE NAT REGION

1.7.1 ATS Surveillance services (radar, ADS-B and Multilateration) are provided within some portions of the NAT HLA airspace, 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).

1.7.2 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 the parts of the Bodø, Reykjavik, Gander, Shanwick, Santa Maria and New York oceanic areas.

1.7.3 ADS-B services have for some time been available in some continental airspaces immediately adjacent to the NAT Region and are now provided within portions of the NAT HLA airspace, specifically in the Gander, Reykjavik and Santa Maria OCAs. (see Chapter 10). Eligibility for ADS-B service in the NAT is based upon the provisions in the NAT Regional Supplementary Procedures (ICAO Doc 7030) section 5.5.

1.7.4 The procedures contained in 1.7.5 below shall be applicable in those portions of the following FIRs where an ADS-B-based ATS surveillance service is provided:

Reykjavik FIR, Søndrestrøm FIR, Bodø FIR, Gander Oceanic FIR, New York Oceanic East FIR and Santa Maria Oceanic FIR.

1.7.5 Downlinked ADS-B data will not be used by the ATC system for determining aircraft position when, as specified in ICAO Doc 7030, any of the position quality indicators have a value of 0 (zero). Consequently, an aircraft carrying 1090 MHz extended squitter (1090ES) ADS-B equipment shall disable ADS-B transmission unless:

a) the aircraft emits position information of an accuracy and integrity consistent with the transmitted values of the position quality indicator; or

b) the aircraft always transmits a value of 0 (zero) for one or more of the position quality indicators (NUCp, NIC, NAC or SIL), when the requirements of a) above cannot be met; or

c) the operator has received an exemption granted by the appropriate ATS authority.

Note.— The following documents provide guidance for the installation and airworthiness approval of ADS-B OUT system in aircraft and ensure compliance with a) above:

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

2. FAA AC No. 20-165A — 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.

1.7.6 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.

1.7.7 Aircraft operators wishing to receive an exemption from the procedures specified in 1.7.5 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.

1.8 DATA LINK MANDATED AIRSPACE

1.8.1 Phase 2A of the ICAO NAT Region Data link Mandate was implemented on 05 February 2015 (See ICAO NAT Supplementary Procedures (SUPPS) (Doc 7030) Sections 3.3 - CPDLC and 5.4 - ADS-C). In this phase the CPDLC/ADS-C mandated airspace includes all OTS tracks at FLs 350 to 390, inclusive. To flight plan or fly in the altitude band FL350-390 inclusive on any OTS Track, aircraft must be equipped with and operating FANS 1/A or equivalent CPDLC and ADS-C.

1.9 PERFORMANCE MONITORING

1.9.1 The horizontal (i.e. latitudinal and longitudinal) and vertical navigation performance of operators within NAT HLA airspace is monitored on a continual basis. If a deviation is identified, follow- up action after flight is taken, both with the operator and the State of Registry of the 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 airspace is compared to the standards established for the Region, to ensure that the relevant TLSs are being maintained. (See Chapter 11).

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. The NAT SPG has produced a document providing a comprehensive overview of expected development of North Atlantic flight operations. This document, "Future ATM Concept of Operations for the North Atlantic Region" (NAT Doc 005) is available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT Doc 005".

1.10.2 Presently such plans include a gradual transition from MNPS to a PBN system of navigation performance specification. This *MNPS to PBN Transition Plan for the ICAO NAT Region*, is available on the ICAO EUR/NAT website. The Plan will be continuously updated but the first Milestone in the planned transition Plan was passed in January 2013. From then an MNPS operational authorization could be issued to any aircraft that is approved (certified) for RNAV 10 (RNP 10) and/or RNP 4 without any further examination of the navigation specification component. Milestone 2 of the MNPS to PBN NAT transition plan was passed in January 2015. From that date the navigation performance specification component of all new North Atlantic MNPS Operational Approvals must have been based upon RNAV 10 (RNP 10) or RNP 4 navigation specifications. At Milestone 3 effective from 04 February 2016, the name of the "NAT MNPS Airspace" changes to "NAT High Level Airspace". Notwithstanding these nomenclature and navigation performance criteria changes, the indicator X, is still required to be included in item 10 of the ICAO FPL.

1.10.3 It is important to note that the longevity of 6.3NM based MNPS Approvals issued prior to January 2015 will be limited. Since from 30 January 2020, Milestone 4 of the MNPS to PBN NAT Transition Plan will take effect and the current NAT MNPS airspace will be re-designated for "PBN Based Operations". From then North Atlantic operations Aircraft Approvals which had been issued on the basis of the 6.3NM standard will no longer be valid.

1.10.4 The first phase of the North Atlantic Data Link Mandate was implemented on 07 February 2013. In this phase the Remarks section of the daily OTS Track Messages each specified two core tracks on which to flight plan or fly in the altitude band FL360-390 inclusive, aircraft must be equipped with and operating CPDLC and ADS-C. The initial element of the second phase of the mandate (2A) was implemented on 05 February 2015. The vertical and lateral extent of the Data Link Mandated NAT airspace was then expanded to encompass all NAT OTS Tracks in the altitude band FL350-390 inclusive.. The goals are that: by 2018, 90% of aircraft operating in the NAT Region airspace at FL290 and above will be equipped with FANS 1/A or equivalent ADS-C and CPDLC and that by 2020, 95% of aircraft operating in that airspace will be so equipped. On this basis current plans are that Phase 2 will progress in three stages:

- Phase 2A, commenced 5 February 2015: the mandate incorporates FL350 to FL390 on all NAT OTS tracks;
- Phase 2B, commencing 7 December 2017: will incorporate FL350-FL390 throughout the ICAO NAT Region;
- Phase 2C, commencing 30 January 2020: will incorporate FL290 and above throughout the ICAO NAT Region.

1.10.5 Some airspace will be excluded from the mandates, including ATS surveillance airspace; airspace north of 80° North; and New York Oceanic FIR. Also certain categories of flights may be allowed to plan and operate through the mandated airspace with non-equipped aircraft. Details will be promulgated in future via State AIS. (See also "**NAT OPS Bulletin 2012-031**" available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", then "NAT OPS Bulletins").

This matter is also discussed in paragraph 10.4.1 and charts providing an indication of the likely extent of the NAT ATS surveillance airspace are included in Attachment 9 (*N.B.* This Attachment is still pending).

1.10.6 Together such new requirements will improve the safety of flight in the Region and permit the use of reduced lateral and longitudinal separation minima (RLatSM & RLongSM), thereby enhancing airspace capacity and providing more fuel efficient profiles for operators. All such changes will be gradually phased in and operators will be provided adequate advance notice. The timing of implementation phases and the extent of the airspace involved in each phase of these mandates will be determined by the ICAO NAT Systems Planning Group in full co-ordination with airspace users.

1.10.7 The performance of the communications and surveillance systems required to support future separation reductions will be regulated. A Performance Based Communication and Surveillance (PBCS) Plan is being developed for the North Atlantic Region. Details of this plan are available in the European and North Atlantic (EUR/NAT) Office public pages on the ICAO website (www.icao.int/EURNAT/), following "EUR & NAT Documents", then "NAT Documents", in folder "Planning documents supporting separation reductions and other initiatives".

1.10.8 Details of the ICAO NAT Region separation reduction plans are provided in several documents on the ICAO EUR/NAT website. These include The Implementation Plan for the Trial Application of RLongSM in the NAT Region and The Draft Implementation Plan for the Trial Application of RLatSM in the NAT Region. These may be accessed on the website at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "Planning documents supporting separation reductions and other initiatives".

1.10.9 Towards these goals various trials will be undertaken and suitably equipped operators will be offered the opportunity to participate in these trials. Information on current trials of reductions in longitudinal separations is available as NAT OPS Bulletins (available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT OPS Bulletins"). One such trial is currently running in the Gander and Shanwick OCAs. In this trial a 5 minutes longitudinal separation minima is being applied between pairs of aircraft equipped with and operating ADS-C and CPDLC. **NAT OPS Bulletin 2012-030** provides fuller details. Also **NAT OPS Bulletin 2010-007** provides details of a separate initiative "Flight Crew Guidance re 5 minutes Separation between GNSS Aircraft".

1.10.10 In December 2015 the first phase of North Atlantic trials of reducing the lateral separation minimum to 25 NM was commenced. In this "RLatSM" Phase 1, 25 NM lateral separation is implemented by establishing ½ degree spacing between two specified core OTS tracks and a central track, within the vertical limits applicable to the airspace associated with the NAT Region Data Link Mandate. Only aircraft with the appropriate Required Navigation Performance (RNP4) approval and operating Automatic Dependent Surveillance-Contract (ADS-C) and Controller Pilot Data Link Communications (CPDLC), are permitted to operate on these ½ degree spaced tracks. Special procedures in respect of planning and operating on these tracks have been development and promulgated via the AIS of the participating States i.e. Canada, Iceland and the United Kingdom. Operators intending to participate in these trials will need to ensure that advanced appropriate pilot and dispatcher training is undertaken.

1.10.11 In 2010/2013 Flight trials were conducted in the Gander and Shanwick OCAs to assess the impact of variable Mach and altitude clearances in the North Atlantic. These trials, entitled ENGAGE (Europe-North America Go ADS-B for a Greener Environment) were initially conducted by NAV CANADA and UK NATS and subsequently expanded to include ISAVIA and NAV Portugal. The ENGAGE trials were successfully completed in July 2013 with average reductions of 500 litres of fuel consumption and 1300 kilogrammes of carbon dioxide equivalents (CO2e) emissions achieved for participating flights and without adverse impact on collision risk.

1.10.12 The NAT Region is envisaged as the first place that satellite based ADS-B ATS surveillance will be used. The current development timetable envisages relevant LEO satellite launches during 2015 and operational use of this service may begin as early as mid-2017. Validation activities to confirm the usability of the signal are planned to take place in Canadian Domestic Airspace and in the soon to be established ADS-B Corridor across the northern portion of the NAT.

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 Due to the constraints of large horizontal separation criteria and a limited economical height band (FL310–400) the airspace is congested at peak hours. In order to provide the best service to the bulk of the traffic, a system of organised tracks is constructed to accommodate as many flights as possible within the major flows on or close to their minimum time tracks and altitude profiles. Due to the energetic nature of the NAT weather patterns, including the presence of jet streams, consecutive eastbound and westbound minimum time tracks are seldom identical. The creation of a different organised track system is therefore necessary for each of the major flows. Separate organised track structures are published each day for eastbound and westbound flows. These track structures are referred to as the Organised Track System or OTS.

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

2.1.4 Over the high seas, the NAT Region is primarily Class A airspace (at and above FL60) (See ICAO Doc. 7030 - NAT Regional Supplementary Procedures), in which Instrument Flight Rules (IFR) apply at all times. Throughout the NAT Region, below FL410, 1000 feet vertical separation is applied. However, airspace utilisation is under continual review, and within the HLA portion of NAT airspace, in addition to the strategic and tactical use of 'opposite direction' flight levels during peak flow periods the Mach Number Technique is applied.

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. The impact on domestic route structures and the serviceability of transition area radars and navaids are checked before the system is finalised.

2.2.2 When the expected volume of traffic justifies it, tracks may be established to accommodate the EUR/CAR traffic axis or traffic between the Iberian Peninsula and North America. Extra care is required when planning these routes as they differ slightly from the 'core tracks' in that they may cross each other (using vertical separations via different flight level allocations), and in some cases may not extend from coast-out to coast-in (necessitating random routing to join or leave). Similarly, some westbound tracks may commence at 30°W, North of 61°N, to accommodate NAT traffic routing via the Reykjavik OCA and Northern Canada.

Collaborative Decision Making Process

2.2.3 Operators proposing to execute NAT crossings 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 This CDM process commences with the Preferred Route Message (PRM) system, which has been used in the NAT Region for many years. To enable oceanic planners to take into consideration operators' preferred routes in the construction of the OTS, all NAT operators (both scheduled and non-scheduled) are urged to provide information by AFTN message to the appropriate OACs regarding the optimum tracks of any/all of their flights which are intended to operate during the 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 requirement and schedule for submitting PRMs in respect of day-time westbound flights are specified in the UK AIP in Section ENR 2.2 at paragraph 3.5.2, and the addresses and formats for these westbound PRMs are specified in paragraph 3.24. The filing of night-time eastbound preferred routings is an element of the NavCanada Traffic Density Analyser (TDA) tool (see paragraph 17.6.22). Access to the TDA requires a password which can be requested from NAV CANADA Customer Service via E-mail : service@navcanada.ca or telephone : +1 613 563 5588 or Toll free at : + 1 800 876 4693. The TDA can then be accessed currently from the following link:
https://extranetapps.navcanada.ca/NATTDA/TDAListing.aspx?reqDirection=East

2.2.5 Subsequently, following the initial construction of the NAT tracks by the publishing agencies (Gander OAC for Eastbound tracks and Shanwick OAC for Westbound tracks), 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.

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 (an example of such a structure is shown in Example 1/Figure 2 below). However, where this provision requires moving the westbound OTS to a less optimum position, it can be agreed that only one exit point and landfall will be left vacant and that some opposite direction flight levels are left off an adjacent westbound track separated by one degree, for use by eastbound flights.

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 co-ordinates of the organised tracks as well as the flight levels that are expected to be in use on each track. In most cases there are also details of domestic entry and exit 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 Track Messages are shown below 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 (co-ordinates) 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 Track Message. The Remarks may vary significantly from day to day. They include essential information that Shanwick or Gander need to bring to the attention of operators. These Remarks sometimes include details of special flight planning restrictions that may be in force. For example, with effect from 05 February 2015 Phase 2A of the NAT Data Link Mandate was implemented. *From that date all NAT OTS Tracks in the revised altitude band **FL350**-390* are *subject to the FANS equipage requirement.* The Remarks section carries such notification. Also since the implementation of RLatSM Tials in December 2015 *The Remarks section* of the Track Message identifies two core OTS tracks and a ½ Degree spaced central track, on which to flight plan or fly in the DLM altitude band FL350-390 inclusive, aircraft must also be RNP 4 certified. The Remarks section of the Night-time Eastbound OTS Message also includes important information on appropriate clearance delivery frequency assignments.

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

Day-time OTS	1130 UTC to 1900 UTC at 30°W
Night-time OTS	0100 UTC to 0800 UTC at 30°W

2.3.6 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.

2.3.7 Correct interpretation of the track message by airline dispatchers and aircrews is essential for both economy of operation and in minimising the possibility of misunderstanding leading to the use of incorrect track co-ordinates. Oceanic airspace outside the published OTS is available, subject to application of the appropriate separation criteria and NOTAM restrictions. It is possible to flight plan to join or leave an outer track of the OTS. If an operator wishes to file partly or wholly outside the OTS, knowledge of separation criteria, the forecast upper wind situation and correct interpretation of the NAT Track Message will assist in judging the feasibility of the planned route. When the anticipated volume of traffic does not warrant publication of all available flight levels on a particular track, ATC will publish only those levels required to meet traffic demand. However, the fact that a specific flight level is not published for a particular track does not necessarily mean that it cannot be made available if requested. Nevertheless, it should be recognised that the actual availability of an unpublished flight level for planning on an OTS Track may be subject to constraints of the NAT Flight Level Allocation Scheme (FLAS) agreed between NAT ATS Providers (See Attachment 6).

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 the changeover periods some restrictions to flight planned routes and levels are imposed. Eastbound and westbound aircraft operating during these periods should file flight level requests in accordance with the Flight Level Allocation Scheme (FLAS) as published in the *UK and Canada AIPs* and shown at Attachment 6.

2.4.3 It should also be recognised that during these times there is often a need for clearances to be individually co-ordinated between OACs and cleared flight levels may not be in accordance with those flight planned. If, for any reason, a flight is expected to be level critical, operators are recommended to contact the initial OAC prior to filing of the flight plan to ascertain the likely availability of required flight levels.

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

Example 1 — Example of Westbound NAT Track Message

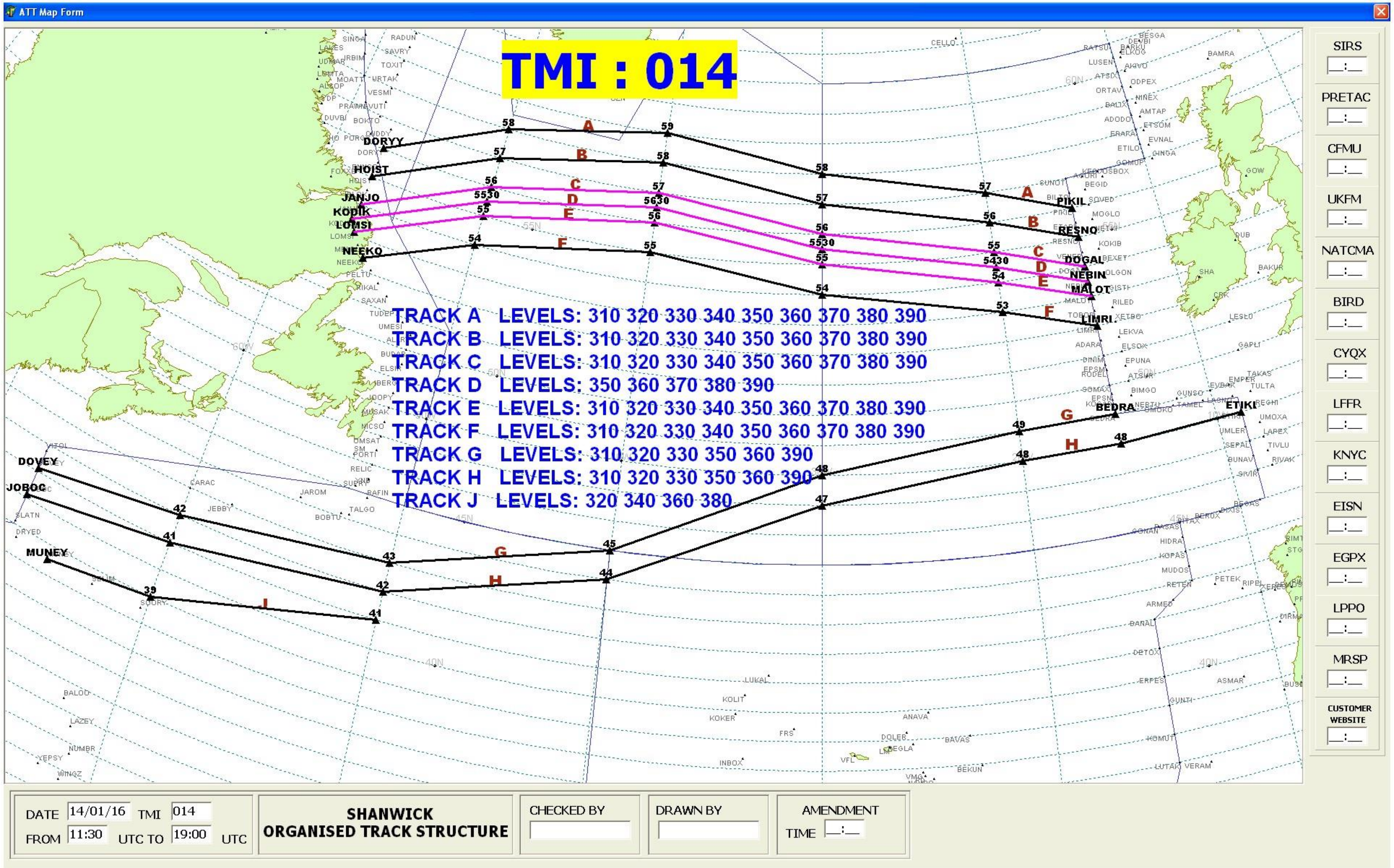
FF CYZZWNAT
102151 EGGXZOZX
(NAT-1/3 TRACKS FLS 310/390 INCLUSIVE
JAN 14/1130Z TO JAN 14/1900Z
PART ONE OF THREE PARTS-
A PIKIL 57/20 58/30 59/40 58/50 DORYY
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
B RESNO 56/20 57/30 58/40 57/50 HOIST
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
C DOGAL 55/20 56/30 57/40 56/50 JANJO
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
END OF PART ONE OF THREE PARTS)

FF CYZZWNAT
102151 EGGXZOZX
(NAT-2/3 TRACKS FLS 310/390 INCLUSIVE
JAN 14/1130Z TO JAN 14/1900Z
PART TWO OF THREE PARTS-
D NEBIN 5430/20 5530/30 5630/40 5530/50 KODIK
EAST LVLS NIL
WEST LVLS 350 360 370 380 390
EUR RTS WEST NIL
NAR -
E MALOT 54/20 55/30 56/40 55/50 LOMSI
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
F LIMRI 53/20 54/30 55/40 54/50 NEEKO
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR -
G BEDRA 49/20 48/30 45/40 43/50 42/60 DOVEY
EAST LVLS NIL
WEST LVLS 310 320 330 350 360 390
EUR RTS WEST NIL
NAR -
H ETIKI 48/15 48/20 47/30 44/40 42/50 41/60 JOBOC
EAST LVLS NIL
WEST LVLS 310 320 330 350 360 390
EUR RTS WEST REGHI
NAR -
END OF PART TWO OF THREE PARTS)

FF CYZZWNAT
102152 EGGXZOZX
(NAT-3/3 TRACKS FLS 310/390 INCLUSIVE
JAN 14/1130Z TO JAN 14/1900Z
PART THREE OF THREE PARTS-
J 41/50 39/60 MUNEY
EAST LVLS NIL
WEST LVLS 320 340 360 380
EUR RTS WEST
NAR -
REMARKS.
1. TMI IS 014 AND OPERATORS ARE REMINDED TO INCLUDE THE
TMI NUMBER AS PART OF THE OCEANIC CLEARANCE READ BACK.
2. ADS-C AND CPDLC MANDATED OTS ARE AS FOLLOWS
TRACK A 350 360 370 380 390
TRACK B 350 360 370 380 390
TRACK C 350 360 370 380 390
TRACK D 350 360 370 380 390
TRACK E 350 360 370 380 390
TRACK F 350 360 370 380 390
TRACK G 350 360 370 380 390
TRACK H 350 360 370 380 390
END OF ADS-C AND CPDLC MANDATED OTS
3. RLATSM OTS LEVELS 350-390. RLATSM TRACKS AS FOLLOWS
TRACK C
TRACK D
TRACK E
END OF RLATSM OTS
4. FOR STRATEGIC LATERAL OFFSET AND CONTINGENCY PROCEDURES RELATED TO OPS
IN NAT FLOW PLEASE REFER TO THE NAT PROGRAMME COORDINATION WEB SITE AT
WWW.NAT PCO.ORG. SLOP SHOULD BE USED AS A STANDARD PROCEDURE AND NOT JUST
AS WEATHER TURBULENCE AVOIDANCE.
5. EIGHTY PERCENT OF GROSS NAVIGATION ERRORS RESULT FROM POOR COCKPIT
PROCEDURES. ALWAYS CARRY OUT PROPER WAY POINT CHECKS.

6.OPERATORS ARE REMINDED THAT THE CLEARANCE MAY
DIFFER FROM YOUR
FLIGHT PLAN, FLY YOUR CLEARANCE.
7.UK AIP. ENR 2.2.4.2 PARA 5.2 STATES THAT NAT
OPERATORS SHALL FILE PRM'S.
8.FLIGHTS REQUESTING WESTBOUND OCEANIC CLEARANCE
VIA ORCA DATALINK SHALL
INCLUDE IN THE RMK/ FIELD THE HIGHEST ACCEPTABLE
FLIGHT LEVEL WHICH CAN BE
MAINTAINED AT THE OAC ENTRY POINT.-
END OF PART THREE OF THREE PARTS …

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



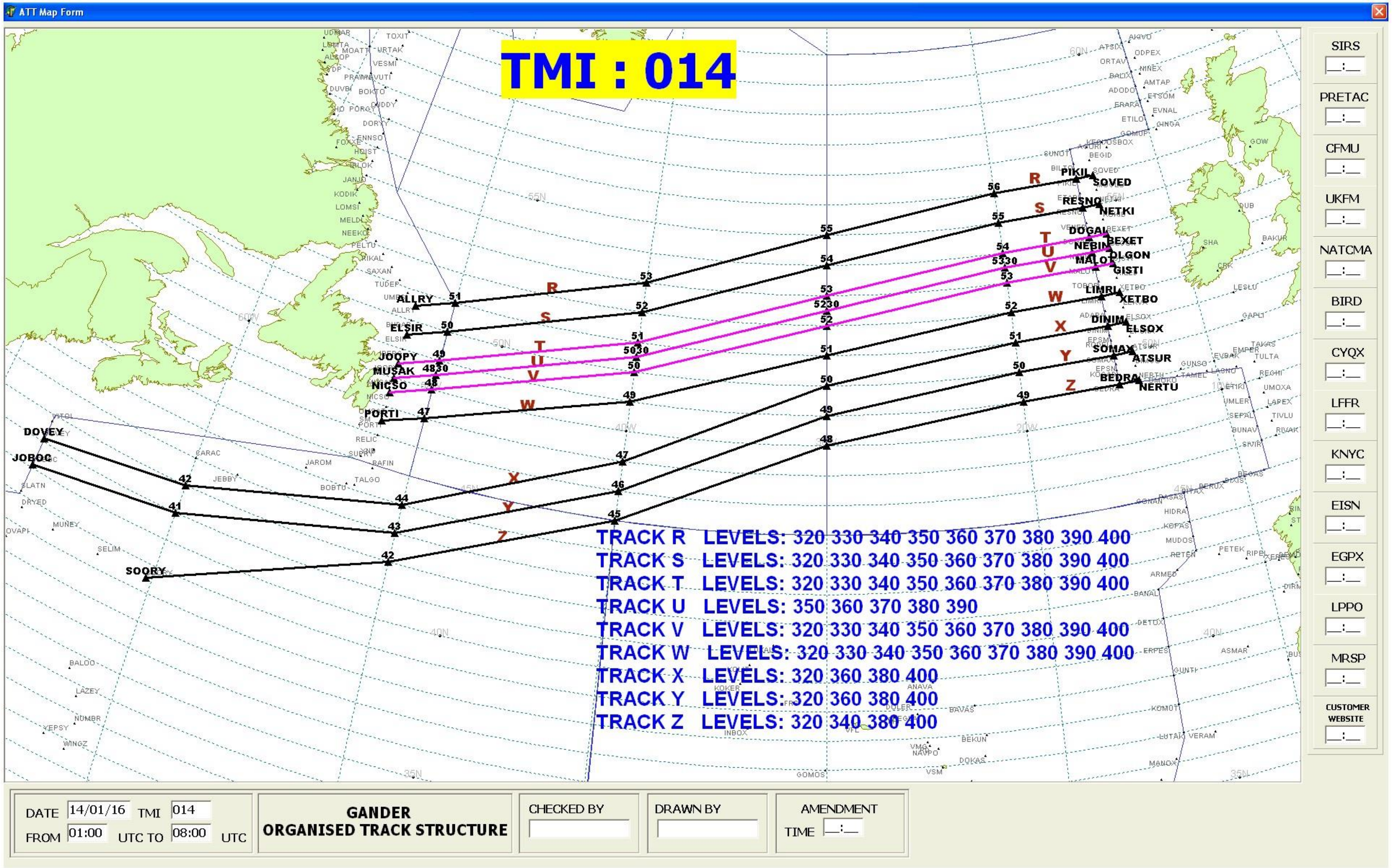
Example 2 — Example of Eastbound NAT Track Message (TO BE UPDATED)

DD CYZZENAT
091401 CZQXZQZX
(NAT-1/3 TRACKS FLS 320/400 INCLUSIVE
FEB 10/0100Z TO FEB 10/0800Z
PART ONE OF THREE PARTS-
S ALLRY 51/50 53/40 55/30 56/20 PIKIL SOVED
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N247A N251A N253A-
T ELSIR 50/50 52/40 54/30 55/20 RESNO NETKI
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N209C N215A N217A-
U JOOPY 4930/50 5130/40 5330/30 5430/20 DOGAL BEXET
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N177D N181F-
V NICSO 48/50 50/40 52/30 53/20 MALOT GISTI
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N143A N153D-
END OF PART ONE OF THREE PARTS)

DD CYZZENAT
091402 CZQXZQZX
(NAT-2/3 TRACKS FLS 320/400 INCLUSIVE
FEB 10/0100Z TO FEB 10/0800Z
PART TWO OF THREE PARTS-
W PORTI 47/50 49/40 51/30 52/20 LIMRI XETBO
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N105C N117A-
X DOVEY 42/60 44/50 47/40 50/30 51/20 DINIM ELSOX
EAST LVLS 320 360 380 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR NIL-
Y JOBOC 41/60 43/50 46/40 49/30 50/20 SOMAX ATSUR
EAST LVLS 320 360 380 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR NIL-
END OF PART TWO OF THREE PARTS)

DD CYZZENAT
091403 CZQXZQZX
(NAT-3/3 TRACKS FLS 320/400 INCLUSIVE
FEB 10/0100Z TO FEB 10/0800Z
PART THREE OF THREE PARTS-
Z SOORY 42/50 45/40 48/30 49/20 BEDRA NERTU
EAST LVLS 320 340 380 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR NIL-
REMARKS:
1.TMI IS 041 AND OPERATORS ARE REMINDED TO INCLUDE THE TMI NUMBER AS
PART OF THE OCEANIC CLEARANCE READ BACK.
2.ADS-C AND CPDLC MANDATED OTS ARE AS FOLLOWS
TRACK S 350 360 370 380 390
TRACK T 350 360 370 380 390
TRACK U 350 360 370 380 390
TRACK V 350 360 370 380 390
TRACK W 350 360 370 380 390
TRACK X 350 360 370 380 390
TRACK Y 350 360 370 380 390
TRACK Z 350 360 370 380 390
END OF ADS-C AND CPDLC MANDATED OTS
3. RLATSM OTS LEVELS 350-390. RLATSM TRACKS AS FOLLOWS
TRACK T
TRACK U
TRACK V
END OF RLATSM OTS
4.80% OF NAVIGATIONAL ERRORS RESULT FROM POOR COCKPIT PROCEDURES.
ALWAYS CARRY OUT PROPER WAYPOINT PROCEDURES.
5.NAT REGION DATALINK MANDATE PHASE 2A WILL COMMENCE FEB 05 2015 AT 1130Z.
FL350-390 INCLUSIVE ON OR AT ANY POINT ALONG THE OTS REGARDLESS OF
PUBLISHED ALTITUDES. OPERATORS ATTENTION IS DRAWN TO AIC 2/14.
6.OPERATORS ATTENTION IS DRAWN TO NOTAM A0017/13 RE: CHANGE IN NEW YORK
CENTER OCEANIC CLEARANCE PROCEDURES.
7.OPERATORS ARE ADVISED THAT VERSION 23 OF THE GANDER DATA LINK OCEANIC
CLEARANCE DELIVERY CREW PROCEDURES IS NOW VALID AND AVAILABLE AS NAT
OPS BULLETIN 2014-007 ON THE WWW.PARIS.ICAO.INT WEBSITE.-
END OF PART THREE OF THREE PARTS)

Figure 3 — Example of Night-Time Eastbound NAT Organised Track System



CHAPTER 3

OTHER ROUTES AND ROUTE STRUCTURES WITHIN OR ADJACENT TO NAT HLA AIRSPACE

3.1 GENERAL

3.1.1 The Organised Track System is the most significant route structure within NAT HLA airspace. Other route structures within and adjacent to NAT HLA airspace are detailed below.

3.2 OTHER ROUTES WITHIN NAT HLA AIRSPACE

3.2.1 Other routes within NAT HLA airspace (illustrated in Fig 3) are as follows:

(1)* 'Blue Spruce' Routes, established as special routes for aircraft equipped with only one serviceable LRNS. (Chapter 1 refers.) **State approval for NAT HLA operations is required in order to fly along these routes**. (See Chapter 12 for full route definitions);

(2) routes between Northern Europe and Spain/Canaries/Lisbon FIR. (T9*, T13 and T16);

(3)* routings between the Azores and the Portuguese mainland and between the Azores and the Madeira Archipelago;

(4)* routings between Iceland and Constable Pynt on the east coast of Greenland and between Kook Islands on the west coast of Greenland and Canada

(5) special routes of short stage lengths where aircraft equipped with normal short-range navigation equipment can meet the NAT HLA track-keeping criteria (G3 and G11). **State approval for NAT HLA operations is required in order to fly along these routes**.

*Note: *routes identified with an asterisk in sub paragraphs (1), (2), (3) and (4) 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.*

3.3 ROUTE STRUCTURES ADJACENT TO NAT HLA AIRSPACE

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 Paragraphs 4.2.13 & 4.2.14).

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 Airport Facility Directory – Northeast, currently available through the following:
https://www.faa.gov/air_traffic/flight_info/aeronav/productcatalog/supplementalcharts/
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 Center Advisory Database (www.fly.faa.gov) for NAT Advisory Message, published daily, for specified transitions from select U.S. airports to the NAT Entry Points. Additionally, route advisories are published, as necessary, to address special route requirements eastbound and westbound through the New York Oceanic FIR/CTA.

Canadian Domestic Track Systems

3.3.4 Within Canada there are three track systems: the Northern Control Area tracks (NCAs), the Southern Control Area tracks (SCAs) and the Northern Organised Track System (NOROTS); these provide links for NAT traffic operating between Europe and North America to central and western North American airports. Track procedures and details are published in Transport Canada's Aeronautical Information Manual (TC AIM). The co-ordinates of the NOROTS are published daily via NOTAM.

Routes between North America and the Caribbean area

3.3.5 An extensive network of routes linking points in the United States and Canada with Bermuda, the Bahamas and the Caribbean area are defined in the New York OCA West. This network has been known as the West Atlantic Route System (WATRS). Since 5 June 2008 the original WATRS airspace together with portions of the Miami Oceanic airspace and the San Juan FIR have been designated as "WATRS Plus Airspace". In this airspace New York Air Route Traffic Control Center (ARTCC) applies 30 NM lateral and 30 NM longitudinal separation minima, and 50 NM longitudinal separation minimum between appropriately authorized and equipped aircraft. (FANS1/A and RNP 4 or RNAV 10 (RNP 10), respectively, see Chapter 4 for further detail). New York ARTCC will continue to accommodate operators that are not eligible for these reduced separations. Details of these routes and associated procedures are contained in the United States AIP. Some information on WATRS can be currently found at: http://www.faa.gov/pilots/intl/oceanic_ops/.

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

3.3.6 Parts of the Shanwick OCA are designated as the Shannon Oceanic Transition Area (SOTA) and the Northern Oceanic Transition Area (NOTA). NOTA airspace is included in the NAT HLA and hence NAT HLA airspace requirements are still applicable from FL285 to FL420 in NOTA. However, SOTA is not included in the NAT HLA. Therefore flights within SOTA routing such that they are subject to an Oceanic Clearance, are required to be NAT HLA MNPS Approved.

3.3.7 SOTA has the same vertical extent as the Shanwick OCA, and is bounded by lines joining successively the following points:

N5100 W01500 – N5100 W00800 – N4830 W00800 – N4900 W01500 – N5100 W01500

3.3.8 NOTA has the same vertical extent as the Shanwick OCA and is bounded by the lines joining successively the following points.

N5400 W01500 - N5700 W01500 - N5700 W01000W - N5434 W01000 - N5400 W01500.

3.3.9 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.

Brest Oceanic Transition Area (BOTA)

3.3.10 Part of the Shanwick OCA is designated as the Brest Oceanic Transition Area (BOTA). BOTA is not included in the NAT HLA. Hence only flights routing such that they are subject to an Oceanic Clearance, are required to be NAT HLA MNPS Approved.

3.3.11 BOTA has the same vertical extent as the Shanwick OCA, and is bounded by lines joining successively the following points:

N4834 W00845 – N4830 W00800 – N4500 W00800 – N4500 W00845 – N4834 W00845

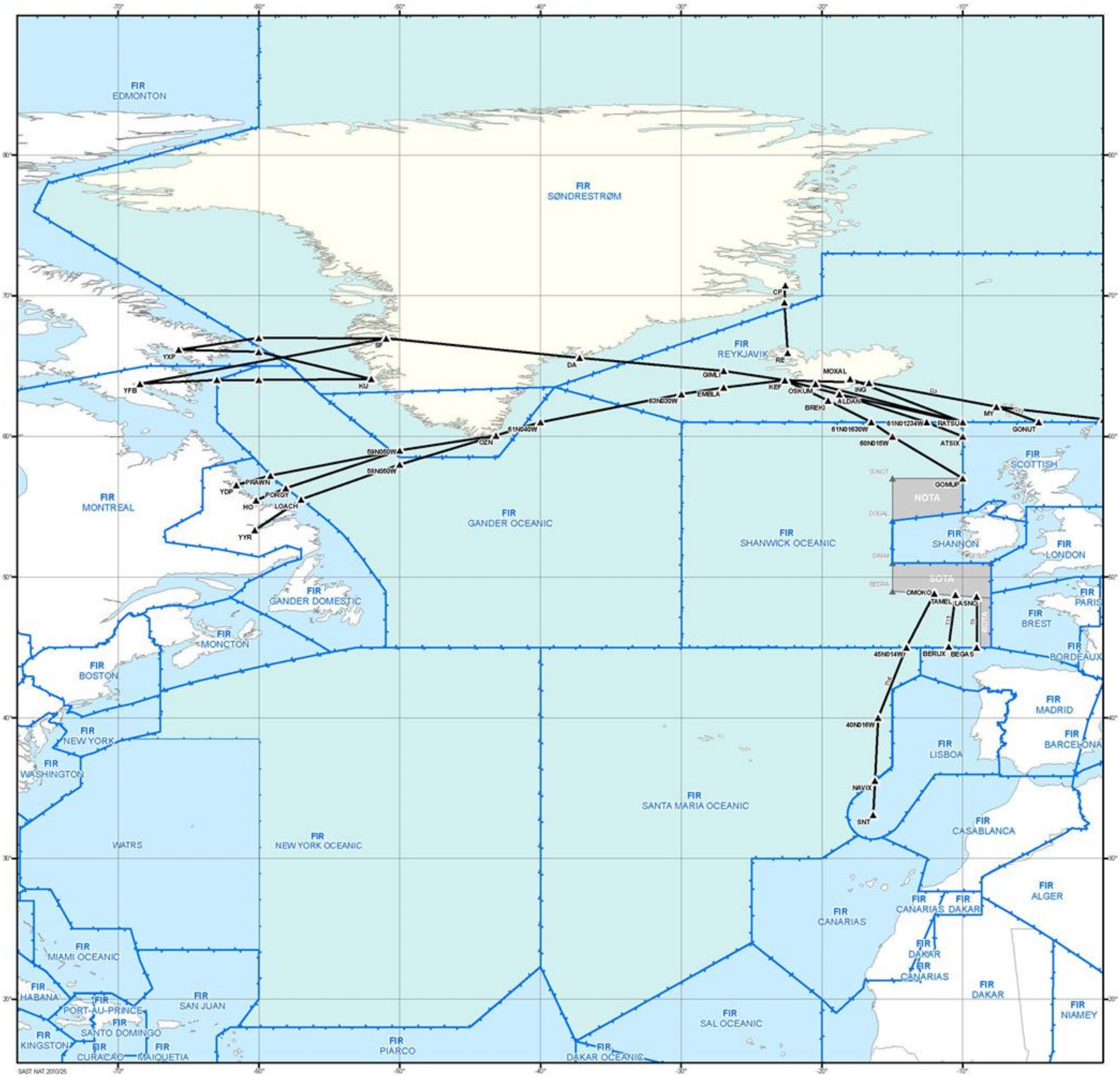
3.3.12 Air Traffic service is provided by the Brest ACC, call sign BREST CONTROL.

Gander Oceanic Transition Area (GOTA)

3.3.14 The GOTA is comprised of airspace from 6530N 060W east to the Reykjavik ACC boundary; south to 6330N 055W; south to OYSTR; north to PRAWN; then MOATT; then north to 61N 063W; along the Montreal ACC boundary north to the Edmonton ACC boundary.

3.3.15 Air Traffic service is provided by the Gander ACC, call sign GANDER CENTRE.

3.4 FIGURE 4 – OTHER ROUTES AND STRUCTURES WITHIN NAT HLA AIRSPACE



CHAPTER 4

FLIGHT PLANNING

4.1 FLIGHT PLAN REQUIREMENTS

General

4.1.1 It is essential that care is taken when entering track information into a computer and the information should be cross-checked before it is given to the operating crew. Crews of all NAT flights at or above FL290, even those that will transit the NAT above the NAT HLA (i.e. above FL420) or through the NAT HLA but are not planned to use the OTS, must be given both the organised track message and relevant amendments to it. Copies must be available on-board the aircraft. *(N.B. In the event of a contingency or diversion, knowledge of the location of the OTS tracks will be useful to the crew of any NAT high level flight)*. Should more than one version of the daily Track Message have been issued, then crews should be issued the entire revised version together with an appropriate explanation to relate differences between versions. Each successive version will be identified by the TMI and an alphabetic suffix. e.g. 243A, 243B etc.

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 degrees of latitude; and all generally northbound or southbound flights should normally be flight planned so that specified parallels of latitude spaced at five degree intervals (65°N, 60°N, 55°N etc.) are crossed at whole degrees of longitude. Exceptions apply in the case of flights routing north of 70°N, these are noted below. However, where appropriate ALL oceanic ten-degree meridians should be included as waypoints in the flight plan submitted to ATC, even where “named” significant points are close to these "prime" meridians of longitude. It is not appropriate to then omit the ten-degree crossings from the ATC Flight Plan.

4.1.3 All flights should plan to operate on great circle tracks joining successive significant waypoints.

Routings

4.1.4 During the hours of validity of the OTS, operators are encouraged to flight plan as follows:

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

4.1.5 Nothing in the paragraph above prevents operators from flight planning through/across the OTS. However they should be aware that whilst ATC will make every effort to clear random traffic across the OTS at published levels, re-routes or significant changes in flight level are likely to be necessary during most of the OTS traffic periods. It must also be noted that aircraft without the equipage necessary for the Data Link Mandate will not be permitted during the OTS validity period to join or cross those tracks within the mandate, as specified via the daily OTS Track Message Remarks. For such aircraft, however, continuous climb or descent through the specified levels may be available on request, subject to traffic.

4.1.6 Outside of the OTS periods operators may flight plan any random routing, except that during a period of one hour prior to each OTS period the following restrictions apply:

- Eastbound flights that cross 30°W less than one hour prior to the incoming/pending Westbound OTS (i.e. after 1029 UTC), or Westbound flights that cross 30°W less than one hour prior to the incoming/pending Eastbound OTS (i.e. after 2359 UTC), should plan to remain clear of the incoming/pending OTS structure.

Flight Levels

4.1.7 Within RVSM Airspace improved opportunity exists for step climbs and such opportunities are even more improved from the trial applications of 5 minutes longitudinal separations. (Details of these trials are provided in relevant State AIS and in four ICAO NAT OPS Bulletins, available available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT OPS Bulletins".

4.1.8 Operators may include step climbs in the flight plan, although each change of level during flight must be requested from ATC by the pilot. The chance of approval of such requests will, of course, be entirely dependent upon potential traffic conflicts. Outside the OTS there is a good likelihood of achieving the requested profiles. However, within the prime OTS levels at peak times, ATC may not always be able to accommodate requested flight level changes and prudent pre-flight fuel planning should take this into consideration.

4.1.9 During the OTS Periods (eastbound 0100-0800 UTC, westbound 1130-1900 UTC) aircraft intending to follow an OTS Track for its entire length may plan at any of the levels as published for that track on the current daily OTS Message. However, with effect from 05 February 2015 Phase 2A of the NAT Data Link Mandate was implemented. From that date all NAT OTS Tracks in the altitude band FL350-390 are subject to the FANS equipage requirement. FANS1/A (or equivalent) equipage and operation will be required to plan and/or fly on **any** OTS Track at **FL350** -FL390, inclusive. The Remarks section of the OTS Message carries such notification.

4.1.10 Trials of reduced lateral separation of (nominally) 30 NMs (RLatSM) were commenced in December 2015. Two core OTS Tracks are designated and a central ½ Degree spaced Track between them is published. To plan or fly on any of these three Tracks at FL350 – 390 inclusive aircraft must be RNP 4 Approved

4.1.11 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. Pilots intending to fly on a random route or outside the OTS time periods, should normally plan flight level(s) appropriate to the direction of flight.

Note: "Appropriate Direction Levels" within the NAT HLA are specified by the Semi-circular Rule Per ICAO Annex 2, Appendix 3, Table a.

4.1.12 Planners should note however that the NAT ATS Provider State AIPs specify some exceptions to use of "Appropriate Direction Levels" both during the OTS time periods and outside them. At specified times, appropriate direction levels are reserved for use by (opposite direction) traffic flows that then predominate. These exceptions may be modified in future to accommodate changes in traffic flows. The current usage allocation of flight levels in the NAT HLA is published in the UK and Canadian AIPs and shown at Attachment 6 as the NAT Flight Level Allocation Scheme (FLAS). Hence, pilots and planners should always consult the current AIPs and any supporting NOTAMs when flight planning random routes through NAT HLA airspace.

4.1.13 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.

ATC Flight Plans

4.1.14 Correct completion and addressing of the flight plan is extremely important as errors can lead to delays in data processing and to the subsequent issuing of clearances to the flights concerned. Despite the growing use of automated flight planning systems, a significant proportion of ATC 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. The format and contents of the ICAO model flight plan was significantly amended with effect from 15 November 2012. A detailed description of the changes is contained in the document "**Review of Amend 1 to PANS ATM**" available at www.icao.int/EURNAT/, following "Other Meetings Seminars and Workshops", then "Sub-Regional FPL2012 Workshop-Greece".

4.1.15 Detailed explanations of how to complete an ATS Flight Plan in respect of the NAT portion of a flight are contained in Chapter 17 and Attachment 4 of this Manual. The Attachment also highlights the more common completion errors that are made.

4.1.16 Operators are encouraged to indicate their RNP, RNAV, RVSM, FANS 1/A data link, ADS-B and NAT HLA capability in the flight plan. It is important that operators provide this information in flight plans in order to ensure that the full benefits of current capacity and safety improvement initiatives in the NAT Region are made available to appropriately equipped flights. The provision of this information will also support planning for future initiatives by providing more accurate information regarding the actual capabilities of the fleet operating in the ICAO NAT Region. In order to signify that a flight is approved to operate in NAT HLA airspace, the letter 'X' shall be inserted within Item 10 of the flight plan. A 'W' must also be included in Item 10 to indicate that the flight is approved for RVSM operations.

Note: Since 5 June 2008 the former West Atlantic Route System (WATRS) together with the Atlantic portion of Miami Oceanic Airspace and the San Juan FIR has been designated "WATRS Plus Airspace". Since December 2013 in this airspace, pairs of aircraft with RNP 4 and FANS1/A Approvals may receive clearances by ATC using 30 NMs lateral and 30 NMs longitudinal separation minima; and pairs of aircraft with RNAV 10 (RNP 10) and FANS1/A Approvals may be cleared for 50 NMs longitudinal separation.

Some information can be currently found at:

http://www.faa.gov/pilots/intl/oceanic_ops/

Also currently 50 Nm lateral separation standard is implemented in the New York Oceanic East and Santa Maria Oceanic FIRs between aircraft meeting RNAV 10 (RNP 10) or RNP 4 specifications.

Hence, in order to benefit from these separation standards any NAT HLA Aircraft intending to fly through these NAT FIRs or through the adjacent WATRS Plus airspace, should ensure that its RNP Approval status is included in the Flight Plan. Specifically such operators should:

i) annotate ICAO Flight Plan Item 10 (Equipment) with the letter "R" and

ii) annotate Item 18 (Other Information) with, as appropriate, "PBN/A1 (for RNAV 10 (RNP 10) Approval) or PBN/L1 (for RNP 4 Approval)".

4.1.17 For turbojet aircraft the Speeds/Mach Number planned to be used for each portion of the flight in the NAT Region should be specified in Item 15 of the flight plan.

The proposed speeds should be reflected in the following sequence:

a) cruising True Airspeed (TAS) prior to oceanic entry;

b) oceanic entry point and cruising Mach Number;

c) TAS subsequent to oceanic exit.

4.1.18 For non-turbojet aircraft TAS should be specified in Item 15 of the flight plan.

4.1.19 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.

4.2 FLIGHT PLANNING REQUIREMENTS ON SPECIFIC ROUTES

Flights Planning on the Organised Track System

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

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 for the organised track should be specified at either the last domestic reporting point prior to oceanic airspace entry or the organised track commencement point.

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

4.2.5 For flights operating along the whole length of one of the organised tracks, estimates are only required for the commencement point of the track and Oceanic FIR boundaries.

4.2.6 Phase 2A of the NAT data Link Mandate was implemented 05 February 2015. In this phase all OTS tracks will be designated as DLM airspace at Flight Levels **350** to 390 inclusive. Aircraft/crews which are not DLM compliant are not permitted to plan/fly on, or to join or cross, any OTS track at these levels. For such aircraft, however, continuous climb or descent through the specified levels (FL350-390) may be available, on request, subject to traffic. When a “Split” westbound structure is published, although eastbound flights which are not DLM compliant may flight plan in the airspace between the branches of the Split OTS they should not plan any route which results in a partial back-tracking of a westbound OTS track.

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

4.2.7 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.

4.2.8 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.

4.2.9 For flights operating **at or south of 80°N**, the distance between significant points shall, as far as possible, not exceed one hour's flight time. Additional significant points should be established when deemed necessary due to aircraft speed or the angle at which the meridians are crossed, e.g.:

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

b) at intervals of 20 degrees of longitude (between 10°W and 50°W) for flights operating **north of 70°N and at or south of 80°N**.

4.2.10 When the flight time between successive significant points referred to in 4.2.10 is less than 30 minutes, one of these points may be omitted.

4.2.11 For flights operating **north of 80°N**, the planned tracks shall normally be defined by significant points formed by the intersection of parallels of latitude expressed in degrees and minutes with meridians expressed in whole degrees. The distance between significant points shall normally equate to not less than 30 and not more than 60 minutes of flying time. (The 30 minute minimum was introduced in the Iceland AIP in 2014) .

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

Note: The ICAO Regional Supplementary Procedures for the NAT Region (Doc.7030) state 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.

4.2.12 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.

4.2.13 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. (*N.B.: This 30 minute minimum was introduced in the Iceland AIP in 2014*).

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

4.2.14 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.

4.2.15 The routes are prefixed by the abbreviation "N," with the numbering for the common portions orientated geographically from south to north. The odd numbers have eastbound application while the even numbers apply to westbound. Following a one-to-three-digit number, an alpha character indicates the validation code and forms part of the route identifier. Validation codes are associated to amendments to the common routes only and not to non-common route portions.

4.2.16 The use of NARs is, however, not compulsory. The East-bound Track Message includes recommended NARs for access to each OTS Track. Since 01 October 2012 the West-bound Track Message routinely carries the annotation "NAR Nil" for each OTS Track. West-bound NAR details are still listed in the Canada Flight Supplement and Moncton FIR issues daily NOTAMS showing “recommended NARs”. Operators may file them if desired. The only exception is in respect of West-bound OTS Tracks terminating at CARAC, JAROM or RAFIN for which a NAR must be filed. Here operators may file on any one of the destination appropriate NARs published from that relevant coastal fix.

4.2.17 Canadian Domestic route schemes and the US East Coast Link Routes are also published. Flights entering the NAM Region north of 65N must be planned in accordance with the NCA and/or NOROTS as appropriate. 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.

Flights Planning to Operate Without Using HF Communications

4.2.18 The carriage of functioning HF communications is mandatory for flight in the Shanwick OCA, even if the pilot intends using alternative media for regular ATS air-ground contacts. Aircraft with only functioning VHF communications equipment should plan their route outside the Shanwick OCA and ensure that they remain within VHF coverage of appropriate ground stations throughout the flight. Theoretical VHF coverage charts are shown in Attachment 5. Such strict routing restriction may not apply in all NAT Oceanic Control Areas. Some may permit the use of SATCOM Voice to substitute for or supplement HF communications. Details of communication requirements by individual NAT ATS Providers are published in State AIPs. However, it must also be recognised that the Safety Regulator of the operator may impose its own operational limitations on SATCOM Voice usage. Any operator intending to fly through NAT HLA Airspace without fully functional HF communications or wishing to use an alternative medium should ensure that it will meet the requirements of its State of Registry and those of all the relevant ATS Providers throughout the proposed route.

Flights Planning to Operate with a Single Functioning LRNS

4.2.19 Within the NAT HLA airspace only those routes identified with an asterisk in sub paragraphs (1), (2), (3) and (4) of paragraph 3.2.1 may be flight planned and flown by aircraft equipped with normal short-range navigation equipment (VOR, DME, ADF) and at least one approved fully operational LRNS. Specific State Approval for such NAT HLA operations must, however, be obtained from the State of the Operator or the State of Registry of the aircraft.

Flights Planning to Operate with Normal Short-Range Navigation Equipment Only.

4.2.20 Two routes providing links between Iceland and the ICAO EUR Region (G3 and G11) (see Chapter 3) are designated as special routes of short stage lengths where it is deemed that aircraft equipped with normal short-range navigation equipment can meet the NAT HLA track-keeping criteria. Nevertheless, State Approval for NAT HLA operations is still required in order to fly along these routes.

CHAPTER 5

OCEANIC ATC CLEARANCES

5.1 GENERAL

5.1.1 There are three elements to an Oceanic Clearance: Route, Speed and Level. These elements serve to provide for the three basic elements of separation: lateral, longitudinal and vertical.

5.1.2 Oceanic Clearances are required for all flights within NAT controlled Airspace (at or above FL55). Pilots should request Oceanic Clearances from the ATC responsible for the first OCA within which they wish to operate, following the procedures and the time-frame laid down in appropriate AIPs. Such clearances, although in most cases obtained some time before reaching the Oceanic entry point, are applicable only from that entry point. It is recommended that pilots should request their Oceanic Clearance at least 40 minutes prior to the Oceanic entry point ETA except when entering the Reykjavik area from the Scottish or Stavanger areas, then the clearance should be requested 20 minutes before the Oceanic entry point ETA.

5.1.3 To assist the OAC in pre-planning optimum airspace utilisation, when requesting an oceanic clearance the pilot should notify the OAC of the maximum acceptable flight level possible at the boundary, taking into account that a climb to the assigned oceanic flight level must be achieved prior to entering oceanic airspace and normally whilst the aircraft is within radar coverage. The pilot should also notify the OAC of any required change to the oceanic flight planned level, track or Mach Number as early as practicable after departure. If requesting an OTS track, the clearance request should include the next preferred alternative track.

5.1.4 Specific information on how to obtain oceanic clearance from each NAT OAC is published in State AIPs. Various methods of obtaining Oceanic Clearances include:

a) use of published VHF clearance delivery frequencies;

b) by HF communications to the OAC through the appropriate aeradio station (in accordance with the timeframes detailed in paragraph 5.1.1 above);

c) a request via domestic or other ATC agencies;

d) by data link, when arrangements have been made with designated airlines to request and receive clearances using on-board equipment (ACARS). Detailed procedures for its operation may vary. Gander, Shanwick, Santa Maria and Reykjavik OACs provide such a facility and the relevant operational procedures are published in national AIS and also as NAT OPS Bulletins which are available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", and folder "NAT OPS Bulletins". New York OAC uses the FANS 1/A CPDLC function to uplink oceanic clearances to all aircraft utilising CPDLC.

5.1.5 At some airports **situated close to oceanic boundaries or within the NAT Region**, it may be necessary to obtain the Oceanic Clearance before departure. These procedures are detailed in relevant State AIPs, which should be consulted prior to departure. On the east side of the NAT, this will apply to departures from all Irish airfields, all UK airfields west of 2° 30'W and all French Airfields west of zero degree longitude. Oceanic Clearances for controlled flights leaving airports **within the region** are issued by the relevant ATS unit prior to departure.

5.1.6 If an aircraft, which would normally be RVSM and/or NAT HLA MNPS Approved, encounters, whilst en-route to the NAT Oceanic Airspace, a critical in-flight equipment failure, or at dispatch is unable to meet the MEL requirements for RVSM or NAT HLA MNPS Approval on the flight, then the pilot must advise ATC at initial contact when requesting Oceanic Clearance.

5.1.7 After obtaining and reading back the clearance, the pilot should monitor the forward estimate for oceanic entry, and if this changes by **3 minutes or more**, unless providing position reports via ADS-C, the pilot must pass a revised estimate to ATC. As planned longitudinal spacing by these OACs is based solely on the estimated times over the oceanic entry fix or boundary, failure to adhere to this ETA amendment procedure may jeopardise planned separation between aircraft, thus resulting in a subsequent re-clearance to a less economical track/flight level for the complete crossing. Any such failure may also penalise following aircraft.

5.1.8 If any of the route, flight level or Mach Number in the clearance differs from that flight planned, requested or previously cleared, attention may be drawn to such changes when the clearance is delivered (whether by voice or by data link). Pilots should pay particular attention when the issued clearance differs from the Flight Plan. *(N.B. a significant proportion of navigation errors investigated in the NAT involve an aircraft which has followed its Flight Plan rather than its differing clearance).*

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

5.1.10 If pilots have not received their Oceanic Clearance prior to reaching the Shanwick OCA boundary, they must contact Domestic ATC and request instructions to enable them to remain clear of Oceanic Airspace whilst awaiting such Clearance. This is not the case for other NAT OCAs into any of which flights may enter whilst pilots are awaiting receipt of a delayed Oceanic Clearance. Pilots should always endeavour to obtain Oceanic Clearance prior to entering these other NAT OCAs; however if any difficulty is encountered the pilot should not hold while awaiting Clearance unless so directed by ATC. In such circumstances, pending receipt of the Oceanic Clearance, the aircraft should continue to maintain the flight level cleared by the current control authority.

5.1.11 Unless otherwise stated the Oceanic Clearance issued to each aircraft is at a specified flight level and cruise Mach Number (Exceptions are discussed at section 5.7 below). Subsequent enroute changes to Flight level or Mach Number should not be made without prior ATC clearance, except in an urgency situation. (e.*g. encountering unanticipated severe turbulence).*

5.1.12 An example of a pilot voice request for Oceanic Clearance is as follows:

> *"ACA 865 request Oceanic Clearance. Estimating PIKIL at 1131. Request Mach decimal eight zero, Flight Level three five zero, able Flight Level three six zero, second choice Track Charlie".*

5.1.13 If the request also includes a change to the original flight plan, affecting the oceanic segment, then it should be according to the following example:

> *"BAW 123 request Oceanic Clearance. Estimating RESNO at 1147. Request Mach decimal eight zero, Flight Level three four zero. Now requesting Track Charlie, able Flight Level three six zero, second choice Track Delta".*

5.2 CONTENTS OF CLEARANCES

5.2.1 An abbreviated clearance is issued by Air Traffic Services when clearing an aircraft to fly along the whole length of an Organised Track. When an abbreviated clearance is issued it includes:

a) clearance Limit, which will normally be destination airfield;

b) cleared track specified as “Track” plus code letter;

c) cleared flight level(s);

d) cleared Mach Number; and

A typical example of such a clearance is as follows:

“ACA865 is cleared to Toronto via Track Bravo, from PIKIL maintain Flight Level three five zero, Mach decimal eight zero”.

5.2.2 Procedures exist for an abbreviated read back of an Oceanic Clearance. The flight crew will confirm that they are in possession of the current NAT Track message by using the TMI number (including any appropriate alpha suffix) in the read-back of the Oceanic Clearance, as follows:

“ACA865 is cleared to Toronto via Track Bravo ***283A****, from PIKIL maintain Flight Level three five zero, Mach decimal eight zero”.*

5.2.3 If the TMI number is included in the read-back there is no requirement for the pilot to read back the NAT Track co-ordinates even if the cleared NAT Track is not the one which was originally requested. If any doubt exists as to the TMI (see paragraph 2.3.3 for fuller explanation of this term) or the NAT Track co-ordinates, the pilot should request the complete track co-ordinates from the OAC. Similarly, if the pilot cannot correctly state the TMI, the OAC will read the cleared NAT Track co-ordinates in full and request a full read back of those co-ordinates.

5.2.4 For aircraft cleared by Shanwick OAC on random routings in the NAT Region the present procedure of reading the full track co-ordinates as part of the Oceanic Clearance and requesting from the pilot a full read back of the co-ordinates is expected to continue. Gander and Reykjavik OACs may, however, issue clearances for random routings which specify “via flight plan route”. Nevertheless, in all circumstances regarding random route clearances, pilots are required to read back **the full track co-ordinates** of the flight plan route, from the oceanic entry point to the exit point.

5.2.5 In 2011/2012 the NAT SPG developed documentation to provide examples of standard phraseology used in the ICAO NAT Region This effort was undertaken to promote standardization of air traffic services practices and to address safety risks associated with incorrect understanding of, and reactions to, the typical clearances issued to flights operating in the North Atlantic airspace. The resulting material is included at Attachment 7. It provides examples and accompanying explanations for a variety of clearances and instructions which could be provided in the course of normal operations in the ICAO NAT Region. The examples include both voice and data link messages adhering to the ED/106 standard, which is used to provide oceanic clearances via data link from the Gander, Prestwick, Reykjavik and Santa Maria oceanic area control centres. The examples include voice messages as they would be delivered via aeradio, clearance delivery or directly by the air traffic controller. Operators and pilots, particularly those new to NAT operations, are encouraged to study the material closely.

5.3 OCEANIC CLEARANCES FOR WESTBOUND FLIGHTS ROUTING VIA 61°N 010°W

5.3.1 The provision of air traffic service at RATSU (61°N 010°W) has been delegated by Shanwick to Reykjavik. Flights intending to enter NAT Oceanic airspace via RATSU (61°N 010°W) should not call Shanwick for an Oceanic Clearance. The required Oceanic Clearance will be issued by Reykjavik Control. There are three points established at the boundary of delegated airspace from Scottish to Reykjavik, BESGA, DEVBI and BARKU on routes to RATSU. Reykjavik will issue Oceanic Clearances from those points. Aircraft that have not received their oceanic clearance prior to those points shall enter Reykjavik airspace at the domestic cleared flight level while awaiting such oceanic clearance.

5.4 OCEANIC CLEARANCES FOR FLIGHTS INTENDING TO OPERATE WITHIN THE NAT REGION AND SUBSEQUENTLY ENTER THE NAM REGIONS

5.4.1 As indicated in Chapters 3 and 4 of this Manual, to provide for the safe and efficient management of flights to/from the NAT Region, transition route systems/schemes are established in the NAM Region. These schemes detail particular domestic routings associated with each landfall point. Flights in this category must be planned in accordance with these schemes. Should a pilot of a flight in this category receive a clearance on a route other than originally flight planned, special caution should be exercised to ensure that the co-ordinates of the assigned route and of the associated landfall **and** subsequent domestic routings are fully understood and correctly inserted into the automated navigation systems. Appropriate cross checks should be carried out. In all cases when an enroute re-clearance is requested, the pilot should ensure that the revised ATC clearance includes the new routing from the oceanic exit point to the first landfall point or coastal fix. If at the time of being given a clearance or re-clearance, the pilot has any doubt concerning the subsequent domestic routing, details should be checked with the ATC unit issuing the clearance/re-clearance.

5.5 OCEANIC CLEARANCES FOR RANDOM FLIGHTS INTENDING TO OPERATE WITHIN THE NAT REGION AND SUBSEQUENTLY ENTER REGIONS OTHER THAN NAM OR EUR

5.5.1 Oceanic Clearances issued to flights in this category are similar to domestic ATC clearances in that clearances are to destination on the assumption that co-ordination will be effected ahead of the aircraft's passage. In this case, if necessary, the flight profile may be changed en-route, prior to hand-over from one centre to another, subject to traffic conditions in the adjacent area.

5.6 OCEANIC FLIGHTS ORIGINATING FROM THE NAM, CAR OR SAM REGIONS AND ENTERING NAT HLA AIRSPACE VIA THE NEW YORK OCA EAST

5.6.1 In February 2013, New York Center changed the way in which Oceanic Clearances are delivered to aircraft that enter the NAT via the New York Oceanic East FIR.

5.6.2 There are three elements to an Oceanic Clearance; Complete Route, Flight and Mach number. These elements do not have to be issued in the same clearance. Additionally, these elements may not be issued by the same ATS Provider. For example, the Route portion may be issued by one ATC Unit, the Oceanic Altitude issued by another and finally the Mach Number by a third. The receipt of all three elements, even if not received at the same time, constitutes receipt of an Oceanic Clearance and no further request for one is necessary. The detail of the procedures followed may differ depending on the ICAO region from which the flight originates.

5.6.3 For aircraft planning to enter the NAT via the New York Oceanic East FIR from the NAM Region or the New York Oceanic West FIR, the IFR clearance to destination received at the departure aerodrome from Air Traffic Control constitutes the Route portion of the Oceanic Clearance. Once airborne, and prior to entry into the NAT, aircraft will be assigned a Mach number and an Altitude by the FAA.

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

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

5.6.5 Example two: on a flight from New York (KJFK) to Madrid (LEMD), Kennedy Clearance Delivery up-links a clearance via Pre-Departure Clearance (PDC) with a complete route and altitude; later, New York Center assigns the aircraft a Mach number. At this point, all three required elements (route, Mach number and flight level) have been received and the flight has an Oceanic Clearance. A subsequent change to any element(s) of the Oceanic Clearance does not alter the others.

5.6.6 The only exception to this procedure is for aircraft entering from the Piarco CTA and thence through the southern (non-NAT HLA) portion of the New York East FIR. For these flights Piarco ACC will issue all three elements of the Oceanic Clearance prior to entry into the New York Oceanic CTA.

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

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

5.7 CLEARANCES INCLUDING VARIABLE FLIGHT LEVEL

5.7.1 Clearances which include Variable Flight Level may on occasions be requested and granted, traffic permitting. Clearances requests which include a variable Flight Level may be made by voice or using CPDLC. The trials and results leading to the inclusion of these facilities in NAT operations are referenced in this document in paragraph 1.10.10.

5.7.1 Within the NAT, on occasion when traffic permits, aircraft are cleared for a cruise climb or to operate within a block of flight levels. The operational difference between cruise climbs and block of flight levels, however, does not always seem to be fully understood.

5.7.2 ICAO defines cruise climb as follows: "*An aeroplane cruising technique resulting in a net increase in altitude as the aeroplane mass decreases*". As far as is known, no current aircraft have the capability to automatically conduct a cruise climb. Cruise climb can however be approximated by the pilot instructing the aircraft to climb in small incremental steps (for example 100 or 200 feet at a time) as the weight of the aircraft decreases and the optimum flight level increases.

5.7.3 PANS-ATM section 5.3.4.1 specifies the following:

> *5.3.4.1 An aircraft may be cleared to a level previously occupied by another aircraft after the latter has reported vacating it, except when:*
>
> ....
>
> *b) the higher aircraft is effecting a cruise climb;*
>
> ....
>
> *in which case such clearance shall be withheld until the aircraft vacating the level has reported at or passing another level separated by the required minimum.*

5.7.4 Accordingly, when an aircraft is executing a cruise climb and reports at a specific level, the controller will release the airspace that is more than 1000 feet (in RVSM airspace) below the aircraft and may assign that airspace to another aircraft. The flight level report may be received by ATC in a position report delivered by the pilot, by radar or ADS-B information or in an ADS-C periodic or event report. If the aircraft is within ATS surveillance airspace or is using ADS-C the pilot must be aware that ATC is periodically being informed about the aircraft level and the controller will adjust the aircraft's protected airspace accordingly.

5.7.5 It is therefore imperative that aircraft conducting a cruise climb **do not under any circumstances descend**. A cruise climbing aircraft may only climb or maintain a level.

5.7.6 By contrast, when an aircraft is cleared into a block of flight levels the pilot may operate anywhere within the block of levels and may climb and/or descend within the block as desired. ATC will not release the protection of the block of flight levels, regardless of flight level reports from the aircraft, until the block clearance is cancelled.

CPDLC message elements for cruise climb

5.7.7 Pilots may request a cruise climb clearance by using the following message element:

DM 8: REQUEST CRUISE CLIMB TO [level]

5.7.8 The controller will issue a cruise climb clearance using the following message element:

UM 34: CRUISE CLIMB TO [level]

CPDLC message elements for block of flight levels

5.7.9 Pilots may request a clearance to operate within a block of flight levels by using the following message element:

DM 7: REQUEST BLOCK [level] TO [level]

5.7.10 The controller will issue a clearance to operate within a block of flight levels using one of the following message elements:

UM 30: MAINTAIN BLOCK [level] TO [level]

UM 31: CLIMB TO AND MAINTAIN BLOCK [level] TO [level]

UM 32: DESCEND TO AND MAINTAIN BLOCK [level] TO [level]

5.7.11 When a pilot desires to operate with a “flexible” vertical profile the following should be kept in mind when making the request to ATC:

- ✓ Request a cruise climb when the desire is to gradually climb as the aircraft weight decreases and the optimum flight level increases.

- ✓ Request a block of flight levels when there is a requirement to vary the aircrafts altitude up or down for instance due to factors such as turbulence or icing.

Note: Requesting a block of flight levels when the intention is to only climb results in an inefficient use of airspace and may deny other aircraft to receive economic flight profiles.

CRUISE CLIMB VS. BLOCK OF FLIGHT LEVELS
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.

5.8 ERRORS ASSOCIATED WITH OCEANIC CLEARANCES

5.8.1 Navigation errors associated with Oceanic Clearances fall into several categories of which the most significant are ATC System Loop errors and Waypoint Insertion errors.

ATC System Loop Errors

5.8.2 An ATC system loop error is any error caused by a misunderstanding between the pilot and the controller regarding the assigned flight level, Mach Number or route to be followed. Such errors can arise from: incorrect interpretation of the NAT Track Message by dispatchers; errors in co-ordination between OACs; or misinterpretation by pilots of Oceanic Clearances or re-clearances. Errors of this nature, which are detected by ATC from pilot position reports will normally be corrected. However, timely ATC intervention cannot always be guaranteed, especially as it may depend on the use of third-party relayed HF, GP/VHF or SATCOM Voice communications.

Waypoint Insertion Errors

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

a) failure to observe the principles of checking waypoints to be inserted in the navigation systems, against the ATC cleared route;

b) failure to load waypoint information carefully; or

c) failure to cross-check on-board navigation systems.

5.8.4 More detailed guidance on this subject is contained in Chapter 8, Chapter 14 and Chapter 15 of this Document.

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

CHAPTER 6

COMMUNICATIONS AND POSITION REPORTING PROCEDURES

6.1 ATS COMMUNICATIONS

6.1.1 It is important that pilots appreciate that routine air/ground ATS Voice communications in the NAT Region are conducted via aeradio stations staffed by communicators **who have no executive ATC authority.** Messages are relayed by the ground station to/from the air traffic controllers in the relevant OAC. This is the case, whether communications are via HF, GP/VHF or SATCOM Voice.

6.1.2 In the North Atlantic Region there are six aeronautical radio stations, one associated with each of the Oceanic Control Areas. They are: Bodø Radio (Norway, Bodø ACC), Gander Radio (Canada, Gander OACC), Iceland Radio (Iceland, Reykjavik ACC), New York Radio (USA, New York OACC), Santa Maria Radio (Portugal, Santa Maria OACC) and Shanwick Radio (Ireland, Shanwick OACC). However, the aeradio stations and OACs are not necessarily co-located. For example, in the case of Shanwick operations, the OAC is located at Prestwick in Scotland whilst the associated aeradio station is at Ballygirreen in the Republic of Ireland. In addition to those six aeronautical stations, there are two other stations that operate NAT frequencies. They are Canarias Radio which serves Canarias ACC and Arctic Radio serving Edmonton, Winnipeg and Montreal ACC's.

HF Voice Communications

6.1.3 Even with the growing use of datalink communications a significant volume of NAT air/ground communications are conducted using voice on SSB HF 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 to 18 MHz.

6.1.4 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 North Atlantic frequencies of less than 7 MHz are utilised at night and frequencies of greater than 8 MHz during the day.

6.1.5 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 frequency hours of operation of each NAT aeradio station is contained in the **"HF Management Guidance Material for the North Atalntic Region**" (NAT Doc 003) (Appendices C- 1 thru 6), available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT Doc 003". Each Family is designated for use by aircraft of specific States of Registry and according to the route to be flown (*Is this still true ????)*. NAT ATS provider State *AIPs* list the families of frequencies to be used.

6.1.6 Each individual aircraft is normally allocated a primary and a secondary HF frequency, either when it receives its clearance or by domestic controllers shortly before the oceanic boundary.

6.1.7 When initiating contact with an aeradio station the pilot should state the HF frequency in use. HF Radio operators usually maintain a listening watch on more than one single frequency. Identification by the calling pilot of the particular frequency being used is helpful to the radio operator.

SELCAL

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

a) provide the SELCAL code in the flight plan; (any subsequent change of aircraft for a flight will require passing the new SELCAL information to the OAC);

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

c) maintain thereafter a SELCAL watch.

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

6.1.10 Flight management staff and crews of aircraft equipped with 12-tone SELCAL equipment should be made aware that SELCAL code assignment is predicated on the usual geographical area of operation of that 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.

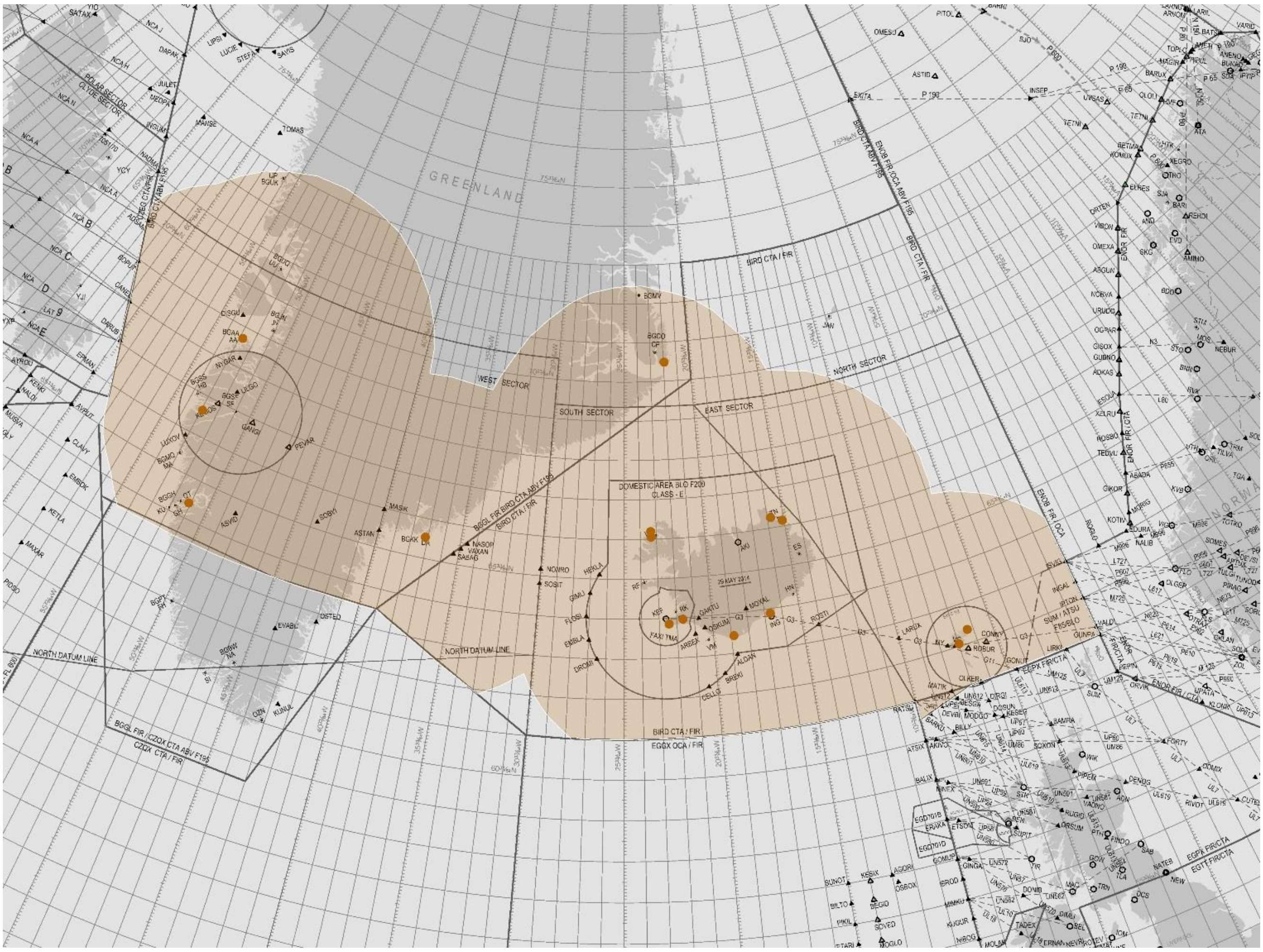
6.1.11 When acquiring a previously owned aircraft equipped with SELCAL, many aircraft operators mistakenly assume that the SELCAL code automatically transfers to the purchaser or lessee. This is not true. As soon as practical, it is the responsibility of the purchaser or lessee to obtain a SELCAL code 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. In the latter instance, if 12-tone equipment is involved, the Registrar should be consulted when there is any question as to the likely geographical area of operation and the possibility of code duplication.

6.1.12 The 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.

VHF Voice Communications

6.1.13 Aeradio 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. 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 remotely controlled from Gander Aeradio station, and at Qaqatoqaq, Kulusuk, several locations in Iceland and the Faroes, via Iceland Radio. Theoretical VHF coverage charts are shown at Attachment 5. When using GP/VHF frequencies in areas of fringe coverage however, care should be taken to maintain a SELCAL watch on HF thus ensuring that if VHF contact is lost the aeradio station is still able to contact the aircraft. It is important for the pilot to appreciate that when using GP/VHF, as with HF and SATCOM Voice, these communications are with an aeradio station and the pilot is not in direct contact with ATC. However Direct Controller/Pilot Communications (DCPC) can be arranged, if necessary, via patch-through on some GP/VHF frequencies.

6.1.14 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 the map 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 pilot is communicating directly with an air traffic controller. The callsign of Iceland radio is *"Iceland radio"* or just *"Iceland"* and indicates that the pilot is communicating with a radio operator who is relaying messages between the pilot and the appropriate control facility.



6.1.15 Gander OAC operates a number of VHF remote outlets in Greenland and in the adjacent eastern seaboard of Canada, providing DCPC service for ADS-B operations in those parts of its airspace. For details of this ADS-B service, participation requirements and coverage charts, operators should consult Canadian AIS. A brief description of the service is provided in Chapter 10 of this document.

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

SATCOM Voice Communication

6.1.17 In 2011 following successful trials, it was agreed that Aeronautical Mobile Satellite (Route) Service (AMS(R)S), more commonly referred to as SATCOM Voice, can be used as a supplement to HF communications throughout the NAT Region for any routine, non-routine or emergency ATS air/ground communications. NAT ATS Provider State AIPs contain the necessary telephone numbers and/or short-codes for air-initiated call access to aeradio stations and/or direct to OACs. Since oceanic traffic typically communicate with ATC through aeradio facilities, routine SATCOM Voice calls should be made to such a facility rather than the ATC Centre. Only when the urgency of the communication dictates otherwise should

SATCOM Voice calls be made to the ATC Centre. SATCOM voice communication initiated due to HF propagation difficulties does not constitute urgency and should be addressed to the air-ground radio facility.

6.1.18 The provisions governing the use of SATCOM Voice for ATS communications in the NAT Region are contained in ICAO NAT SUPPS (Doc.7030/5) Section 3.4. These provisions include that even when using SATCOM, pilots must simultaneously operate SELCAL or maintain a listening watch on the assigned HF frequency.

6.1.19 Operators must also recognise that they are bound by their own State of Registry's regulations regarding carriage and use of any and all long-range ATS communications equipment. Some States do not authorise the carriage of SATCOM as redundancy for HF equipage. However, in other instances MMEL remarks for HF systems do provide relief for SATCOM Voice equipped aircraft, thereby making the requirement for the carriage of fully serviceable/redundant HF communications equipment less of an issue (See also Section 6.6 below regarding the use of SATCOM in the event of "HF Communications Failure").

6.1.20 In 2012 the ICAO Planning and Implementation Groups for the Asia/Pacific and North Atlantic Regions (APANPIRG & NAT SPG) jointly approved a document, "**Satellite Voice Guidance Material (SVGM)**". This document provides a comprehensive update of various regional and State guidance material for ANSPs and aircraft operators to use SATVOICE for ATS communications. The document is available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "SATVOICE Guidance Material (SVGM)".

Data Link Communications

6.1.21 Data link communications are gradually being introduced into the NAT environment for position reporting (via FANS 1/A ADS-C & CPDLC) and for other air/ground ATS exchanges (using FANS 1/A CPDLC). NAT Region specific guidance may be published in NAT OPS Bulletins when deemed necessary by the NAT SPG and the operational procedures to be used are specified in the "**Global Operational Data Link Document (GOLD)**", both of which can be downloaded from www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents". AIS publications of the NAT ATS Provider States should be consulted to determine the extent of current implementation in each of the North Atlantic OCAs.

6.1.22 On first contact with the initial aeradio stations crews of participating aircraft should expect to receive the instruction "VOICE POSITION REPORTS NOT REQUIRED".

6.1.23 Similar to SATCOM Voice usage, Pilots electing to use Data link communications for regular ATS communications in the ICAO NAT Region remain responsible for operating SELCAL (including completion of a SELCAL Check), or maintaining a listening watch on the assigned HF frequency.

6.1.24 Flights equipped with FANS CPDLC and /or ADS-C should ensure that the data link system is logged on to the appropriate control area when operating within the NAT south of 80 North. This applies even when the aircraft is provided with ATS surveillance services. CPDLC provides communication redundancy and controllers will in many cases use CPDLC for communication even though the pilot is maintaining a listening watch on the assigned DCPC VHF frequency. ADS-C furthermore enables ATC to perform route conformance monitoring for downstream waypoints.

6.1.25 Phase 2A of the NAT Data Link Mandate was implemented 05 February 2015. In this phase the NAT DLM airspace was expanded to include all OTS tracks at FLs **350** to 390, inclusive. Only aircraft with functioning CPDLC and ADS-C may plan and/or fly in the height band FL350-390 inclusive on any OTS Track.

6.1.26 If a flight experiences an equipment failure AFTER departure which renders the aircraft non-DLM compliant, requests to operate in the NAT Region Data Link Airspace will be considered on a tactical basis. Such flights must indicate their non-DLM status prior to entering the airspace. If the failure occurs while the flight is in NAT Region Data Link Mandate 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.

6.1.27 If a flight experiences an equipment failure PRIOR to departure which renders the aircraft non-DLM compliant, the flight should not flight plan to enter the NAT Regional DLM Airspace.

6.2 INTER-PILOT AIR-TO-AIR VHF FACILITY 123.45 MHZ AND EMERGENCY FREQUENCY 121.5 MHZ

6.2.1 The frequency 121.5 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.

6.2.2 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, 123.45 MHz, is intended for pilot-to-pilot exchanges of operationally significant information *(N.B. It is not to be used as a "chat" frequency)*.

6.2.3 123.45 MHz may be used to relay position reports via another aircraft in the event of an air-ground communications failure.

6.2.4 This frequency (123.45 MHz) may also be used by pilots to contact other aircraft when needing to coordinate offsets required in the application of the Strategic Lateral Offset Procedures (SLOP).

6.2.5 If necessary initial contact for relays or offset coordination can be established on 121.5 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.

6.2.6 Therefore in order to minimise unnecessary use of 121.5 MHz, it is recommended that when possible aircraft additionally monitor 123.45 MHz when flying through NAT airspace.

6.3 POSITION REPORTING

Time and Place of Position Reports

6.3.1 Unless otherwise requested by Air Traffic Control, position reports from flights on routes which are not defined by designated reporting points should be made at the significant points listed in the flight plan.

6.3.2 Air Traffic Control may require any flight operating in a North/South direction to report its position at any intermediate parallel of latitude when deemed necessary.

6.3.3 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.

6.3.4 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.

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

Contents of Position Reports

6.3.6 For flights outside domestic ATS route networks, position should be expressed in terms of latitude and longitude except when flying over named reporting points. For flights whose tracks are predominantly east or west, latitude should be expressed in degrees and minutes, longitude in degrees only. For flights whose tracks are predominantly north or south, latitude should be expressed in degrees only, longitude in degrees and minutes. However, it should be noted that when such minutes are zero then the position report may refer solely to degrees (as per examples below).

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

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

Standard Message Types

6.3.9 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, pilots should observe the following rules:

a) use the correct type of message applicable to the data transmitted;

b) state the message type in the contact call to the ground station or at the start of the message;

c) adhere strictly to the sequence of information for the type of message;

d) **all times** in any of the messages should be expressed in hours and minutes **UTC**.

6.3.10 The message types are shown below with examples:

POSITION
Example: *"Position, Swissair 100, on 8831, RESNO at 1235, Flight Level 330*
Estimating 56 North 020 West at 1310, 56 North 030 West Next"

REQUEST CLEARANCE
Example: *"Request Clearance, American 123, on 8831, 56 North 020 West at 1308,*
Flight Level 330, Estimating 56 North 030 West at 1340,
56 North 040 West Next. Request Flight Level 350"

or if a position report is not required
"Request Clearance, Speedbird 212 on 3476, Request Flight Level 370"

REVISED ESTIMATE
Example: *"Revised Estimate, Speedbird 212 on 3476, 57 North 040 West at 0305"*

MISCELLANEOUS
Plain language – free format

Addressing of Position Reports

6.3.11 Position reports for aircraft operating on tracks through successive points on the mutual boundary of two OCAs (e.g. when routing along the 45ºN parallel), should be made to both relevant OACs. (In practice this only requires an addition to the address. (e.g. "Shanwick copy Santa Maria".)

6.4 "WHEN ABLE HIGHER" (WAH) REPORTS

6.4.1 Prior advice to ATC of the time or position that a flight will be able to accept the next higher level can assist ATC in ensuring optimal usage of available altitudes. A WAH Report must be provided by all flights entering the NAT HLA Airspace portion of the New York OCA and entering the Santa Maria OCA. Due to the higher number of step climb requests on the generally longer NAT route segments that transit New York and Santa Maria OCAs and also because of the greater frequency of crossing traffic situations here, the strategy of issuing "coast-out to coast-in" conflict-free clearances is not always employed by these two oceanic control centres. Here, air traffic control of a more tactical nature is often exercised. The provision of WAH Reports in these circumstances allows the controllers to more effectively utilise their airspace and provide aircraft more fuel efficient profiles. Provision of WAH Reports on entering other NAT OCAs is optional or they may be requested by any OAC.

6.4.2 When required or when otherwise provided, upon entering an oceanic FIR, pilots should include in the initial position report the time or location that the flight will be able to accept the next higher altitude. The report may include more than one altitude if that information is available.

Example: *"Global Air 543, 40 North 040 West at 1010, Flight Level 350,*
Estimating 40 North 050 West at 1110, 40 North 060 West Next.
Able Flight Level 360 at 1035, Able Flight Level 370 at 1145,
Able Flight Level 390 at 1300"

6.4.3 Information thus provided of the aircraft's future altitude "ability" will not automatically be interpreted by ATC as an advance "request" for a step climb. It will be used as previously indicated to assist ATC in planning airspace utilisation. However, should the pilot wish to register a request for one or more future step climbs, this may be incorporated in the WAH report by appropriately substituting the word "Request" for the word "Able".

Example: *"Global Air 543, 42 North 040 West at 1215, Flight Level 330,*
Estimating 40 North 050 West at 1310, 38 North 060 West Next.
Request Flight Level 340 at 1235, Able Flight Level 350 at 1325,
Request Flight Level 360 at 1415"

6.4.4 Although optimal use of the WAH reports is in conjunction with a Position Report, a WAH report can be made or updated separately at any time.

Example: "*Global Air 543, Able Flight Level 360 at 1035, Request Flight Level*
370 at 1145, Able Flight Level 390 at 1300"

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

6.5 METEOROLOGICAL REPORTS

6.5.1 In accordance with Amendment 75 to ICAO Annex 3 - *Meteorological Service for International Air Navigation*, with effect from 18 November 2010 aircraft are no longer required to provide voice reports of MET observations of wind speed and direction nor outside air temperature.

6.5.2 When an ATS unit establishes an event contract with an aircraft to provide ADS–C position reports, it may also establish an additional periodic report contract (e.g. with a 30 mins interval). Such ADS–C periodic reports, unlike event reports, contain wind and temperature data and thereby satisfy the MET authorities requirements for the provision of MET data. However, it must be appreciated that any such automated MET Reports do not include information on any observations of special or non-routine significant meteorological phenomena, such as moderate/severe turbulence or icing, volcanic ash, thunderstorms, etc.. Therefore any pilot providing position reports via data link, who encounters any such significant meteorological phenomena should report this information via voice or, if appropriate, via a CPDLC free text downlink message. The format to be used for the reporting of such observations should, where appropriate, be by reference to geographical co-ordinates.

6.6 HF COMMUNICATIONS FAILURE

6.6.1 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.

6.6.2 It must be recognised that there is in general an underlying premise in "normal" radio communications failure procedures that they are for use when a single aircraft suffers an on-board communications equipment failure. Within the NAT Region and some adjacent domestic airspace (e.g. Northern Canada), where HF Voice is primarily used for air-ground ATC communications, ionospheric disturbances resulting in poor radio propagation conditions can also interrupt these communications. While it is impossible to provide guidance for all situations associated with an HF communications failure, it is, however, extremely important to differentiate between two distinct circumstances: - firstly, an on-board communications equipment failure, resulting in an individual aircraft losing HF communications with ATC and; secondly, the occurrence of poor HF propagation conditions (commonly referred to as "HF Blackouts"), which can simultaneously interrupt HF air-ground communications for many aircraft over a wide area.

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

6.6.4 However, the occurrence of poor HF propagation conditions can simultaneously interrupt HF air-ground communications for many aircraft over a wide area and ATC may then be unable to make any interventions to assure safe traffic separations. Notwithstanding the gradual introduction of Data link and SATCOM Voice for regular air-ground ATS communications in the NAT Region, all pilots must recognise that, pending the mandatory carriage and use of such means, an HF blackout will impact the ability of ATC to ensure the safe separation of all traffic. **Hence, even if using other than HF for regular communications with ATC, pilots should still exercise appropriate caution when HF blackout conditions are encountered.**

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

General Provisions

1. The pilot of an aircraft experiencing a two-way ATS communications failure should operate the SSR Transponder on identity Mode A Code 7600 and Mode C.

2. When so equipped, an aircraft should use Satellite Voice Communications to contact the responsible aeradio station via special telephone numbers/short codes published in State AIPs (see also "HF Management Guidance Material for the NAT Region"). However, it must be appreciated that pending further system developments and facility implementations the capability for Ground(ATC)-initiated calls varies between different NAT OACs.

3. If the aircraft is not equipped with SATCOM Voice then the pilot should attempt to use VHF to contact any (other) ATC facility or another aircraft, inform them of the difficulty, and request that they relay information to the ATC facility with which communications are

intended.

4. The inter-pilot air-to-air VHF frequency, 123.45 MHz, may be used to relay position reports via another aircraft. *(N.B. The emergency frequency 121.5 MHz should not be used to relay regular communications, but since all NAT traffic is required to monitor the emergency frequency, it may be used, in these circumstances, to establish initial contact with another aircraft and then request transfer to the inter-pilot frequency for further contacts).*

5. In view of the traffic density in the NAT Region, pilots of aircraft experiencing a two-way ATS communications failure should broadcast regular position reports on the inter-pilot frequency (123.45 MHz) until such time as communications are re-established.

Communications Procedures for Use in the Event of an On-board HF Equipment Failure

6.6.6 Use SATCOM Voice communications, if so equipped. (See General Provisions 2. above).

6.6.7 If not SATCOM Voice equipped try VHF relay via another aircraft (See General Provisions 3. & 4 above).

Communications Procedures for Use during Poor HF Propagation Conditions

6.6.8 Poor HF propagation conditions are the result of ionospheric disturbances. These are usually caused by sun-spot or solar flare activity creating bursts of charged particles in the solar wind which can spiral down around the Earth’s magnetic lines of force and distort or disturb the ionised layers in the stratosphere which are utilised to refract HF radio waves. As with the Aurora Borealis, which is of similar origin, these ionospheric disturbances most commonly occur in regions adjacent to the Magnetic Poles. Since the Earth’s North Magnetic Pole is currently located at approximately 87N 150W, flights through the North Atlantic and Northern Canada regions can, on occasion, experience resulting HF communications difficulties.

6.6.9 SATCOM Voice communications are unaffected by most ionospheric disturbances. Therefore, when so equipped, an aircraft may use SATCOM Voice for ATC communications (See General Provisions 2 above).

6.6.10 If not SATCOM Voice equipped, in some circumstances it may be feasible to seek the assistance, via VHF, of a nearby SATCOM Voice equipped aircraft to relay communications with ATC (See General Provisions 3. & 4. above).

6.6.11 Whenever aircraft encounter poor HF propagation conditions that would appear to adversely affect air-ground communications generally, it is recommended that all pilots then broadcast their position reports on the air-to-air VHF frequency 123.45 MHz. Given the density of traffic in the NAT Region and the fact that in such poor propagation conditions ATC will be unable to maintain contact with all aircraft, it is important that even those aircraft that have been able to establish SATCOM Voice contact also broadcast their position reports.

6.6.12 If for whatever reason SATCOM Voice communications (direct or relayed) are not possible, then the following procedures may help to re-establish HF communications. Sometimes these ionospheric disturbances are very wide-spread and HF air-ground communications at all frequencies can be severely disrupted throughout very large areas (e.g. simultaneously affecting the whole of the NAT Region and the Arctic.). However, at other times the disturbances may be more localised and/or may only affect a specific range of frequencies.

6.6.13 In this latter circumstance, HF air-ground communications with the intended aeradio station may sometimes continue to be possible but on a frequency other than either the primary or secondary frequencies previously allocated to an aircraft. Hence, in the event of encountering poor HF propagation conditions pilots should first try using alternative HF frequencies to contact the intended aeradio station.

6.6.14 However, while the ionospheric disturbances may be severe, they may nevertheless only be localized between the aircraft's position and the intended aeradio station, thus rendering communications with that station impossible on any HF frequency. But the aeradio stations providing air-ground services in the NAT Region do co-operate as a network and it may, even then, still be possible to communicate with another aeradio station in the NAT network on HF and request that they relay communications. Efforts should therefore be made to contact other NAT aeradio stations via appropriate HF frequencies.

6.6.15 Nevertheless, as previously indicated, there are occasions when the ionospheric disturbance is so severe and so widespread that HF air-ground communications with any aeradio station within the NAT Region network are rendered impossible.

Rationale for Lost Communications Operational Procedures

6.6.16 Because of the density of oceanic traffic in the NAT Region, unique operational procedures have been established here to be followed by pilots whenever communications are lost with ATC. These procedures and the rationale for their development follow.

Tactical ATC Environment

6.6.17 In a tactical ATC environment,, such as one in which ATS Surveillance and VHF voice communications are used, ATC has continuous real-time data on the position/progress of all relevant traffic and the intentions of any individual aircraft with which ATC may have lost communications can be inferred from that aircraft's filed flight plan. Hence, in such an environment, when voice communications with a single aircraft fail, the relevant published "lost comms procedures" normally require that aircraft to "land at a suitable aerodrome or continue the flight and adjust level and speed in accordance with the filed flight plan". Communications blackouts affecting multiple aircraft, are not a feature of this type of VHF environment and hence in these circumstances, if required, ATC will be able to re-clear other traffic to ensure safe separations are maintained.

Procedural ATC Environment

6.6.18 However, in a (largely) non-ATS surveillance environment such as the North Atlantic, ATC must rely significantly upon the HF Voice Position Reports communicated by each aircraft for position, progress and intent data. Communications equipment failures and/or poor propagation conditions can interrupt the provision of this information. Therefore, to mitigate against such occurrences in the busy NAT HLA airspace, outside of VHF coverage, ATC often employs strategic traffic planning and issues Oceanic Clearances which have been pre-co-ordinated with downstream OACs. Flights that continue to follow such a pre-coordinated strategic oceanic clearance are thereby guaranteed conflict-free progress to oceanic exit, even if no ATS communications are subsequently possible with any one, or even with all, of those strategically planned aircraft.

6.6.19 Every effort is made by the initial NAT OAC to clear aircraft as per their filed flight plans. However, this is not always possible, particularly during peak traffic flow periods. Aircraft may receive clearances at flight levels or speeds other than those flight planned or, less frequently, may be cleared on oceanic tracks via entry or exit points other than those contained in the filed flight plan. Also it must be recognized that while a filed NAT flight plan may contain one or more step climbs for execution within the NAT Region, the initially issued oceanic clearance, or even any subsequently updated clearance (i.e. re-clearance), has only been co-ordinated for a single (i.e. initial or current) flight level. It must therefore be appreciated that it is only the flight routing and profile contained in the current received oceanic clearance that has been guaranteed to provide conflict-free progress. Unless this oceanic clearance is precisely the same as the filed flight plan, in any lost communications situation in the NAT Region, if a pilot in receipt of an oceanic clearance unilaterally reverts to his/her filed flight plan (even by simply executing a later step climb), then a guarantee of conflict-free progress no longer exists. Consequently, if a NAT aircraft loses the possibility of communications with the relevant OAC at any time after receiving and acknowledging an oceanic clearance, and the pilot elects to continue the flight, then the aircraft must adhere strictly to the routing and profile of the current oceanic clearance until exiting the NAT Region. Pilots must not unilaterally revert to their filed flight plan.

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

On-Board HF Communications Equipment Failure

6.6.20 Due to the potential length of time in oceanic airspace, it is strongly recommended that a pilot, experiencing an HF communications equipment failure prior to entering the NAT, whilst still in domestic airspace and still in VHF contact with the domestic ATC Unit, does not enter NAT airspace but adopts the procedure specified in the appropriate domestic AIP and lands at a suitable airport. Should the pilot, nevertheless, elect to continue the flight then every effort must be made to obtain an oceanic clearance and the routing, initial level and speed contained in that clearance must be maintained throughout the entire oceanic segment. Any level or speed changes required to comply with the Oceanic Clearance must be completed within the vicinity of the oceanic entry point.

6.6.21 If, however, an oceanic clearance cannot be obtained, the individual aircraft suffering radio communications equipment failure should enter oceanic airspace at the first oceanic entry point, level and speed contained in the filed flight plan and proceed via the filed flight plan route to landfall. **The initial oceanic level and speed included in the filed flight plan must be maintained until landfall.** Any subsequent step-climbs included in the filed flight plan **must not** be executed.

HF Blackout

6.6.22 In the case of aircraft that lose ATC communications as a result of poor propagation conditions (HF Blackouts) when approaching NAT airspace through domestic airspace where ATC communications are also conducted via HF (e.g. entering the NAT through Northern Canadian airspace into the Reykjavik OCA), it is probably less advisable to execute unscheduled landings. These poor propagation conditions are very likely to affect many aircraft simultaneously and multiple diversions of "lost comms" aircraft might create further difficulties and risks.

6.6.23 As with the equipment failure situation, aircraft approaching the NAT and losing ATC communications as a result of poor HF radio propagation conditions should, if already in receipt of an oceanic clearance, follow the routing specified in that clearance and maintain the **initial** cleared level and speed throughout the oceanic segment i.e. through to landfall.

6.6.24 However, in these HF Blackout circumstances, if no oceanic clearance has been received, the aircraft must remain at the last cleared domestic flight level, not only to the ocean entry point but also throughout the whole subsequent oceanic segment (i.e. until final landfall). This is in stark contrast to the equipment failure case. In such HF Blackouts, pilots must not effect level changes to comply with filed flight plans. Such aircraft should, maintain the last cleared level and, enter oceanic airspace at the first oceanic entry point and speed contained in the filed flight plan, then proceed via the filed flight plan route to landfall.

6.6.25 The rationale here must be appreciated. In such circumstances it is likely that ATC will have simultaneously lost HF communications with multiple aircraft in the same vicinity. Should pilots then wrongly apply the "normal" radio failure procedures and "fly the flight plan", there is a possibility that two such aircraft may have filed conflicting flight paths/levels through the subsequent oceanic airspace, and without communications with either aircraft, ATC would then be unable to intervene to resolve the conflict. Since safe aircraft level separation assurance has already been incorporated into the current domestic clearances, **it is consequently imperative that under such (Domestic and Oceanic) HF-blackout circumstances, all aircraft electing to continue flight into NAT oceanic airspace without a received and acknowledged oceanic clearance, should adhere to the flight level in the last received domestic clearance. No level changes should be made to comply with a filed oceanic level that is different from that of the domestic clearance in effect at the time that ATC air-ground communications were lost.**

Operational Procedures following Loss of HF Communications after Entering the NAT

6.6.26 If the HF communications equipment failure occurs or HF Blackout conditions are encountered after entering the NAT then : -

> The pilot must proceed in accordance with the last received and acknowledged Oceanic Clearance, including level and speed, to the last specified oceanic route point (normally landfall). After passing this point, the pilot should conform with the relevant AIP specified State procedures/regulations and if necessary rejoin the filed flight plan route by proceeding, via the published ATS route structure where possible, to the next significant point contained in the filed flight plan. *Note: the relevant State procedures/regulations to be followed by an aircraft in order to rejoin its filed Flight Plan route are specified in detail in the appropriate State AIP.*

6.6.27 Aircraft with a destination within the NAT Region should proceed to their clearance limit and follow the ICAO standard procedure to commence descent from the appropriate designated navigation aid serving the destination aerodrome at, or as close as possible to, the expected approach time. Detailed procedures are promulgated in relevant State AIPs.

Summary of Operational Procedures Required following Loss of Air/Ground ATS Communications in the NAT Region

6.6.28 The foregoing detailed operational procedures can be simply summarised as follows :

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

In all cases, after landfall rejoin, or continue on, the flight planned route, using appropriate State AIP specified procedures for the domestic airspace entered.

6.7 CONTINGENCY SITUATIONS AFFECTING ATM PROVISION IN THE NAT REGION

6.7.1 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 arrangements which would, in such events, be put in place to ensure, as far as possible, the continued safety of air navigation. Such arrangements include required actions by pilots and operators of affected flights. These arrangements 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". Operators and Pilots planning and conducting operations in North Atlantic region should ensure their familiarity with these arrangements and in particular with the actions expected of pilots in such contingency situations.

6.7.2 The plan is presented in two parts. The first deals with contingency arrangements necessary when only one NAT ATS unit is affected. While the second addresses events which are likely to affect more than one facility within the NAT region, for example the contamination of the airspace by volcanic ash. Where available, information is also provided outlining the steps taken by ANSPs to deal with any long term unavailability of an ATC facility.

6.8 OPERATION OF TRANSPONDERS

6.8.1 All aircraft operating as IFR flights in the NAT Region shall be equipped with a pressure-altitude reporting SSR transponder. Unless otherwise directed by ATC, pilots flying in the NAT FIRs will operate transponders continuously in Mode A/C Code 2000, except that the last assigned code will be retained for a period of 30 minutes after entry into NAT airspace or after leaving a radar service area. Pilots should note that it is important to change from the last assigned domestic code to the Mode A/C Code 2000 since the original domestic code may not be recognised by the subsequent Domestic Radar Service on exit from the oceanic airspace. One exception to this requirement should be noted. Because of the limited time spent in the NAT HLA airspace, when flying on Route Tango 9, the change from the last assigned domestic code to Code 2000 should be made Northbound 10 minutes after passing BEGAS and Southbound 10 minutes after passing LASNO.

6.8.2 It should be noted that 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 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.

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

6.9 AIRBORNE COLLISION AVOIDANCE SYSTEMS (ACAS)

6.9.1 From 1 January 2005, all turbine-engined aeroplanes having a maximum certificated take-off mass exceeding 5,700 kg or authorized to carry more than 19 passengers have been required to carry and operate ACAS II in the NAT Region. TCAS Version 7.0 meets the technical specifications for ACAS II as contained in ICAO Annex 10 Volume IV. Pilots should report all ACAS/TCAS Resolution Advisories which occur in the NAT Region to the controlling authority for the airspace involved. (See further on this in Chapter 13.)

CHAPTER 7

APPLICATION OF MACH NUMBER TECHNIQUE

7.1 DESCRIPTION OF TERMS

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

7.2 OBJECTIVE

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

7.2.2 For many aircraft types the cockpit instrument displays the True Mach being flown. However, for some types the AFM notes a correction that must be made to the Indicated Mach to provide the True Mach. It is important to recognise that the maintenance of longitudinal separations depends upon the assumption that the ATC assigned Mach numbers maintained by all aircraft are True Mach numbers. Pilots must therefore ensure that any required corrections to indicated Mach are taken into account when complying with the True Mach number specified in the ATC clearance.

7.3 PROCEDURES IN NAT OCEANIC AIRSPACE

7.3.1 The Oceanic Clearance includes the assigned (True) Mach Number which is to be maintained. It is therefore necessary that information on the desired Mach Number be included in the flight plan for turbojet aircraft intending to fly in NAT oceanic airspace. ATC uses Mach Number together with pilot position reports to calculate estimated times for significant points along track. These times provide the basis for longitudinal separation between aircraft and for co-ordination with adjacent ATC units.

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

7.3.3 It is, however, important to recognise that the establishment and subsequent monitoring of longitudinal separation is totally reliant upon aircraft providing accurate waypoint passing times in position reports. It is therefore essential that pilots conducting flights in NAT HLA Airspace utilise accurate clocks and synchronise these with a standard time signal, based on UTC, prior to entering NAT HLA Airspace. It should be noted that some aircraft clocks can only be re-set while the aircraft is on the ground. (See further comments on time-keeping/longitudinal navigation in Chapter 1 and Chapter 8.)

7.3.4 In the application of Mach Number Technique, pilots must adhere strictly to their assigned True Mach Numbers unless a specific re-clearance is obtained from the appropriate ATC unit. However, as the aircraft weight reduces it may be more fuel efficient to adjust the Mach Number. Since the in-trail and crossing track separations between individual aircraft are established on the basis of ETAs passed to, or calculated by, ATC, it is essential that ATC approval is requested prior to effecting any change in cruise Mach Number. Such approval will be given if traffic conditions permit. **Pilots must recognise that adherence to the assigned Mach Number is essential. No tolerance is provided for. Pilots must not utilise Long Range Cruise or ECON FMC modes when transiting NAT HLA airspace**. If an immediate temporary change in the Mach Number is essential, e.g. due to turbulence, ATC must be notified as soon as possible. Pilots with experience of flying in oceanic airspaces other than the North Atlantic, may be familiar with a procedure in those areas which permits pilots to unilaterally elect to change their cruising mach number by up to 0.02M, without prior ATC approval. **This is not the case in the North Atlantic HLA airspace.**

Note *In 2010/2011 Flight trials were conducted to assess the impact of variable Mach and altitude in the North Atlantic and within a defined corridor. These trials, entitled ENGAGE (Europe-North America Go ADS-B for a Greener Environment) were initially conducted by NAVCANADA and UK NATS in the Gander and Shanwick OCAs. Aircraft within surveillance coverage of Automatic Dependent Surveillance – Broadcast (ADS-B) were able to climb earlier, thus releasing flight levels which could be assigned to aircraft not yet in surveillance coverage. This also provided opportunities for aircraft not yet in surveillance coverage to vary their Mach so as to maintain more fuel efficient speeds. These ENGAGE trials were subsequently extended to include ISAVIA and NAV Portugal. They were concluded in July 2013. Significant fuel savings and reduced carbon emissions were effected.. The trial application of Reduced Longitudinal Separation of 5 minutes between ADS- C/CPDLC equipped aircraft (RLongSM), also creates more opportunities to apply variable flight level or allow changes to the assigned Mach.*

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

7.4 PROCEDURE AFTER LEAVING OCEANIC AIRSPACE

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

CHAPTER 8

NAT HLA/MNPS FLIGHT OPERATION & NAVIGATION PROCEDURES

8.1 INTRODUCTION

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

8.1.2 Navigation systems are continually evolving and early editions of the NAT MNPSA Operations Manual concentrated on offering specific guidance on the use of individual approved long range navigation systems. The current philosophy within ICAO is to specify 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 RNP-X, where X represents an accuracy of 95% containment in X Nms. However, specifications requiring the same accuracies but not requiring on-board monitoring are referred to as RNAV-X.

8.1.3 MNPS was used in the NAT Region for almost forty years. It did not require on-board automatic monitoring and alerting functions. Instead, pilots were required to remain vigilant and to employ rigorous routine manual monitoring procedures. In the 1990's a navigation requirements system was introduced for use originally in the Pacific Region. Like the MNPS, it too did not include any requirement for on-board automatic monitoring. Its introduction was long before the PBN concept was developed and it was then annotated as "RNP 10". Large numbers of aircraft worldwide are now in receipt of "RNP 10" approvals. To conform with the PBN standard terminology, as indicated above, this system should actually be designated as "RNAV10". 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 "RNAV10".

8.1.4 With current technology, on-board automatic performance monitoring can only be carried out using GPS. Hence GPS 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".

8.1.5 MNPS was established primarily with the NAT OTS environment in mind. The defining waypoints of OTS tracks were specified by whole degrees of latitude and, using an effective 60 NM lateral separation standard, most adjacent tracks are separated by only one degree of latitude at each ten-degree meridian. The traffic density in the OTS is higher than in any other oceanic airspace. In such a densely populated flexible track system (one that changes twice every day), it is essential that crews avoid (whole degree) waypoint insertion errors. Such errors in the NAT HLA/MNPSA inevitably result in a conflict with traffic on an adjacent track. For this reason the Minimum Navigation Performance Specifications had to include not just the technical navigation accuracy of the Long-range Navigation Systems used on the aircraft but also the crew navigation and cross-checking procedures employed. The MNPS statement thus involved both cockpit/flight deck procedures and crew training requirements. These further requirements continue to apply for Approvals in the now re-designated NAT HLA airspace. In the early days of the RNP concept, it was these additional requirements that separated MNPS from RNP. However, RNP has come a long way since its inception and the development of the RNP 10 approvals for PAC operations brought it much closer to the original MNPS concept. The ICAO North Atlantic Region is in the process of transitioning from MNPS to PBN operations. This will allow for improved airspace capacities through the use of reduced separation minima. Although to achieve these reductions while maintaining or improving system safety, requires additionally performance enhancements in both communications and surveillance. Plans for these other advances constitute a “NAT Region Performance Based Communications & Surveillance (PBCS) Plan”. Details of the NAT Region plans for MNPS to PBN Transition and the introduction of PBCS are available at www.icao.int/EURNAT/, following “EUR & NAT Documents”, then “NAT Documents”, in folder “Planning documents supporting separation reductions and other initiatives”. With effect from January 2015 the technical/equipage elements of all new State Approvals for operations in the NAT MNPSA have been based on PBN specifications and from February 2016 the NAT MNPS Airspace is re-designated as the NAT HLA airspace .

Note: For more detailed information on RNP see ICAO Document Doc 9613 – ‘Performance Based Navigation Manual’

8.1.6 Obviously, there are several combinations of airborne sensors, receivers, computers with navigation data bases and displays which are capable of producing like accuracies, and which with inputs to automatic flight control systems provide track guidance. However, regardless of how sophisticated or mature a system is, it is still essential that stringent navigation and cross checking procedures are maintained if Gross Navigation Errors (GNEs) are to be avoided. A GNE within NAT Airspace is defined as a deviation from cleared track of 25 NM or more. Some of these errors are detected by means of long range radars as aircraft leave oceanic airspace. Other such errors may also be identified through the scrutiny of routine position reports from aircraft.

8.1.7 All reported navigation errors in North Atlantic airspace are thoroughly investigated. Records show that navigation equipment or system technical failures are now fortunately rare. However, when they do occur they can sometimes be subtle or progressive, resulting in a gradual and perhaps not immediately discernible degradation of performance. Chapter 11 of this Manual provides guidance on detection and recovery when such problems are encountered.

8.1.8 Unfortunately, human failings produce the vast majority of navigation errors in the North Atlantic Region. As indicated above, while the flexible OTS structure and the employment of a 60 NM lateral separation standard, provide for highly efficient use of NAT airspace, they also bring with them a demand for strictly disciplined navigation procedures. About half of NAT flights route via an OTS track and a large portion of the remaining random flights follow routes that at some point approach within one or two degrees of 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 definition will very likely lead to a conflict with another aircraft which is routing correctly via the resulting common significant point. Ironically, the risk of an actual collision between two aircraft routing via a common point, as is the case when such errors are made, is further exacerbated by the improved technical accuracy of the modern navigation and height keeping equipment employed.

8.1.9 Today in North Atlantic operations the predominant source of aircraft positioning information is that of GPS. This includes aircraft that use stand-alone GPS equipment and aircraft where GPS positioning information is integrated into the system navigation solution (e.g. a GPS / IRS mix). The accuracy of GPS navigation is such that the actual flight paths of any two GPS equipped aircraft navigating to a common point will almost certainly pass that point within less than a wingspan of each other. Given that the North Atlantic is the most heavily used oceanic airspace anywhere in the world, it must therefore be appreciated that even a single digit error in just one waypoint can result in a significant conflict potential.

8.1.10 The importance of employing strict navigation system operating procedures designed to avoid the insertion of wrong waypoints or misunderstandings between pilots and ATC over cleared routes cannot be over-emphasised. The principles embodied in many of the procedures described in this Chapter are aimed squarely at the prevention of such problems.

8.1.11 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 Manufacturers' and operators' handbooks and manuals.

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

8.1.13 Maintenance of a high standard of navigation performance is absolutely essential to the maintenance of safety in the NAT HLA airspace.

8.2 GENERAL PROCEDURES

Presentation of Navigation Information

8.2.1 A significant proportion of navigation errors result from the use of incorrect data. To minimize the problem, source data must be clearly legible under the worst cockpit lighting conditions and presented in a format suitable for error-free use in the cockpit environment. In this context, the following considerations apply:

a) on navigation charts, all position co-ordinates, e.g. ramp position, ATC waypoints, radio navaid positions, etc., should ideally be printed in dark blue or black numerals against a white background. Where such co-ordinates would normally appear against a locally tinted background, they should be enclosed in a white box. Absolutely no information should be overprinted on top of position co-ordinates. In situations where groups of position co-ordinates must appear in close proximity to each other, the position to which each set of co-ordinates applies should be clearly indicated by means of a leader;

b) navigational documents, such as track messages or flight plans, should be double-spaced or "boxed", to minimize the possibility of line slippage when the information is read; and

c) it is advisable to provide pilots with a simple plotting chart of suitable scale (1 inch equals 120 NM has been used successfully on NAT routes) in order to facilitate a visual presentation of the intended route that, otherwise, is defined only in terms of navigational co- ordinates.

Importance of Accurate Time

8.2.2 It must be recognised that proper operation of a correctly functioning LRNS will ensure that the aircraft follows its cleared track. ATC applies standard separations between cleared tracks and thereby assures the safe **lateral** separation of aircraft. However, longitudinal separations between subsequent aircraft following the same track and between aircraft on intersecting tracks are assessed in terms of differences in ETAs/ATAs at common waypoints. Aircraft clock errors resulting in position report time errors can therefore lead to an erosion of actual longitudinal separations between aircraft. **It is thus vitally important that prior to entry into the NAT HLA airspace the time reference system to be used during the flight is accurately synchronised to UTC and that the calculation of waypoint ETAs and the reporting of waypoint ATAs are always referenced to this system**. Many modern aircraft master clocks (typically the FMS) can only be reset while the aircraft is on the ground. Thus the Pre-flight Procedures for any NAT HLA flight **must include** a UTC time check and resynchronisation of the aircraft master clock. Lists of acceptable time sources for this purpose have been promulgated by NAT ATS Provider States.

8.2.3 The following are examples of acceptable time standards:

- GPS (Corrected to UTC) - Available at all times to those crews who can access time via approved on-board GPS (TSO-C129) equipment.
- WWV - National Institute of Standards (NIST - Fort Collins, Colorado). WWV operates continually H24 on 2500, 5000, 10,000, 15,000 and 20,000 kHz (AM/SSB) and provides UTC (voice) once every minute.
- CHU - National Research Council (NRC - Ottawa, Canada) - CHU operates continually H24 on

3330, 7335 and 14,670 kHz (SSB) and provides UTC (voice) once every minute (English even minutes, French odd minutes).

- BBC - British Broadcasting Corporation (United Kingdom). The BBC transmits on a number of domestic and world-wide frequencies and transmits the Greenwich time signal (referenced to UTC) once every hour on most frequencies, although there are some exceptions.

8.2.4 Further details of these and other acceptable time references can be found in AIS documentation of the NAT ATS Provider States. In general, the use of any other source of UTC that can be shown to the State of the Operator or the State of Registry of the aircraft to be equivalent, may be allowed for this purpose.

The Use of a Master Document

8.2.5 Navigation procedures must include the establishment of some form of master working document to be used on the flight deck. This document may be based upon the flight plan, navigation log, or other suitable document which lists sequentially the waypoints defining the route, the track and distance between each waypoint, and other information relevant to navigation along the cleared track. When mentioned subsequently in this guidance material, this document will be referred to as the 'Master Document'.

8.2.6 Misuse of the Master Document can result in GNEs occurring and for this reason strict procedures regarding its use should be established. These procedures should include the following:

a) Only one Master Document is to be used on the flight deck. However, this does not preclude other crew members maintaining a separate flight log.

b) On INS equipped aircraft a waypoint numbering sequence should be established from the outset of the flight and entered on the Master Document. The identical numbering sequence should be used for storing waypoints in the navigation computers.

c) For aircraft equipped with FMS data bases, FMS generated or inserted waypoints should be carefully compared to Master Document waypoints and cross checked by both pilots.

d) An appropriate symbology should be adopted to indicate the status of each waypoint listed on the Master Document.

8.2.7 The following is a typical example of Master Document annotation. An individual operator’s procedures may differ slightly but the same principles should be applied:

a) The waypoint number is entered against the relevant waypoint co-ordinates to indicate that the waypoint has been inserted into the navigation computers.

b) The waypoint number is circled, to signify that insertion of the correct co-ordinates in the navigation computers has been double-checked independently by another crew member.

c) The circled waypoint number is ticked, to signify that the relevant track and distance information has been double-checked.

d) The circled waypoint number is crossed out, to signify that the aircraft has overflown the waypoint concerned.

8.2.8 All navigational information appearing on the Master Document must be checked against the best available prime source data. When a re-route is necessary, some regulators recommended that a new Master Document is prepared for the changed portion of the flight. In cases where the original Master Document is to be used, the old waypoints must be clearly crossed out and the new ones carefully entered in their place. The checks listed in the previous paragraph must be carried out in respect of all new or revised waypoints.

8.2.9 When ATC clearances or re-clearances are being obtained, headsets should be worn. The inferior clarity of loud-speakers has, in the past, caused errors during receipt. Two qualified crew members should monitor such clearances; one of them recording the clearance on the Master Document as it is received, the other cross-checking the receipt and read-back. All waypoint co-ordinates should be read back in detail, adhering strictly to standard ICAO phraseology, except where approved local procedures make this unnecessary. Detailed procedures pertaining to abbreviated clearances/read-backs are contained in the appropriate AIPs, and in this Manual at Chapter 5 - Oceanic ATC Clearances.

Position Plotting

8.2.10 A simple plotting chart provides a visual presentation of the intended route which, is defined otherwise only in terms of navigational co-ordinates. Plotting the intended route on such a chart may reveal errors and discrepancies in the navigational co-ordinates which can then be corrected immediately, before they reveal themselves in terms of a deviation from the ATC cleared route. As the flight progresses, plotting the aircraft's present position on this chart will also serve the purpose of a navigation cross check, provided that the scale and graticule are suitable.

8.2.11 As the flight progresses in oceanic airspace, plotting the aircraft's position on this chart will help to confirm (when it falls precisely on track) that the flight is proceeding in accordance with its clearance. However, if the plotted position is laterally offset, the flight may be deviating unintentionally, and this possibility should be investigated at once.

8.2.12 Plotting the aircraft's progress on a chart can be a useful tool for contingency situations. In the event of a total loss of long range navigation capability, a completed plotting chart will assist in the necessary reversion to Dead Reckoning. In other contingency situations it can help is assessing separation assurance from other busy tracks or from high terrain (e.g over Greenland).

8.2.13 It is recommended that a chart with an appropriate scale be used for plotting. Many company Progress Charts are of the wrong scale or too small. It has been noted that the use of plotting charts that are small can lead to oceanic errors. EAG Chart AT (H) 1; No 1 AIDU (MOD) Charts AT(H)1, 2, 3 & 4 and the Jeppesen North/Mid Atlantic Plotting Charts are all useful compromises between scale and overall chart size; while the *NOAA/FAA North Atlantic Route Chart* has the advantage, for plotting purposes, of a 1° latitude/longitude graticule.

Provision of Step-Climbs

8.2.14 Tactical ATS Surveillance control and tactical procedural control are exercised in some areas of the NAT HLA airspace. However, oceanic clearances for most NAT flights are of a strategic nature, whereby flights are allocated a conflict-free route and profile from coast-out to landfall. Although such strategic clearances normally specify a single flight level for the entire crossing, there is often scope for en-route step-climb re-clearances as fuel burn-off makes higher levels more optimal. Controllers will accommodate requests for step-climbs whenever possible. When so re-cleared, pilots should initiate the climb without delay (unless their discretion was invited or unless a conditional clearance was issued) and those aircraft not using CPDLC/ADS-C should **always** report to ATC immediately upon **leaving** the old and on **reaching** the new cruising levels.

Relief Crew Members

8.2.15 Very long range operations may include the use of relief crew. In such cases it is necessary to ensure that procedures are such that the continuity of the operation is not interrupted, particularly in respect of the handling and treatment of the navigational information.

8.3 PRE-FLIGHT PROCEDURES

Inertial Navigation Systems

Insertion of Initial Latitude and Longitude

8.3.1 Two fundamental principles concerning the operation of an IRS are: that it needs to be accurately aligned before flight; and that the actual position of the aircraft, at alignment, is set into the system. If either of these principles is violated, systematic errors will be introduced. These errors can be corrected whilst the aircraft is on the ground but it is not possible to adequately recover from them whilst the aircraft is in flight, despite any indications to the contrary. Correct insertion of the initial position must therefore be checked before inertial systems are aligned and the position should be recorded in the flight log and/or Master Document. It is recommended that subsequent 'silent' checks of the present position and of the inertial velocity outputs (e.g. ground speed registering zero) be carried out independently by both pilots during (an early stage of) the pre-flight checks and again just before the aircraft is moved. Any discrepancies should be investigated.

8.3.2 With regard to the insertion of the initial co-ordinates whilst on the ramp, the following points should be taken into account:

- in some inertial systems, insertion errors exceeding about one degree of latitude will illuminate a malfunction light. It should be noted that very few systems provide protection against longitude insertion errors.
- at all times, but particularly in the vicinity of the Zero Degree E/W (Greenwich) Meridian or near to the Equator, care should be taken to ensure that the co-ordinates inserted are correct. (i.e. E/W or N/S).

System Alignment

8.3.3 The alignment of inertial systems must be completed and the equipment put into navigation mode prior to releasing the parking brake at the ramp. Some systems will align in about 10 minutes, others can take 15 minutes or more; expect alignment to take longer in extreme cold or at higher latitudes or when the aircraft (and hence the inertial platform) is buffeted by winds or rocked during cargo loading. A rapid realignment feature is sometimes provided but should only be used if, during an intermediate stop, it becomes necessary to increase the system accuracy. The aircraft must be stationary during rapid realignment which typically will take about one minute.

8.3.4 To ensure that there is adequate time for the initial alignment, the first crew member on the flight deck should normally put the inertial system(s) into the align mode as soon as practicable.

GNSS (GPS) Systems

8.3.5 As with all LRNS operations, GPS LRNS operations must be approved by the State of the Operator (or the State of Registry for International General Aviation operations) as part of the NAT HLA operational approval. When both the LRNSs required for unrestricted NAT HLA operations are GPSs the approval of their operation will include the requirement to carry out Pre-Departure Satellite Navigation

Prediction Programmes (as shown below). When only one of the two LRNSs required is a GPS, State Authorities vary as to whether they require their operators to conduct such pre-departure programmes.

Satellite Availability

8.3.6 :

To determine 3-D position:

- Four satellites are required;

For Receiver Autonomous Integrity Monitoring (RAIM) purposes:

- Five satellites are required to detect the presence of a single faulty

satellite; For Fault Detection and Exclusion (FDE) purposes:

- Six satellites are required to identify a faulty satellite and exclude it from participating in further navigation solution calculations.

Note 1: An FDE algorithm is normally associated with a RAIM algorithm.

Note 2: The above numbers of satellites (for RAIM and FDE purposes only) may in each case be reduced by one if barometric aiding is used.

Satellite Navigation Prediction

8.3.7 When so required, operators intending to conduct GPS navigation in NAT HLA airspace must utilise a Satellite Navigation Availability Prediction Programme specifically designated for the GPS equipment installed. This prediction programme must be capable of predicting, prior to departure for flight on a "specified route"*, the following:

a) Any loss of navigation coverage (meaning that less than 3 satellites will be in view to the receiver);
and

b) Any loss of the RAIM/FDE function and its duration.

*Note: *"specified route" is defined by a series of waypoints (to perhaps include the route to any required alternate), with the time between waypoints based on planned speeds. Since flight planned ground speeds and/or departure times may not be met, the pre-departure prediction must be performed for a range of expected ground speeds.*

8.3.8 This prediction programme must use appropriate parameters from the RAIM/FDE algorithm employed by the installed GPS equipment. In order to perform the predictions this programme must provide the capability to manually designate satellites that are scheduled to be unavailable. Such information is not included in the GPS almanac or ephemeris data in the navigation message (i.e. the GPS receiver does not receive this information). Information on GPS satellite outages is promulgated via the U.S. NOTAM Office. The KNMH transmitting station (US Coast Guard Station, Washington D.C.) is responsible for release (in NOTAM format) of information relating to the operating condition of the GPS constellation satellites. These NOTAMs can be obtained through direct query to the USA data bank, via the AFTN, using the following service message format: SVC RQ INT LOC = KNMH addressed to KDZZNAXX. Such information can also be found on the US Coastguard Web site at www.navcen.uscg.gov."

8.3.9 When GPS is being used as a supplementary navigation means or when GPS is only one of the two LRNSs required for NAT HLA MNPS Approval (e.g. when the second LRNS is an IRS/INS installation) then some States of Registry may not require the operator to conduct pre-flight RAIM/FDE prediction checks.

Operational Control Restrictions

The Capability to determine a GPS position

8.3.10 Prior to departure, the operator must use the prediction programme to first demonstrate that forecast satellite outages will not result in a loss of navigation coverage (i.e. the capability to determine position) on any part of the specified route of flight. If such outages are detected by the programme, the flight will need to be re-routed, delayed or cancelled.

Determination of the Availability of RAIM/FDE

8.3.11 Once the position determination function is assured (i.e. no loss in navigation coverage for the route has been predicted), the operator must run the RAIM/FDE outage prediction programme (N.B. possible exceptions as per para 8.3.9 above). Any continuous outage of RAIM/FDE capability of greater than 51 minutes in NAT HLA airspace (or greater than 25 minutes for flights on RLatSM Tracks) means again that the flight should be re-routed, delayed or cancelled. It is understood that some prediction programmes carry out both these checks together.

Note: Derivation of the 51& 25 minute limits – At the instant the RAIM/FDE capability is lost, it is assumed that the GPS navigation solution proceeds to direct the aircraft away from track at a speed of 35 knots. With the current NAT HLA nominal track spacing of 60 nautical miles (30 NMs for RLatSM Tracks), it is further assumed that aircraft on adjacent tracks have a lateral "safety buffer" of 30 nautical miles (15 NMs for RLatSM Tracks). At 35 knots it will take an aircraft 51(or 25) minutes to exit this "safety buffer". It should be noted that this is a very conservative methodology and it is thought unlikely that a RAIM/FDE outage alone could cause such errant navigation behaviour.

Loading of Initial Waypoints

8.3.12 The manual entry of waypoint data into the navigation systems must be a co-ordinated operation by two persons, working **in sequence and independently**: one should key in and insert the data, and subsequently the other should recall it and confirm it against source information. **It is not sufficient for one crew member just to observe or assist another crew member inserting the data**.

8.3.13 The ramp position of the aircraft, plus at least two additional waypoints, or, if the onboard equipment allows, all the waypoints relevant to the flight, should be loaded while the aircraft is at the ramp. However, it is more important initially to ensure that the first en-route waypoint is inserted accurately.

Note: The vast majority of commercial air transport aircraft operating in NAT HLA airspace have an IRS/INS as part of their Long Range navigation fit. An increasing number of those with IRS/INS also have GPS and whilst GPS may then be considered the primary LRNS, these aircraft are still required to input the ramp position. This should then be compared with the GPS solution. For those few aircraft with GPS as the only LRNS, whilst there may be no need to actually load the ramp position, it is good airmanship and recommended operational practice to compare the published ramp position with the GPS-derived position. Without selective availability GPS should give a position within 30 metres of the published ramp position. If the GPS position is *more than 100 metres from the published ground position, then the cause should be investigated. If sufficient satellites are in view the most likely causes are GPS receiver error, atmospheric interference, or, incorrect ramp co-ordinates.*

8.3.14 During flight, at least two current waypoints beyond the leg being navigated should be maintained in the Control Display Units (CDUs) until the destination ramp co-ordinates are loaded. Two pilots should be responsible for loading, recalling and checking the accuracy of the inserted waypoints; one loading and the other subsequently recalling and checking them independently. However, this process should not be permitted to engage the attention of both pilots simultaneously during the flight. Where remote loading of the units is possible, this permits one pilot to cross-check that the data inserted automatically is indeed accurate.

8.3.15 An alternative and acceptable procedure is for the two pilots silently and independently to load their own initial waypoints and then cross-check them. The pilot responsible for carrying out the verification should work from the CDU display to the Master Document rather than in the opposite direction. This may lessen the risk of the pilot 'seeing what is expected to be seen’ rather than what is actually displayed.

Flight Plan Check

8.3.16 The purpose of this check is to ensure complete compatibility between the data in the Master Document and the calculated output from the navigation systems. Typical actions could include:

a) checking the distance from the ramp position to the first waypoint. Some systems will account for the track distance involved in an ATC SID; in others, an appropriate allowance for a SID may have to be made to the great circle distance indicated in order to match that in the Master Document. If there is significant disagreement, rechecking initial position and waypoint co-ordinates may be necessary.

b) selecting track waypoint 1 to waypoint 2 and doing the following:
   - checking accuracy of the indicated distance against that in the Master Document;
   - checking, when data available, that the track displayed is as listed in the Master Document. (This check will show up any errors made in lat/long designators (i.e. N/S or E/W).)

c) similar checks should be carried out for subsequent pairs of waypoints and any discrepancies between the Master Document and displayed data checked for possible waypoint insertion errors. These checks can be coordinated between the two pilots checking against the information in the Master Document.

d) when each leg of the flight has been checked in this manner it should be annotated on the Master Document by means of a suitable symbology as previously suggested (See "The Use of a Master Document” above).

e) some systems have integral navigation databases and it is essential that the recency of the database being used is known. It must be recognised that even the co-ordinates of waypoint positions contained in a data base have been keyed in at some point by another human. The possibility of input errors is always present. **Do not assume the infallibility of navigation databases and always maintain the same thorough principles which are applied in the checking of your own manual inputs.**

Leaving the Ramp

8.3.17 The aircraft must not be moved prior to the navigation mode being initiated, otherwise inertial navigation systems must be realigned. Prior to leaving the ramp Zero Ground Speed indications from the LRNS should be confirmed. Any excessive Ground Speeds noted while on chocks should be resolved by checking fault codes, the currency of data bases and RAIM (if GPS is employed).

8.3.18 After leaving the ramp, inertial groundspeeds should be checked (a significantly erroneous reading may indicate a faulty or less reliable inertial unit). A check should be made on any malfunction codes whilst the aircraft is stopped but after it has taxied at least part of the way to the take-off position; any significant ground-speed indications whilst stationary may indicate a faulty inertial unit such as a tilted platform. Prior to take-off, operators with an avionic fit which employs an electronic map display should confirm that the derived position indicates that the aircraft is at the start of the runway.

8.3.19 Many modern aircraft are equipped with FMS navigation systems (i.e. Flight Management Computers fed by multiple navigation sensors.). Once the FMS is put into 'Nav' mode, the system decides on the most appropriate (i.e. accurate) navigation sensors to use for position determination. If GPS is part of the solution, then the position is normally predominantly based on GPS inputs with the IRS/INS in a supporting role. It may therefore be difficult to know exactly what component of the navigation solution (IRS, GPS, DME etc) is being used to derive position at any one time. With an FMS-based system, or a GPS stand-alone system, the “Leaving the Ramp” checks should be designed to provide assurance that the navigation information presented is indeed 'sensible'.

8.4 IN FLIGHT PROCEDURES

Initial flight

8.4.1 It is recommended that during the initial part of the flight, ground navaids should be used to verify the performance of the LRNSs. Large or unusual ‘map shifts’ in FMS output, or other discrepancies in navigation data, could be due to inertial platform misalignment or initialisation errors. Position updates to the FMS will not correct these errors despite possible indications to the contrary. If such a situation is encountered when INS/IRS are the primary LRNSs then it would be unwise to continue into NAT HLA airspace. Pilots should consider landing in order to investigate the cause and then perhaps be in a position to correct the problem.

8.4.2 It is recommended that a compass heading check be presented and the results recorded. This check is particularly helpful when using inertial systems. The check can also aid in determining the most accurate compass if a problem develops later in the crossing.

ATC Oceanic Clearance and subsequent Re-clearances

8.4.3 Where practicable, two flight crew members should listen to and record every ATC clearance and both agree that the recording is correct. Standard Operating Procedures (SOPs) for LRNS 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. This task cannot be delegated. Any doubt should be resolved by requesting clarification from ATC.

8.4.4 In the event that a re-clearance is received when temporarily 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 cross-checking and verification process can be undertaken.

8.4.5 If the ATC oceanic cleared route is identical to the flight planned track, it should be drawn on the plotting chart and verified by the other pilot.

8.4.6 If the aircraft is cleared by ATC on a different track from that flight planned, some regulators recommend that a new Master Document be prepared showing the details of the cleared track. Overwriting of the existing flight plan can cause difficulties in reading the waypoint numbers and the new co-ordinates.

For this purpose, it is helpful if a blank pro-forma Master Document (flight plan) is carried with the flight documents. One flight crew member should transcribe track and distance data from the appropriate reference source onto the new Master Document pro-forma and this should be checked by another crew member. If necessary, a new plotting chart may be used on which to draw the new track. The new document(s) should be used for the oceanic crossing. If the subsequent domestic portion of the flight corresponds to that contained in the original flight plan, it should be possible to revert to the original Master Document at the appropriate point.

8.4.7 Experience has clearly shown that when ATC issues an initial oceanic clearance that differs from the flight plan, or subsequently during the flight issues a re-clearance involving re-routing and new waypoints, there is a consequential increase in the risk of errors being made. Indeed errors associated with re-clearances continue to be the most frequent cause of Gross Navigation Errors in the North Atlantic HLA airspace. Therefore, in both of these circumstances the situation should be treated virtually as the start of a new flight and the procedures employed with respect to the following, should all be identical to those procedures employed at the beginning of a flight (see paragraph 8.3.16 above):

a) copying the ATC re-clearance;

b) amending the Master Document;

c) loading and checking waypoints;

d) extracting and verifying flight plan information, tracks and distances, etc.; and

e) preparing a new plotting chart.

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

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

Approaching the Ocean

8.4.10 Prior to entering NAT HLA Airspace, the accuracy of the LRNSs should be thoroughly checked, if necessary by using independent navigation aids. For example, INS position can be checked by reference to en-route or proximate VOR/DMEs, etc. However, with a modern FMS, the system decides which LRNS is to be used, and indeed, the FMS may be taking information from DMEs (and possibly VORs) as well as the LRNS carried. Nevertheless, in spite of all this modern technology and even if the FMS is using GPS, it is still worthwhile to carry out a 'reasonableness' check of the FMS/GPS position, using (for example) DME/VOR distance and bearing.

Note: It should be recognized, however, that "distance & bearing" checks in the western portion of the North Atlantic can be problematic. It has been noted that the navigation information data bases used on-board aircraft; in Flight Planning Systems ; and in ATS Ground Systems do not always define the same (large) Magnetic Variation for the same location in this airspace.

8.4.11 When appropriate and possible, the navigation system which, in the opinion of the pilot, has performed most accurately since departure should be selected for automatic navigation steering.

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

8.4.13 Just prior, or at entry to, the ocean pilots should attempt to determine the offsets (if any) being flown by aircraft immediately ahead on the same track one flight level above and one flight level below. They should then select an offset which differs from the other aircraft. If this is not possible, or practical, then pilots should randomly chose of the three flight path options. See Section 8.5 for rationale and more details.

Entering the NAT HLA Airspace and Reaching an Oceanic Waypoint

8.4.14 When passing waypoints, the following checks should be carried out:

a) just prior to the waypoint, check the present position co-ordinates of each navigation system against the cleared route in the Master Document, and

b) check the next two waypoints in each navigation system against the Master Document.

c) at the waypoint, check the distance to the next waypoint, confirm that the aircraft turns in the correct direction and takes up a new heading and track appropriate to the leg to the next waypoint.

d) before transmitting the position report to ATC, verify the waypoint co-ordinates against the Master Document and those in the steering navigation system. When feasible the position report "next" and "next plus 1" waypoint co-ordinates should be read from the CDU of the navigation system coupled to the autopilot.

8.4.15 Even if automatic waypoint position reporting via data link (e.g. ADS-C or CPDLC) is being used to provide position reports to ATC the above checks should still be performed.

8.4.16 The crew should be prepared for possible ATC follow-up to the position report.

8.4.17 Crews should also be aware that trials are underway in the NAT Region of ADS-C conformance monitoring. ATC may establish event contracts that will result in automatic alerts whenever the aircraft diverges from its cleared profile. Unless previously advised by the pilot of the need for such a divergence, crews should expect ATC to query the situation. Standardised CPDLC alert messages have been developed for use here.

Routine Monitoring

8.4.18 It is important to remember that there are a number of ways in which the autopilot may unobtrusively become disconnected from the steering mode. Therefore, regular checks of correct engagement with the navigation system should be made.

8.4.19 It is recommended that where possible the navigation system coupled to the autopilot should display the present position co-ordinates throughout the flight. If these are then plotted as suggested above, they will provide confirmation that the aircraft is tracking in accordance with its ATC clearance. Distance to go information should be available on the instrument panel, whilst a waypoint alert light, where fitted, provides a reminder of the aircraft's imminent arrival over the next waypoint.

8.4.20 A position check should be made at each waypoint and the present position plotted 10 minutes after passing each waypoint. For a generally east-west flight, this 10 minute point will be approximately 2 degrees of longitude beyond the oceanic waypoint. It may therefore in fact be simpler to plot a present position 2 degrees of longitude after each 10 degree waypoint. There may be circumstances, (e.g. when, due to equipment failure, only one LRNS remains serviceable) in which additional plots midway between each waypoint may be justified.

8.4.21 It is good practice to cross check winds midway between oceanic waypoints by comparing the flight plan, LRNS and upper milli-bar wind charts data. Such a cross check will also aid crews in case there is a subsequent contingency situation requiring the use of Dead Reckoning.

8.4.22 The navigation system not being used to steer the aircraft should display cross-track distance and track angle error. Both of these should be monitored, with cross-track distance being displayed on the HSI where feasible.

Approaching Landfall

8.4.23 When the aircraft is within range of land based navaids, and the crew is confident that these navaids are providing reliable navigation information, consideration should be given to updating the LRNSs. Automatic updating of the LRNSs from other navaids should be closely monitored, and before entry into airspace where different navigation requirements have been specified (e.g. RNP5 in European BRNAV airspace), crews should use all aids (including VORs and DMEs) to confirm that the in-use navigation system is operating to the required accuracy. If there is any doubt regarding system accuracy, the appropriate ATC unit should be informed.

8.5 SPECIAL IN-FLIGHT PROCEDURES

Strategic Lateral Offset Procedures (SLOP)

8.5.1 ATC clearances are designed to ensure that separation standards are continually maintained for all traffic. However, the chain of clearance definition, delivery and execution involves a series of technical system processes and human actions. Errors are very rare but they do occur. Neither pilots nor controllers are infallible. Gross Navigation Errors (usually involving whole latitude degree mistakes in route waypoints) are made, and aircraft are sometimes flown at flight levels other than those expected by the controller. When such errors are made, ironically, the extreme accuracies of modern navigation and height keeping systems themselves increase the risk of an actual collision. Within an ATS surveillance environment the controller is alerted to such errors and can, using VHF voice communications, intervene in a timely fashion. This is not the case in Oceanic airspace, such as the North Atlantic, where the controller's awareness of the disposition of a significant proportion of the traffic is reliant largely upon pilot position reports through communication links utilising HF or SATCOM Voice via third party radio operators. And furthermore, even among that proportion of traffic utilising data link for automated position reporting, and perhaps ATS communications, navigation errors continue to occur. Consequently, it has been determined that allowing aircraft conducting oceanic flight to fly self-selected lateral offsets will provide an additional safety margin and mitigate the risk of traffic conflict when non-normal events such as aircraft navigation errors, height deviation errors and turbulence induced altitude-keeping errors do occur. Collision risk is significantly reduced by application of these offsets. These procedures are known as "Strategic Lateral Offset Procedures (SLOP)".

8.5.2 This procedure provides for offsets within the following guidelines:

a) along a route or track there will be three positions that an aircraft may fly: centreline or one or two miles right *(Note: SLOP provisions as specified in ICAO PANS-ATM Doc.4444 were amended 13 November 2014 to include the use of "micro-offsets of 0.1 Nms for those aircraft with this FMS capabilty. Appropriate guidance for the use of this amended procedure in the North Atlantic is under study and hence pending);*

b) offsets will not exceed 2 NM right of centreline; and

c) offsets **left** of centreline **must not be made**.

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

a) Aircraft without automatic offset programming capability must fly the centreline.

b) To achieve an equal distribution of flying the centreline or 1 NM (one nautical mile) right or 2 NM (two nautical miles) right of centerline, it is recommended that pilots of aircraft capable of programming automatic offsets should randomly select flying centreline or an offset. (*See Note in 8.5.2 a) above)* In order to obtain lateral spacing from nearby aircraft (i.e. those immediately above and/or below), pilots should use whatever means are available (e.g. ACAS/TCAS, communications, visual acquisition, GPWS) to determine the best flight path to fly.

c) An aircraft overtaking another aircraft should offset within the confines of this procedure, if capable, so as to create the least amount of wake turbulence for the aircraft being overtaken.

d) For wake turbulence purposes, pilots should fly one of the three positions shown above. Pilots should not offset to the left of centreline nor offset more than 2 NM right of centreline. Pilots may contact other aircraft on the air-to-air channel, 123.45 MHz, as necessary; to co- ordinate the best wake turbulence mutual offset option. *(Note. It is recognized that the pilot will use his/her judgement to determine the action most appropriate to any given situation and that the pilot has the final authority and responsibility for the safe operations of the aeroplane. See also* Chapter 13*, paragraph 13.5.)* As indicated below, contact with ATC is not required.

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

f) Aircraft transiting ATS Surveillance-controlled airspace mid-ocean should remain on their already established offset positions.

g) There is no ATC clearance required for this procedure and it is not necessary that ATC be advised.

h) Voice Position reports should be based on the waypoints of the current ATC clearance and not the offset positions.

8.5.4 SLOP has been implemented as a standard operating procedure in the NAT Region since 2004. An indication of the proportion of pilots adopting a SLOP offset here is obtained through study of ADS-C position reports. Such study has shown that during 2012 more than 40% of aircraft flying in the NAT MNPS Airspace selected the 1NM Right option and about 20% chose the 2NM Right option. As indicated above, system safety would be further enhanced if aircraft were more evenly distributed between the centreline, 1 and 2 NM Right options. As proposed in paragraph 8.5.3 b) above, Pilots should attempt to determine the offsets (if any) being flown by aircraft immediately ahead on the same track one flight level above and one flight level below. And then select an offset which differs from those. If this is not possible or practical, then pilots should randomly choose one of the three flight path options.

8.5.5 The previously mentioned study of ADS-C position reports has also shown that some aircraft continue to adopt an offset LEFT of cleared track centre-line. The standard SLOP procedures are designed to provide safety enhancements for both uni-directional and bi-directional flows. On bi-directional routes a LEFT offset will INCREASE collision risk rather than decrease it. There are areas in the NAT Region where bi-directional traffic flows are routinely used. And there are times when opposite direction traffic may be encountered in any part of the Region. Pilots must therefore recognise that **LEFT offsets from the cleared track centre-line must not be adopted**. After the introduction of RVSM and before the adoption of SLOP, a NAT offsetting procedure was promulgated for wake-turbulence avoidance. This procedure allowed both right and left offsets to be flown. The procedure was developed primarily with a view to the unique traffic flows of the NAT OTS, where uni-directional traffic occupied every flight level from FL310 to FL390. That wake turbulence avoidance specific procedure is no longer in place. The avoidance of wake turbulence (even in the OTS) can be accomplished effectively within the confines of the SLOP procedures, as specified in paragraph 8.5.3 d) above. Pilots should communicate with the other aircraft involved to co-ordinate a pair of mutual offsets from within the allowed three options, in order to mitigate any wake-turbulence issue.

Monitoring during Distractions from Routine

8.5.6 Training and drills should ensure that minor emergencies or interruptions to normal routine are not allowed to distract the crew to the extent that the navigation system is mishandled.

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

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

Avoiding Confusion between Magnetic and True Track Reference

8.5.9 To cover all navigation requirements, some operators produce flight plans giving both magnetic and true tracks. However, especially if crews are changing to a new system, there is a risk that at some stage (e.g. during partial system failure, re-clearances, etc.), confusion may arise in selecting the correct values. Operators should therefore devise procedures which will reduce this risk, as well as ensuring that the subject is covered during training.

8.5.10 Crews who decide to check or update their LRNSs by reference to VORs should remember that in the Canadian Northern Domestic Airspace these may be oriented with reference to true north, rather than magnetic north.

Navigation in the Area of Compass Unreliability

8.5.11 As aircraft move towards the Earth's North magnetic pole the horizontal field strength reduces and the ability of the compass to accurately sense magnetic North is reduced. It is generally recognised that when the horizontal magnetic field strength falls below 6000 nanotesla, the magnetic compass can no longer be considered to be reliable. Moreover, when the horizontal magnetic field strength falls below 3000 nanotesla, the magnetic compass is considered to be unusable. Within NAT HLA airspace the North West of Greenland is an area of Compass Unreliability and adjoining areas of Canadian airspace include areas where the magnetic Compass is unusable. En-route charts for the North Atlantic and North Polar areas show the areas where the compass is either unreliable or unusable.

8.5.12 In areas where the compass is unreliable or unusable, basic inertial navigation requires no special procedures. Different manufacturers may offer their own solutions to the special problems existing in such areas. However, such solutions should not involve the use of charts and manual measurement of direction.

8.5.13 Furthermore, Operators/Pilots are reminded that before operating in an area of Compass Unreliability they are responsible for checking with their State Authorities whether specific regulatory approval or training is required.

Deliberate Deviation from Track

8.5.14 Deliberate temporary deviations from track are sometimes necessary, usually to avoid severe weather; whenever possible, prior ATC approval should be obtained (See Section 13.4). Such deviations have often been the source of gross errors as a consequence of failing to re-engage the autopilot with the navigation system. It should also be noted that selection of the 'turbulence' mode of the autopilot on some aircraft may have the effect of disengaging it from the aircraft navigation system. After use of the turbulence mode, extra care should be taken to ensure that the desired track is recaptured by the steering navigation system.

8.6 POST-FLIGHT PROCEDURES

Inertial Navigation System Accuracy Check

8.6.1 At the end of each flight, an evaluation of accuracy of the aircraft's navigation systems should be carried out. Equipment operating manuals specify maxima for radial errors before a system is considered to be unserviceable. For early gimballed-platform inertial systems these are in the order of 2 NM per hour. One method used to determine radial error is to input the shutdown ramp position; in other systems error messages are output giving differences between raw inertial reference positions and computed radio navigation updated positions. Whatever method is used, a record should be kept of the performance of each INS.

8.7 HORIZONTAL NAVIGATION PERFORMANCE MONITORING

8.7.1 The navigation performance of operators within NAT HLA airspace is monitored on a continual basis. 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 Central Monitoring Agency (CMA), currently operated on behalf of ICAO by the UK National Air Traffic Services Limited.

8.7.2 Pilots and operators are encouraged to cooperate as fully as possible with the CMA in its investigations of any deviations, since the objective here is to support regional safety management function. These investigations are not conducted for regulatory/punitive purposes.

8.7.3 The CMA also maintains a data base of all NAT HLA MNPS Approvals. The CMA runs a continuous monitoring process to compare this Approvals list with the records of all aircraft flying in the NAT HLA airspace. The Approval status of any aircraft involved in a track deviation is specifically checked against the data base and in any cases of doubt the State of the operator or the State of Registry is contacted. Chapter 10 provides full details of the monitoring processes.

CHAPTER 9

RVSM FLIGHT IN NAT HLA AIRSPACE

9.1 GENERAL

9.1.1 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 also to minimise the consequences of equipment failures and possible human errors.

9.1.2 As is the case with lateral navigation systems, technical failures of altimetry and/or height keeping systems are extremely rare within the NAT HLA. However, less rare in the NAT HLA are situations in which an aircraft is flown at a level other that cleared by ATC. ATC Loop Errors, when there is a misunderstanding or miscommunication between ATC and the pilot over the actual cleared level, unfortunately do occur. In an SSR environment ATC are alerted immediately when aircraft departs from the cleared level. Furthermore with Direct Controller Pilot Communications (DCPC) the controller can instantly intervene to resolve the situation and/or to provide potential conflict warnings to other traffic. In the NAT HLA SSR coverage is very limited and regular air/ground ATC Voice communications are usually conducted via a third party radio operator.

9.1.3 Severe turbulence in the NAT HLA is uncommon but mountain waves in the vicinity of Greenland and clear air turbulence associated with jet streams are not unknown. Aircraft encountering such conditions can inadvertently depart from their cleared levels or the pilot may elect to change level to avoid the effects of the turbulence. Other circumstances also occur in which the pilot will be forced to change level, before an appropriate ATC re-clearance can be obtained, e.g. power or pressurisation failure, freezing fuel, etc. Again, without surveillance or DCPC, there can be a significant lag between the aircraft's departure from its cleared level and any possible action from the controller to provide separation from any other potentially conflicting traffic.

9.1.4 It must be appreciated that the NAT HLA is the busiest oceanic airspace in the world. Furthermore, NAT traffic is comprised of a very wide range of aircraft types, flying a wide range of sector lengths and carrying a significant range of loads. As a result, optimum flight levels vary over the whole jet cruising range and nearly all the flight levels of the core tracks of the OTS, during peak hours, are fully occupied. Also, the Mach Numbers flown can vary significantly (e.g. typically between M0.78 and M0.86), resulting in up to 20 minutes variation in NAT transit times. Given that the nominal longitudinal separation standard employed in the NAT HLA is 10 minutes, one consequence of the foregoing is that it is rare for any NAT OTS flight to transit the NAT without overtaking, or being overtaken, by another aircraft at an adjacent level on the same track. It will therefore be seen that any on-track departure from cleared level in the NAT HLA will involve a significant risk of conflicting with other traffic. Furthermore, given the extreme accuracy of lateral track-keeping provided by modern LRNSs (e.g. GPS) such conflict risk can translate to a collision risk. **It is primarily with this in mind that the Strategic Lateral Offset Procedures** (see "Strategic Lateral Offset Procedures (SLOP)" above in Chapter 8 **have been established as a standard operating procedure in the NAT Region**.

Pre-Flight

9.1.5 For flight through the NAT HLA airspace the aircraft and the operator must have the appropriate State Approvals for both NAT HLA and RVSM operations. The crew must be qualified for flight in RVSM airspace and all aircraft intending to operate within NAT HLA airspace must be equipped with altimetry and height-keeping systems which meet RVSM Minimum Aircraft System Performance Specifications (MASPS). RVSM MASPS are contained in ICAO Doc 9574 (Manual on a 300m (1,000ft) Vertical Separation Minimum between FL290 and FL410 inclusive.) and detailed in FAA Advisory Circular (AC) 91-85 which can currently be accessed through:

http://www.faa.gov/air_traffic/separation_standards/rvsm/. 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 http://www.eurocontrol.int/articles/library (paragraph 17.2.4 also refers).

9.1.6 The Minimum Equipment List (MEL) for RVSM operations must be strictly observed

9.1.7 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; the letter 'X' must still be included to show that the aircraft satisfies NAT HLA lateral navigation performance requirements.

Note: Reduced lateral separation standards are currently implemented in the New York East and Santa Maria FIRs and in the WATRS Plus Airspace. RNAV 10 (RNP 10) or RNP 4 Approval is required in order to benefit from these reduced separations employed here. Any NAT HLA Aircraft intending to also fly through these airspaces should ensure that its RNP Approval status is also included in the filed Flight Plan. Specifically such operators should:

i) annotate ICAO Flight Plan Item 10 (Equipment) with the letters "R" and "Z", and

ii) *annotate Item 18 (Other Information) with, as appropriate, "PBN/A1" or "PBN/L1" (no spaces).*

9.1.8 Most flights through the NAT HLA enter via European and/or North American RVSM airspace. These flights will have been required to perform standard pre-flight checks of altimeters for their initial operations in those continental RVSM areas. Other flights departing directly into the NAT Region should ensure that such checks are made.

9.1.9 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 above (See Special Arrangements for Non-RVSM Approved Aircraft – Section 1.6).

In-Flight – Before Operating in NAT HLA Airspace

9.1.10 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. An altimeter cross check should be carried out; **at least two primary altimeters must agree within plus or minus 200 ft**. The readings of the primary and standby altimeters should be recorded to be available for use in any possible subsequent contingency situations.

In-Flight – Entering and Flying in NAT HLA Airspace

9.1.11 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.

9.1.12 When passing waypoints, or at intervals not exceeding 60 minutes (whichever occurs earlier), or on reaching a new cleared flight level, a cross-check 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 as soon as possible**.

9.1.13 To prevent unwanted TCAS/ACAS warnings or alerts, when first approaching any cleared flight level in NAT RVSM airspace, pilots 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 aeroplane neither undershoots nor overshoots the cleared level by more than 150 ft.

9.1.14 Abnormal operational circumstances (e.g. engine failures, pressurisation problems, freezing fuel, turbulence, etc.), sometimes require a pilot to change level prior to obtaining a re-clearance from ATC. Such a timely re-clearance is more difficult to obtain in oceanic or remote areas where DCPC are not necessarily available. This is indeed the case in NAT HLA airspace, in which ATS voice communications are conducted indirectly through a third party radio operator, utilising HF, SATCOM Voice or GP/VHF facilities. As previously indicated, extreme caution and vigilance should be exercised when executing any such (uncleared) level changes, as the potential collision risk (particularly in the OTS) is significant.

9.1.15 It must also be recognised that even under normal operations when using such indirect communication methods, there does exist the potential for misunderstanding between pilot 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 NAT HLA airspace that **pilots not using CPDLC/ADS-C always report to ATC immediately on leaving the current cruising level and on reaching any new cruising level**.

9.1.16 The Strategic Lateral Offset Procedures (SLOP) described in Section 8.5 have been established as a standard operating procedure in the NAT Region to assist in mitigating the potential risks of any of the foregoing height deviations or errors.

9.2 EQUIPMENT FAILURES

9.2.1 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

9.2.2 The aircraft should then follow the appropriate procedure described in Chapter 12 – “Procedures in the Event of Navigation System Degradation or Failure”, or as instructed by the controlling ATC unit.

9.3 VERTICAL NAVIGATION PERFORMANCE MONITORING

9.3.1 The vertical navigation performance of operators within NAT HLA airspace is monitored on a continual basis by the NAT CMA. Such monitoring includes both measurement of the technical height-keeping accuracy of RVSM approved aircraft and assessment of collision risk associated with all reported operational deviations from cleared levels. Chapter 11 deals more fully with this matter.

CHAPTER 10

ATS SURVEILLANCE SERVICES IN NAT HLA AIRSPACE

10.1 GENERAL

10.1.1 ATS Surveillance services are provided within the NAT HLA airspace in the Bodø, Reykjavik, Gander, Santa Maria, Shanwick, and New York oceanic East areas, where radar, ADS-B or multilateration coverage exists.

10.1.2 The carriage of ADS-B has not been mandated in the NAT. Even though ADS-B equipage level is already high (above 80%) in the NAT Region , there are some aircraft that cannot be seen on ADS-B. As a consequence ANSPs will continue to provide procedural separation between non-ADS-B equipped aircraft and any other aircraft in ADS-B airspace that is not also covered by radar or multilateration.

10.1.3 The ATS Surveillance services are provided in accordance with the ATS Surveillance services procedures in the PANS ATM (DOC 4444).

10.2 OPERATION OF SSR TRANSPONDERS

10.2.1 All aircraft operating as IFR flights in the NAT Region shall be equipped with a pressure-altitude reporting SSR transponder. Radar control services are provided in particular portions of the NAT Region (e.g. the southern and eastern portions of Reykjavik OCA). Here, transponder codes issued by the controlling authority must be retained until advised. Otherwise, unless directed by ATC, pilots flying in the NAT FIRs will operate transponders continuously in Mode A/C Code 2000, except that the last assigned code will be retained for a period of 30 min after entry into NAT airspace or after leaving a radar service area. Pilots should recognise that it is important to change from the last assigned domestic code to the Mode A/C Code 2000 since the original domestic code may not be recognised by the subsequent Domestic Radar Service on exit from the oceanic airspace. (One exception to this requirement should be noted. Because of the limited time spent in the NAT HLA airspace when flying on Route Tango 9, the change from the last assigned domestic code to Code 2000 should be made Northbound 10 minutes after passing BEGAS and Southbound 10 minutes after passing LASNO.)

10.2.2 It should be noted that 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 crews must exercise CAUTION when selecting Codes not to inadvertently cycle through any of these special purpose codes and thereby possibly initiate the launching of an interception.

10.3 OPERATION OF ADS-B TRANSMITTERS

10.3.1 ADS-B services are already available in some continental airspaces immediately adjacent to the NAT Region as well as within some portions of the NAT HLA airspace, specifically in the Gander, Reykjavik and Santa Maria OCAs.

10.3.2 Eligibility for ADS-B service in the NAT is based upon the provisions in the NAT Regional Supplementary Procedures (ICAO Doc 7030) section 5.5.

10.3.3 The procedures contained in 10.3.4 below shall be applicable in those portions of the following FIRs where an ADS-B-based ATS surveillance service is provided:

> Reykjavik FIR, Søndrestrøm FIR, Bodø FIR, Gander Oceanic FIR, New York Oceanic East FIR and Santa Maria Oceanic FIR.

10.3.4 An aircraft carrying 1090 MHz extended squitter (1090ES) ADS-B equipment shall disable ADS-B transmission unless:

a) the aircraft emits position information of an accuracy and integrity consistent with the transmitted values of the position quality indicator; or

b) the aircraft always transmits a value of 0 (zero) for one or more of the position quality indicators (NUCp, NIC, NAC or SIL), when the requirements of a) above cannot be met; or

c) the operator has received an exemption granted by the appropriate ATS authority.

Note.— The following documents provide guidance for the installation and airworthiness approval of ADS-B OUT system in aircraft and ensure compliance with a) above:

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

2. FAA AC No. 20-165A — 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.

10.3.5 Aircraft operators wishing to receive an exemption from the procedures specified in 10.3.3 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.

10.3.6 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 via a cockpit interface. 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 packages 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.

10.3.7 Most 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 pilot 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.

10.4 North Atlantic Data Link Mandate Airspace

10.4.1 In each of the phases of the NAT Data Link Mandate implementation plan, areas/level bands are defined, within which, to plan and/or fly, the aircraft must be equipped with FANS 1/A (or equivalent) CPDLC and ADS-C. However, where ATS surveillance service is provided using either SSR or ADS-B, appropriately equipped aircraft (i.e. with Mode A/C transponders or ADS-B transmitters, respectively) are exempt from the DLM requirement for FANS 1/A equipage. Two charts, shown in Attachment 9 (still pending) to this document, give a general indication of the Radar and ADS-B coverage in the NAT Region. However, when planning a NAT flight and intending to perhaps benefit from the terms of any DLM exemption, Operators must consult the current AIS of all the relevant NAT ANSP States.

CHAPTER 11

MONITORING OF AIRCRAFT SYSTEMS AND CREW PERFORMANCE

11.1 THE MONITORING PROCESS

11.1.1 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 pilots, Operators and ATS Providers, of specified deviations from assigned track or flight level supports this.

11.1.2 The monitoring process comprises four distinct actions:

a) monitoring of aircraft navigation performance by the Operator in co-operation with flight crews;

b) monitoring of Operators by the State having jurisdiction over those Operators in order to ensure that acceptable operating procedures are being applied by the Operator while conducting authorised flight operations;

c) monitoring of actual aircraft systems performance in normal flight operations, as observed by means of ATS surveillance by the ATC units of States providing service in the NAT Region, and by other specialist systems designed to measure the technical height-keeping performance of aircraft; and

d) monitoring done on the basis of position and occurrence reporting.

11.1.3 Because of the large variety of circumstances existing in the relationship between States of Registry and their Operators engaged in NAT operations, it is not expected that all States will be able to make similar or identical arrangements. It is however expected that all States concerned will make maximum effort to comply effectively with their responsibilities and in particular to co-operate with requests for information about a particular incident from an ATS Provider or from the NAT CMA.

11.2 MONITORING OF HORIZONTAL NAVIGATION CAPABILITY

Monitoring by the Operators

11.2.1 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, whether these are observed on ground radar, via ADS reports or by the flight crew, that the cause(s) of track deviations be established and eliminated. **Therefore, it will be necessary to keep complete in-flight records so that an analysis can be carried-out.**

11.2.2 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 ETAs and ATAs;

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 pilot;

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; and

h) where available, navigational and performance data contained in the aircraft's flight data recorders.

i) retention of aircraft flight data (FDR) records whenever a 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.

11.2.3 It is also important that any forms which are used make it easy to examine key factors. For instance, documentation might include, for each flight, a question calling for crew assistance in this regard:

e.g. "Did a track error of 10 NM or more occur on this flight? Yes/No."

Monitoring of the Operator by the State

11.2.4 Decisions regarding the monitoring of Operators by the State may be taken unilaterally, but hopefully there will be a co-operative process regarding those specifications to be achieved by the Operator during planning, and when reviewing achieved performance. Much of this process will be concerned with procedures approved by the flight operations inspectorate and confirmed by means of monitoring, to ensure compliance.

Direct Action by ATS Provider States and the NAT CMA in the Monitoring Process

11.2.5 The navigation performance of operators within NAT HLA airspace is monitored on a continual basis. 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 Central Monitoring Agency (CMA), currently operated on behalf of ICAO by the UK National Air Traffic Services Limited. The CMA also maintains a data base of all NAT HLA MNPS Approvals. The CMA runs a continuous monitoring process to compare this Approvals list with the records of all aircraft flying in the NAT HLA airspace. The Approval status of any aircraft involved in a track deviation is specifically checked against the data base and in any cases of doubt the State of Registry is contacted.

11.2.6 When a navigation error is identified, follow-up action after flight is taken, both with the operator and, where the deviation is 25 NM or more, the State of operator or State of Registry of the aircraft involved, to establish the circumstances and contributory factors. The format of the (navigation) Error Investigation Form used for follow-up action is as shown at Attachment 1. Operational errors can have a significant effect on the assessment of risk in the system. For their safety and the safety of other users, crews are reminded of the importance of co-operating with the reporting OAC in the provision of incident information.

11.2.7 The overall lateral navigation performance of all aircraft in the NAT HLA Airspace is continually assessed and compared to the standards established for the Region, to ensure that the TLS is being maintained.

Monitoring of Lateral Deviations

11.2.8 The data collection process involves the continuous collection of data relating to all reported lateral deviations.

11.2.9 ATS surveillance stations capable of monitoring the boundaries of the NAT Region collect data on flights within NAT HLA airspace, together with that on non-NAT HLA airspace flights. The former data provides a direct input into the risk modelling of NAT HLA airspace, whilst the latter provides a wider appreciation of navigation in the NAT Region and allows follow-up action to be taken on a larger sample of flights believed to have experienced navigation errors.

11.2.10 When any lateral deviation of less than 25NM has been detected by the ATS Provider State or has been reported to ATC by the pilot, that ATS Provider unit will, in co-operation with the Operator, investigate its cause. It is important that all agencies react promptly to such reports of any lateral deviations. Investigations should be made at once so that consideration can be given to the need for swift remedial action. In order that deviation reports can receive prompt attention, each airline/Operator should nominate a person to be responsible for receiving reports and to initiate investigations; the name and full address of this individual should be notified to each relevant ATS administration.

11.3 MONITORING OF HEIGHT-KEEPING PERFORMANCE

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

11.3.2 All identified operational situations or errors which lead to aircraft deviating from ATC cleared levels are subject to thorough investigation. Follow-up action after flight is taken with the operator of the aircraft involved, to establish the reason for the deviation or cause of the error and to confirm the approval of the flight to operate in NAT HLA and RVSM Airspace. Operational errors, particularly those in the vertical plane, have a significant effect on risk in the system. For their safety and the safety of other users, crews are reminded of the importance of co-operating with the reporting OAC in the compilation of appropriate documentation including the completion of an ‘Altitude Deviation Report Form’, as illustrated at Attachment 2.

11.3.3 The detailed circumstances of all operational errors, both in the vertical and horizontal planes, are thoroughly reviewed by the CMA, together with the Scrutiny Group of the NAT SPG, which includes current NAT pilots , controllers and State Regulators. 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.

11.3.4 At RVSM levels, moderate and severe turbulence may also increase the level of system risk and crews should report **ALL** occasions, whilst flying in NAT HLA airspace, whenever a vertical deviation of 300 ft or more occurs. The form at Attachment 2 may also be used for this purpose.

11.3.5 The overall vertical navigation performance of all aircraft in NAT RVSM airspace is continually assessed and compared to the standards established for the Region, to assess whether the relevant TLS is being maintained.

Monitoring of Operational Height-keeping Performance

11.3.6 The introduction of RVSM Airspace into the NAT Region has increased the necessity for consistent and accurate reporting by pilots and ATC units, of all deviations of 90 m (300 ft) or more from the cleared flight level, whatever the cause.

Monitoring of Technical Height-keeping Performance

11.3.7 The technical height-keeping accuracy of aircraft flying at RVSM levels is passively monitored during flight over a Height Monitoring Unit (HMU) located near to Strumble in Wales. Alternatively, individual aircraft can be monitored through temporary carriage of portable GPS (Height) Monitoring Units (GMUs). Furthermore, height monitoring data is available to the NAT CMA from the 3 European HMUs. 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. Revised Minimum Monitoring Requirements for RVSM Approval, as specified in ICAO Annex 6, became effective in November 2010. 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).

11.4 Monitoring of ACAS II Performance

11.4.1 ACAS II can have a significant effect on ATC. Therefore, there is a continuing need to monitor the performance of ACAS II in the developing ATM environment.

11.4.2 Following an RA event, or other significant ACAS II event, pilots and controllers should complete an ACAS II RA report. Aircraft Operators and ATS authorities should forward completed reports through established channels.

11.5 Overall Navigation (and Systems) Performance

11.5.1 All information relating to horizontal and vertical navigation (and systems) performance within the NAT Region is provided to the NAT SPG via the CMA. Regular statistical assessments of system safety determine whether or not the overall target level of safety (TLS) is being met. 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.

11.6 TACTICAL MONITORING OF NAT HLA AND RVSM APPROVALS

11.6.1 Experience with the monitoring process indicates that a proportion of lateral deviations and other operational errors are attributable to aircraft operating in NAT HLA/RVSM Airspace without the required approvals. It was for this reason that in 1990, to make random checks more effective, the NAT SPG introduced a programme of tactical monitoring to help identify aircraft operating within NAT HLA airspace without the required approval. In 1997, this procedure was extended to RVSM approvals, and currently Canada, Iceland and the United Kingdom participate in this programme. Pilots who are uncertain of, or are unable to confirm their approval status, are issued a clearance to operate outside NAT HLA/RVSM Airspace and a report is forwarded to the CMA for follow-up action.

11.7 OPERATIONAL ERROR REPORTING AND CENTRAL MONITORING AGENCY (CMA) ACTIVITIES

Background

11.7.1 In March 1980, the NAT SPG realised that after implementation of a 60 NM lateral separation minima, special importance would have to be placed on monitoring and assessment of navigation performance. It was therefore agreed that there was a need to collect, collate and circulate to States participating in the monitoring programme, data regarding navigation performance in the NAT Region. To meet this requirement, the NAT CMA was established.

11.7.2 In the early 1990s, as a consequence of the planned implementation of RVSM in NAT HLA airspace, the NAT CMA acquired the responsibility for monitoring height-keeping performance. Initially, this was limited to collating data on operational errors but when the technical height-keeping programme came into being, the CMA became the data collection and collation centre. It has also become responsible, in conjunction with other Regional Monitoring Agencies, for setting the target monitoring requirements for the RVSM approval process.

11.7.3 In 2009, it was agreed to make adjustments to the NAT SPG working structure to accommodate the changes in emphasis to performance based requirements, as driven by the Global Air Navigation Plan (ANP), and to take account of the Global Aviation Safety Plan (GASP). At the same time, the NAT SPG approved a high level safety policy which would be applicable to its work. The NAT Safety Oversight Group (SOG) was formed. It is responsible for the continuous monitoring and improvement of the safety level of the air navigation system in the NAT Region. It is composed of ATS provider and airspace user representatives and Regulators. It directs safety oversight and management in the NAT Region.

11.7.4 The NAT Central Monitoring Agency (CMA) is responsible to the NAT SOG for certain aspects of operations monitoring and reporting in the NAT Region.

11.7.5 The NAT Scrutiny Group is a separate body comprising the NAT CMA, Regulators plus ATS provider and airspace user representation, reporting to the NAT SOG. Its function is to ensure a correct categorisation of all reported occurrences in the NAT Region for the purpose of mathematical analysis and other safety management activities.

Responsibilities

11.7.6 The NAT CMA 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 vertical and horizontal navigation (and systems) performance in the NAT Region. It provides participating States, ICAO and other selected Operators and organisations with regular summaries of operational performance to promote awareness of NAT system safety, and with any other pertinent information.

11.7.7 Height monitoring by the CMA comprises collection of operational error data in the vertical dimension, and monitoring of aircraft technical height-keeping performance.

11.7.8 The NAT CMA will take follow-up action in the following circumstances:

a) when reports are received from ATS Provider units, or other sources, that detail for any reason operational errors that have resulted in an aircraft being at a level 90 m (300 ft) or more from its cleared flight level. Follow–up action with the appropriate State of Registry will normally only be taken when the information contained in the reports is not sufficiently comprehensive to determine the cause of the deviation;

b) 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) and;

c) when receiving reports from ATS Provider units of height deviations of 90 m (300 ft) or more resulting from turbulence, ACAS/TCAS manoeuvres or contingency action.

11.7.9 System risk monitoring in the NAT Region is a continuous process. The vertical dimension occurrence reports as described in 11.7.8 above are used by the CMA in compiling monthly and quarterly summaries. Trends are presented graphically. The Quarterly summaries present a more detailed comparative presentation and various risk factors are quantified. An annual summary is also produced and is utilised in the development of an assessment of system vertical risk. In parallel with these processes and simultaneously, the CMA analyses reported lateral navigation errors, leading to similar quantifications of risk factors and an assessment of lateral dimension risk.

Follow-up Action on Observed and Reported Lateral Deviations

11.7.10 Different administrative arrangements exist within those States participating in monitoring programmes although follow-up action on lateral deviations should, in general terms, be as indicated in the following paragraphs.

11.7.11 For aircraft operating within NAT HLA airspace:

a) the observing ATC unit will inform the pilot of the aircraft concerned of the observed error

b) and also that an error report will be processed; any comment made by the pilot at the time of notification should be recorded;

c) the Operators (including military) and any other relevant ATC units will be notified of the observed deviation, either directly by the observing ATC unit or by an agency designated by the State concerned, using the speediest means available (facsimile, AFTN, etc.) and with the least possible delay. This will be followed as soon as possible by a written confirmation. All notifications will be copied to the CMA; and

d) where an observed deviation is equal to or greater than 25NM the appropriate State of Registry or the State of the Operator will be sent a copy of the written confirmation along with a covering letter by the CMA seeking the State's assistance in ensuring the full co-operation of the operator in the investigation.

11.7.12 For aircraft operating outside NAT HLA airspace:

a) the observing ATC unit should, if at all possible, inform the pilot of the aircraft concerned of the observed error and also that an error report may be processed; any comment made by the pilot at the time of notification should be recorded;

b) where the observed deviation from track is 50 NM or more, the procedure detailed in the previous paragraph (covering aircraft operating within NAT HLA airspace) will be followed; and

c) where the observed deviation from track is 25 NM or more but less than 50 NM, the observing ATC unit, or other agency designated by the State, will notify the CMA of the deviation with the least possible delay using facsimile, AFTN, etc. This will be followed by a written confirmation. The CMA will then advise the State of operator or State of Registry.

11.7.13 Further Follow-up Action by the Operator and/or State of Registry.

11.7.14 Subsequent follow-up action on observed deviations of 25 NM or more, notified in accordance with the above provisions, should initially be conducted between the Operator and a designated agency of the State having responsibility for the ATC unit which observed the deviation, on the understanding that:

a) the errors outlined in paragraph 11.7.12 c) above (i.e. deviations 25 NM or more but less than 50 NM occurring outside NAT HLA airspace) will not normally require further action;

b) the State of Registry or the State of the Operator concerned may be requested to conduct a further investigation if deemed necessary;

c) all correspondence should be copied to the CMA; and

d) the EUR/NAT Office of ICAO will assist in those cases where no response is obtained from either the Operator concerned or the State of Registry.

Other Reports to the CMA

11.7.15 Details of the following occurrences should also be reported to the CMA by the ATS Provider units:

a) erosions of longitudinal separation between aircraft, within NAT HLA airspace, of 3 minutes or more;

b) occasions when action is taken to prevent a GNE;

c) lateral deviations from cleared route of less than 25NM

d) discrepancies of 3 minutes or more between an ETA/ATA at a waypoint; and

e) occasions when an Operator is suspected of not being in possession of an NAT HLA/RVSM approval.

f) diversions or Turnbacks, noting in particular whether the appropriate published contingency procedure was correctly adopted.

g) ACAS RAs

h) wake turbulence reports

i) incorrect application of the SLOP (e.g a left offset).

CHAPTER 12

PROCEDURES IN THE EVENT OF NAVIGATION SYSTEM DEGRADATION OR FAILURE

12.1 GENERAL

12.1.1 The navigation systems fitted to NAT HLA MNPS Approved aircraft are generally very accurate and very reliable and GNEs as a result of system technical failures are rare in NAT HLA airspace. Nevertheless, the risks that such errors pose can be significant and crews must employ rigorous procedures to ensure early detection of any possible errors and hence mitigation of the ensuing risk. The NAT CMA thoroughly investigates the circumstances of all reported GNEs in the NAT HLA airspace. The majority are the result of human error, and diligent application by crews of operating procedures such as those described in Chapter 8 should help to minimise the frequency of such errors. As previously stated, actual failures of navigation systems or equipment in NAT HLA MNPS Approved aircraft occur very rarely. However, when they 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. 'Vigilance' must be the watchword when navigating in NAT HLA airspace. 'Complacency' has no place here.

12.1.2 For unrestricted operation in NAT HLA airspace an approved aircraft must be equipped with a minimum of **two fully serviceable** LRNSs. NAT HLA MNPS Approved aircraft which have suffered any equipment failures prior to NAT entry that result in only a single LRNS remaining serviceable may still be flight planned and flown through the NAT HLA airspace but only on specified routes established for this purpose. Aircraft may be approved for NAT HLA operations with only a single LRNS. However, such aircraft are only permitted to plan and fly on these same specified routes and on certain other routes serving individual traffic axes e.g. the Tango Routes, Routes between the Iberian Peninsula and the Azores/Madeira and Routes between Iceland and Greenland (See Chapter 3 of this Manual).

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

12.1.4 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 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 NAT HLA airspace.

Detection of Failures

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

Methods of Determining which System is Faulty

12.1.6 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.

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

12.1.7 Occasions may still arise when distance or cross track differences develop between systems, but the 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. In such instances, ATC should be advised that the flight is experiencing navigation difficulties so that appropriate separation can be effected if necessary.

Guidance on What Constitutes a Failed System

12.1.8 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. As a generalisation, if there is a difference greater than 15 NM between two aircraft navigation systems (or between the three systems if it is not possible to detect which are the most reliable) it is advisable to split the difference between the readings when determining the aircraft's position. However, if the disparity exceeds 25 NM one or more of the navigation systems should be regarded as having failed, in which case ATC should be notified.

Inertial System Failures

12.1.9 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 1NM 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.

GPS Failures

12.1.10 If the GPS displays a “loss of navigation function alert”, the pilot should immediately revert to other available means of navigation, including DR procedures if necessary, until GPS navigation is regained. The pilot must report the degraded navigation capability to ATC.

<u>Satellite Fault Detection Outage</u>

12.1.11 If the GPS 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 GPS position with the position indicated by another LRNS sensor (i.e. other than GPS), if the aircraft is so equipped. However, if the only sensor for the approved LRNS is GPS, then comparison should be made with a position computed by extrapolating the last verified position with airspeed, heading and estimated winds. If the positions do not agree within 10 NM, the pilot should adopt navigation system failure procedures as subsequently described, until the exclusion function or navigation integrity is regained, and should report degraded navigation capability to ATC.

Fault Detection Alert

12.1.12 If the GPS receiver displays a fault detection alert (i.e. a failed satellite), the pilot may choose to continue to operate using the GPS-generated position if the current estimate of position uncertainty displayed on the GPS from the FDE algorithm is actively monitored. If this exceeds 10 nm, the pilot should immediately begin using the following navigation system failure procedures, until the exclusion function or navigation integrity is regained, and should report degraded navigation capability to ATC.

12.2 LOSS OF NAVIGATION/FMS CAPABILITY

12.2.1 Some aircraft carry triplex equipment (3 LRNSs) and hence if one system fails, even before take-off, the two basic requirements for NAT HLA airspace operations may still be met and the flight can proceed normally. The following guidance is offered for aircraft having state approval for unrestricted operations in NAT HLA airspace and which are equipped with only two operational LRNSs:

One System Fails Before Take-Off

12.2.2 The pilot must consider:

a) delaying departure until repair is possible;

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

c) planning on the special routes known as the 'Blue Spruce' Routes, which have been established for use by aircraft suffering partial loss of navigation capability *(Note: As indicated in* Chapter 1*, these routes may also be flown by aircraft approved for NAT HLA operations but equipped with only a single LRNS)*. These Blue Spruce Routes are as follows:

- MOXAL – RATSU (for flights departing Reykjavik Airport)
  (VHF coverage exists. Non HF equipped aircraft can use this route)
- OSKUM – RATSU (for flights departing Keflavik Airport)
  (VHF coverage exists. Non HF equipped aircraft can use this route)
- RATSU – ALDAN – KEF (Keflavik)
  (VHF coverage exists. Non HF equipped aircraft can use this route)
- ATSIX – 61°N 12°34'W – ALDAN – KEF
  (HF is required on this route)
- GOMUP – 60°N 15°W – 61°N 16°30'W – BREKI – KEF
  (HF is required on this route)
- KEF – EMBLA – 63°N 30°W – 61°N 40°W – OZN
- KEF – GIMLI – DA (Kulusuk) – SF (Kangerlussuaq) – YFB
- SF (Kangerlussuaq) – 67°N 60°W - YXP
- OZN – 59°N 50°W – ALTOD - PRAWN – YDP
- OZN – 59°N 50°W – CUDDY - PORGY – HO
- OZN – 58°N 50°W – HOIST - LOACH – YYR

d) The following special routes may also be flown without an LRNS (i.e. with only short-range navigation equipment such as VOR, DME, ADF), but it must be noted that State approval for operation within NAT HLA airspace via these routes is still necessary:

- VALDI - MY (Myggenes) - ING – KEF (G3)
- GONUT - MY (Myggenes) (G11)

12.2.3 Such use of the foregoing routes is subject to the following conditions:

a) sufficient navigation capability remains to ensure that NAT HLA accuracy and the *ICAO Annex 6 (Part I para 7.2.9 and Part II para 2.5.2.9*) requirements for redundancy can be met by relying on short-range navaids;

b) a revised flight plan is filed with the appropriate ATS unit;

c) an appropriate ATC clearance is obtained.

(Further information on the requisite procedures to follow can be obtained from *Section ENR 1.8.2.2.3 in AIP Iceland and in Section RAC 11.22 in AIP Canada*.)

Note: Detailed information (including route definitions and operating procedures), which enables flight along other special routes within NAT HLA airspace, may be found in relevant AIPs. This is specifically so, for aircraft operating without 2 LRNSs between Iceland and Greenland and between Greenland and Canada.

One System Fails Before the OCA Boundary is Reached

12.2.4 The pilot must consider:

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

b) diverting via one of the special routes described previously;

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

One System Fails After the OCA Boundary is Crossed

12.2.5 Once the aircraft has entered oceanic airspace, the pilot should normally continue to operate the aircraft in accordance with the Oceanic Clearance already received, appreciating that the reliability of the total navigation system has been significantly reduced.

12.2.6 The pilot should however,

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

b) prepare a proposal to ATC with respect to the prevailing circumstances (e.g. request clearance above or below NAT HLA airspace, turn-back, obtain clearance to fly along one of the special routes, etc.);

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

d) obtain appropriate re-clearance prior to any deviation from the last acknowledged Oceanic Clearance.

12.2.7 When the flight continues in accordance with its original clearance (especially if the distance ahead within NAT HLA airspace is significant), the pilot 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 NAT HLA Airspace

12.2.8 The pilot 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 121.5 MHz and advising ATC as soon as possible.

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

Complete Failure of Navigation Systems Computers

12.2.9 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 ETAs.

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 NOAA/FAA North Atlantic Route Chart are considered suitable for this purpose.

CHAPTER 13

SPECIAL PROCEDURES FOR IN-FLIGHT CONTINGENCIES

13.1 INTRODUCTION

13.1.1 Situations can be anticipated in which the provision of Air Traffic Management to flights within the NAT Region might be affected. NAT ATS Providers have developed arrangements which would, in such events, be put in place to ensure, as far as possible, the continued safety of air navigation. These arrangements include required contingency actions by pilots and operators of any affected flights. They are detailed in 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" (See also section 6.7 above for further details).

13.1.2 However, circumstances can also occur which only affect an individual aircraft. The remainder of this Chapter details guidance to pilots on contingency actions to follow in such circumstances in order to protect the safety of the flight.

13.1.3 The following procedures are intended for guidance only. Although all possible contingencies cannot be covered, they provide for such cases as:

a) inability to maintain assigned level due to weather (for example severe turbulence);

b) aircraft performance problems; or

c) pressurisation failure.

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

13.2 GENERAL PROCEDURES

13.2.1 If an aircraft is unable to continue its flight in accordance with its ATC clearance, a revised clearance should be obtained, whenever possible, prior to initiating any action, using the radio telephony distress (MAYDAY) signal or urgency (PAN PAN) signal as appropriate.

13.2.2 If prior clearance cannot be obtained, an ATC clearance should be obtained at the earliest possible time and, in the meantime, the aircraft should broadcast its position (including the ATS Route designator or the Track Code as appropriate) and its intentions, at frequent intervals on 121.5 MHz (with 123.45 MHz as a back-up frequency). It must be recognised that due to the types of communications used in North Atlantic operations (e,g, CPDLC, station-to-station SATCOM Voice and SELCAL with HF) , pilots' situation awareness, of other potentially conflicting traffic, may be non-existent or incomplete. If, however, the aircraft is in an area where ATC communications are being conducted on VHF, pending receipt of any re-clearance, the position and intentions should be broadcast on the current control frequency, rather than 121.5 or 123.45 MHz.

13.2.3 Until a revised clearance is obtained the specified NAT in-flight contingency procedures should be carefully followed. Procedures for general use in Oceanic airspace are contained within the ICAO PANS ATM (Doc. 4444), specifically Amendment 2 effective November 2009. Procedures particular to the NAT HLA environment are contained in ICAO *NAT Regional Supplementary Procedures (Doc.7030)* and appropriate NAT Provider States' *AIPs*. The procedures are paraphrased below.

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

13.3 SPECIAL PROCEDURES

13.3.1 The general concept of these Oceanic in-flight contingency procedures is, whenever operationally feasible, to offset from the assigned route by 15 NM and climb or descend to a level which differs from those normally used by 500 ft if below FL410 or by 1000 ft if above FL410.

Initial Action

13.3.2 The aircraft should leave its assigned route or track by initially turning at least 45° to the right or left whenever this is feasible. The direction of the turn should, where appropriate, be determined by the position of the aircraft relative to any organised route or track system (e.g. whether the aircraft is outside, at the edge of, or within the system). Other factors which may affect the direction of turn are: direction to an alternate airport, terrain clearance, levels allocated on adjacent routes or tracks and any known SLOP off sets adopted by other nearby traffic.

Subsequent Action

13.3.3 An aircraft that **is able to maintain its assigned flight level**, after deviating 10 NM from its original cleared track centreline and therefore laterally clear of any potentially conflicting traffic above or below following the same track, should :

a) climb or descend 1000 ft if above FL410

b) climb or descend 500 ft when below FL410

c) climb 1000 ft or descend 500 ft if at FL410

13.3.4 An aircraft that **is unable to maintain its assigned** flight level (e.g due to power loss, pressurization problems, freezing fuel, etc.) should, whenever possible, initially minimise its rate of descent when leaving its original track centreline and then when expected to be clear of any possible traffic following the same track at lower levels, expedite descent to an operationally feasible flight level, which differs from those normally used by 500 ft if below FL410 (or by 1000 ft if above FL410).

13.3.5 Before commencing any diversion across the flow of adjacent traffic, aircraft should, whilst maintaining the 15 NM offset track, expedite climb above or descent below the vast majority of NAT traffic (i.e. to a level above FL410 or below FL280), and then maintain a flight level which differs from those normally used: by 1000 ft if above FL410, or by 500 ft if below FL410. However, if the pilot is unable or unwilling to carry out a major climb or descent, then any diversion should be carried out at a level 500 ft different from those in use within NAT HLA airspace, until a new ATC clearance is obtained.

13.3.6 If these contingency procedures are employed by a twin engine aircraft as a result of the shutdown of a power unit or the failure of a primary aircraft system the pilot should advise ATC as soon as practicable of the situation, reminding ATC of the type of aircraft involved and requesting expeditious handling.

13.4 DEVIATIONS AROUND SEVERE WEATHER

13.4.1 If the aircraft is required to deviate laterally from track to avoid weather (e.g. thunderstorms), the pilot should request a revised clearance from ATC and obtain essential traffic information prior to deviating. This is the case even when a pilot expects to have to deviate by a relatively small distance (e.g. less than 10 NM). However, if for any reason such prior revised ATC clearance cannot be obtained, and only in such a circumstance, the contingency procedures described at paragraph 13.4.4 below should be adopted. But, nevertheless, in the meantime efforts should be continued to obtain an appropriate revised ATC clearance.

13.4.2 Pilots must appreciate that ATC can only provide a revised clearance which will continue to assure that minimum standard separations are maintained from all other traffic, including any on adjacent tracks. When this is not possible, ATC will advise the pilot "Unable" and will request the pilot's intentions. The pilot should indicate the direction, anticipated magnitude and if appropriate the expected altitude change of the intended deviation.

13.4.3 If in receipt of a revised clearance, it should be followed in all its provisions. If such a revised clearance is received after the pilot has commenced the contingency procedures, this revised clearance will then supersede any and all of the provisions within the contingency procedures.

13.4.4 Only in the event that a revised ATC clearance has not been obtained, the following contingency deviation procedures should be adopted in their entirety:

a) If possible, deviate away from the organized track or route system;

b) Establish communications with and alert nearby aircraft broadcasting, at suitable intervals: aircraft identification, flight level, aircraft position (including ATS route designator or the track code) and intentions, on the frequency in use (when VHF) and on frequency 121.5 MHz (or, as a back-up, on the VHF inter-pilot air-to-air frequency 123.45 MHz);

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

d) Turn on all aircraft exterior lights.

e) For deviations of less than 10 NM, aircraft should remain at the level assigned by ATC;

f) For deviations of greater than 10 NM, when the aircraft is approximately 10 NM from track, initiate a level change of 300 ft.

- If flying generally Eastbound (i.e. a magnetic track of 000° to 179°) and deviating left (ie north) of track then descend 300 ft; if, however, deviating right (i.e. south) of track then climb 300 ft.
- If flying generally Westbound (i.e. a magnetic track of 180° to 359°) and deviating left (i.e. south) of track then climb 300 ft; if, however, deviating right (i.e. north) of track then descend 300 ft.

i.e.

Route centre line track	***Deviations>19 km (10 NM)***	***Level change***
EAST (000° 179° magnetic)	LEFT RIGHT	DESCEND 90 m (300 ft) CLIMB 90 m (300 ft)
WEST (180° 359° magnetic)	LEFT RIGHT	CLIMB 90 m (300 ft) DESCEND 90 m (300 ft)

g) When returning to track, regain the last assigned flight level, **when the aircraft is within approximately 10 NM of centre line**.

13.4.5 The pilot should inform ATC when weather deviation is no longer required, or when a weather deviation has been completed and the aircraft has returned to the centre line (or previously adopted SLOP Offset) of its cleared route.

13.5 WAKE TURBULENCE

13.5.1 ICAO established a worldwide programme in 2008 for collecting data on wave vortex encounters. Most wake vortex encounters occur in terminal operations and indeed this is where the aircraft type wake categorization scheme is used to regulate separations. The ICAO programme was aimed at reviewing the categorization scheme in light of the recent introduction into service of a new type of very large aircraft.

13.5.2 Wake vortex encounters are, however, also experienced en-route, although less frequently. To accommodate the predominantly uni-directional diurnal traffic flows through the NAT Region, 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, en-route wake vortex encounters outside the NAT Region arise from opposite direction passings or route crossing situations. In the NAT Region en-route 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 pilot action is desirable/necessary. In the early days of RVSM implementation in the NAT Region a number of such reported encounters led to the development of a “wake turbulence offset procedure”. This has now been subsumed into SLOP which is a standard operating procedure throughout the NAT Region and is primarily required to mitigate the collision risk arising from any vertical navigation errors. Any pilot who encounters a wake turbulence event when flying in NAT HLA airspace should ensure that a detailed report is provided and that a copy is forwarded to the North Atlantic Central Monitoring Agency. After the expiry of the current ICAO programme, and in the absence of any other relevant mandatory reporting arrangements, the reporting form included at Attachment 3 to this Manual could be used for this purpose.

13.5.3 The Strategic Lateral Offset Procedures (see Chapter 8) are now standard operating procedures throughout the NAT Region. Thus when flying within NAT HLA airspace, if the aircraft encounters wake turbulence and the pilot considers it necessary to offset from the current track then the pilot may only elect to fly another of the three options allowable in SLOP (i.e. Cleared Track centre-line, or 1 NM or 2 NM right of centre-line). It is no longer possible to offset left of the track centre-line to avoid wake turbulence. If neither of the remaining SLOP offset tracks are upwind of the other aircraft which is causing the wake turbulence, then the pilot should co-ordinate with the other aircraft via the inter-pilot frequency 123.45 MHz, and perhaps request that the other aircraft adopt an alternative (SLOP) allowable downwind offset. If wake turbulence is encountered, even if it is subsequently avoided by judicious use of offsets, a report should still be made. If turbulence is encountered but the pilot is unsure whether the cause is wake vortex or perhaps Clear Air Turbulence, a report should be submitted annotated to this effect.

13.6 ACAS/TCAS ALERTS AND WARNINGS

13.6.1 With effect from 01 January 2005 all turbine-engined aircraft with a certificated take-off mass exceeding 5,700 Kgs or authorised to carry more than 19 passengers are required to carry and operate ACAS II in the NAT Region. It should be noted that TCAS Version 7.0 meets the ICAO technical specifications for ACAS II as described in ICAO Annex 10 Volume IV.

13.6.2 The provisions relating to the carriage and use of ACAS II are contained in ICAO Annexes 2, 6, 10 & 11 and in the Procedures for Air Navigation Services (PANS) Ops & ATM. Operational procedures are fully detailed in PANS-OPS Doc 8168, Volume 1, Part VIII, Chapter 3

13.6.3 All Resolution Advisories (RAs) should be reported to ATC:

a) verbally, as soon as practicable; and

b) in writing, to the Controlling Authority, after the flight has landed, using the necessary procedure and forms, including, when appropriate, the ‘Altitude Deviation Report Form’ shown at Attachment 2 to this Manual.

Possible traffic alerts resulting from ATC use of the 5 minutes GNSS climb/descent through procedure

13.6.4 ACAS/TCAS registers targets up to 40 NM. Depending upon OAT/ambient air density, a Mach of about 0.85 equates to a TAS of approximately 480 Kts, or 8 NM per minute. Since the normal longitudinal separation standard employed in the North Atlantic is 10 minutes, pilots would consequently not usually expect their ACAS/TCAS to register targets at the same level, whether these may be in-trail, crossing, climbing or descending through their level. However, since January 2009, some NAT ATC units are utilising a procedure specified in PANS/ATM Chapter 5, which permits ATC to clear an aircraft to climb or descend through the level of another aircraft, with as little as 5 minutes longitudinal separation, provided that both aircraft are using GNSS (GPS) for position determination and reporting. Many NAT aircraft request and are cleared at lesser Mach Numbers than 0.85. A 5 minutes in trail separation between two aircraft flying at M0.80 and experiencing a headwind component of 30 Kts (not unusual for W/B NAT flights), will equate to approximately 35 NM. Furthermore, depending upon the rounding/truncating protocols used by pilots, FMSs and/or ATC Flight Data Processing Systems (i.e for “minutes and seconds” to “minutes”), a nominal 5 minutes separation can in fact be close to an actual 4 minutes (it can, of course, also be nearly 6 minutes). In such a circumstance the actual longitudinal separation could be less than 30 NM. In these cases ACAS/TCAS may register targets but the generation of Traffic Alerts in unlikely.

13.6.5 The rule allowing ATC to use this procedure includes a caveat that the climb or descent needs to be undertaken within 10 minutes of the time that the second aircraft in the pair has passed a common reporting point. Consequently, the pilot of an aircraft cleared for a climb or descent of more than a single flight level, should be alerted to the possibility of a potential ACAS/TCAS alert by the controller’s use of the conditional phrase “By” or “At or Before” in the clearance received. However, the pilot of the “passive participant” aircraft of the 5 minutes separated pair, if it is the following aircraft, could be presented with a “pop-up” ACAS/TCAS target without such a warning. **NAT OPS Bulletin 2010-007*** provides crew guidance in respect of the use of this procedure in the North Atlantic. It includes the following instruction;- “If there is any concern regarding the proximity of another aircraft, flight crews must not hesitate to clarify the situation and take *appropriate action* to ensure the safety of the flight.” However, given the air/ground communications methods employed in the NAT, the pilot may not receive a response to such a request for “clarification” prior to the other aircraft passing its flight level. Nevertheless, even at these separations, Traffic Alerts and Resolution Advisories are not anticipated and it is not expected that pilots will consider deviating from their clearance as “*appropriate action*”.

Possible traffic targets resulting from ATC use of the 5 minutes longitudinal separation using ADS-C

13.6.6 A trial use of 5 minutes longitudinal separation between pairs of aircraft following the same track and providing position reports via ADS-C, is currently being conducted within the Gander and Shanwick OCAs. Pilots should be aware that, as explained above with respect to the 5 minutes GNSS based climb/descent through procedure, under certain circumstances there could be the possibility of the pair being separated by less than 40 NM and consequently the possibility of the following aircraft’s ACAS/TCAS registering a target. But, as in the climb through case, it is not expected that Traffic Alerts will be generated.

* *available at* www.icao.int/EURNAT/, *following “EUR & NAT Documents”, then “NAT Documents”, in folder “NAT OPS Bulletins”*

CHAPTER 14

CHECK LISTS FOR PILOTS OPERATING IN NAT HLA AIRSPACE

14.1 INTRODUCTION

14.1.1 The North Atlantic HLA airspace is the busiest Oceanic environment anywhere in the world. To safely and efficiently accommodate the high traffic volumes here, unique traffic organization and management techniques are employed and pilots are required to rigorously utilize particular operating procedures. The following Check Lists are provided as guidance. Operators without an oceanic checklist are encouraged to use these and tailor them to their specific needs and approvals.

14.2 SPECIAL NAT NAT HLA ITEMS

14.2.1 To assist those pilots who are less familiar with operating in NAT HLA airspace, below is a list of questions which address the unique and/or particularly important NAT HLA check list elements.

1. Are you sure that your State of Registry has granted approval for both RVSM and NAT HLA operations in connection with this flight by this aircraft? (See Chapter 1 – "Operational Approval and Aircraft System Requirements for flight in the NAT HLA Airspace")
2. If it has, are the letters 'X' and 'W' in Item 10 of your flight plan?
3. Whether or not you are intending to follow an organized track, and bearing in mind that the OTS changes every 12 hours, do you have a copy of the valid track message, including when applicable, any "TMI Alpha Suffixed" changes to it? (See Section 2.3 – "The NAT Track Message".
4. Are you familiar with the Mach Number Technique? (See Chapter 7 – "Application of Mach Number Technique")
5. Have you had an accurate time check referenced to UTC, and is the system you will be using on the flight deck for NAT HLA operation also accurately referenced to UTC? Is this time accuracy going to be maintained for the planned duration of the flight? (See in Section 8.2 – "Importance of Accurate Time")
6. If using GPS, have you checked the latest NOTAMs regarding the serviceability of GPS satellites and have you performed a Satellite Navigation Availability Prediction Programme analysis? (See Chapter 8 – "NAT HLA/MNPS Flight Operation & Navigation Procedures")
7. If flying via the special Greenland/Iceland routes, have you checked the serviceability of your one remaining LRNS and of your short range navigation systems plus the ground navigation aids which you will use? (See Section 12.2 – "Loss of Navigation/FMS Capability")
8. If flying a non-HF equipped aircraft, is your route approved for VHF only? (See paragraph 4.2.18 – "Flights Planning to Operate Without Using HF Communications".)
9. If flying other than on the special routes, are you sure that both your LRNSs are fully operational?
10. Have you planned ahead for any actions you might need to take should you suffer a failure of one LRNS? (See Chapter 12 – "Procedures in the Event of Navigation System Degradation or Failure").

11. Are you sure that both your primary altimetry systems and at least one altitude alerter and one autopilot are fully operational?
12. Are you familiar with the required procedures for flight at RVSM levels? (See Chapter 9 – "RVSM Flight in NAT HLA Airspace").
13. If the aircraft is FANS1/A equipped plan to utilize CPDLC and ADS-C throughout the NAT segment of the flight and ensure that the appropriate descriptor (J2, J5 or J7) is inserted in Item 10a of the flight plan to indicate FANS 1/A interoperable equipment .
14. If ADS-B equipped and entering ADS-B airspace in the NAT make sure your aircraft is approved for ADS-B services in the NAT (see Section 1.7 – "ATS Surveillance Service Areas in the NAT Region").
15. Have you correctly entered the Flight ID into the Transponder/FMS control panel? The Flight ID must exactly match the ACID entered in item 7 of the ICAO flight plan.
16. Have you entered the appropriate descriptor B1 or B2 in Item 10b of the ICAO Flight Plan?

14.2.2 If, as a pilot, you have any doubt about your answers to these questions, it may be necessary for you to consult with the Civil Aviation Department of your State of Registry.

14.3 SAMPLE NAT HLA CHECK LIST

14.3.1 ICAO North Atlantic Working Groups composed of industry, ATC and state regulators have created a "Sample Oceanic Checklist". It is published on the ICAO website as a NAT Oceanic Error Safety (OES) Bulletin supplement and may be found at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT OES Bulletins". It is provided as guidance and is not intended to replace an operator's oceanic checklist. However, Operators without an oceanic checklist are encouraged to use this sample and tailor it to their specific needs and approvals. This checklist focuses on an orderly flow and ways to reduce oceanic errors. The detail of and the rationale for the proposed actions listed are described in the "Expanded Check List", which is also published as a NAT OES Bulletin supplement and similarly available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT OES Bulletins". Operators should use an oceanic check list as part of their Safety Management System (SMS). Operators are also encouraged to study the "NAT Oceanic Errors Safety Bulletin" (OESB). The NAT OESB is also published as a NAT OES Bulletin , again available at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT OES Bulletins".

CHAPTER 15

GUARDING AGAINST COMPLACENCY

15.1 INTRODUCTION

15.1.1 Since 1977, when the MNPS rules were introduced, careful monitoring procedures have provided a good indication both of the frequency with which navigation errors occur and their causes. Their frequency is low: only one flight in around ten thousand commits a serious navigation error. However because of the accuracy and reliability of modern navigation systems, the errors which do occur are most often seen to be as a result of aircrew error.

15.1.2 Operational errors in the vertical plane also occur. Aircraft are sometimes flown at levels other than those for which ATC clearance has been issued. In preparation for the introduction of RVSM in the NAT Region (1997) a comprehensive data collection programme for vertical deviations was implemented, together with a subsequent annual assessment of the resulting collision risks. As in the horizontal plane, the frequency of vertical errors is low. However, the potential collision risk of even a single incidence of flying at an un-cleared level can be very significant. The NAT MNPSA (now 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.

15.1.3 It is therefore essential that crews do not take modern technology for granted. They should at all times, especially during periods of low workload, guard against complacency and over-confidence, by adhering rigidly to approved cockpit/flight deck procedures which have been formulated over many years, in order to help stop operational errors from being an inevitability. Specific reference should be made to the "Oceanic Errors Safety Bulletin" which is updated regularly and is available as a NAT OPS Bulletin to be found at www.icao.int/EURNAT/, following "EUR & NAT Documents", then "NAT Documents", in folder "NAT OPS Bulletins".

15.1.4 This chapter lists some of the errors that have been recorded in the NAT during recent years. Reconstructed scenarios exampling some such errors, together with some contingency situations, are also shown in an interactive DVD, "Track Wise – Targeting Risk within the Shanwick OCA", which was published in October 2012 by UK NATS. Like this Manual, it is aimed at pilots, dispatchers and others concerned in flight operations in the North Atlantic. It follows the progress of a westbound NAT flight through the Shanwick OCA. While the operational procedures elements are specific to Shanwick, the majority of the DVD considers issues common to the whole ICAO NAT Region. It is available at no charge to *bona fide* operators on application to: customerhelp@nats.co.uk.

15.1.5 The complete DVD can be accessed from the European and North Atlantic (EUR/NAT) Office public pages on the ICAO website (www.icao.int/EURNAT/), following "EUR & NAT Documents", then "NAT Documents", then selecting "Trackwise for on-line U-Tube viewing". It is also available on YouTube™, looking for "**Trackwise - Targeting Risk Within The Shanwick OCA**", and also or directly at https://www.youtube.com/watch?v=EJTjwW5ZYas

15.2 OPERATIONAL HEIGHT ERRORS

15.2.1 The most common height errors are caused by:

a) executing an un-cleared climb

e.g. the crew of an aircraft entering Reykjavik OCA from Edmonton FIR encountered HF Blackout conditions prior to reaching the Reykjavik OCA boundary and before receiving an Oceanic Clearance. During the subsequent more than two hours of flight in the MNPSA, the crew executed two step climbs before re-establishing contact with ATC.

Aircraft following an ATC clearance are assured of separation from other potentially conflicting traffic. In HF Blackout conditions if an aircraft unilaterally changes level, ATC has no means to advise or intervene with other traffic and separation can no longer be assured. In such a circumstance, if a climb without ATC clearance is imperative then this should be treated as a contingency and the appropriate track offset of 15 NM should be flown.

b) misinterpreting an ATC acknowledgement of a request as a clearance

e.g. a crew requested a step climb from Shanwick OAC using HF Voice through the Shannon aeradio station. The radio operator acknowledged the request to the aircraft and forwarded it to the Shanwick controller for review and action. The crew interpreted the radio operator's acknowledgement as an approval of the request and immediately executed the step climb. The controller subsequently denied the request due to conflicting traffic with inadequate longitudinal separation at the requested higher level. The requesting aircraft had reached the new level and therefore violated separation minima before receiving the denial. Similar incidents have occurred during NAT CPDLC trials when crews have misinterpreted a technical acknowledgement of a data link request for an ATC approval.

When DCPC is unavailable and air/ground ATS communications are via a third party (whether radio operator or data link service provider) crews must be aware that acknowledgements of requests do not constitute approval.

c) not climbing or descending as cleared

e.g. a crew was cleared for a climb to cross 4030W at FL350. The crew mis-interpreted the clearance and took it to mean climb to cross 40°N 30°W (instead of 40° 30'W) at FL350.

While this was caused by a seemingly ambiguous clearance, crews must be on their guard and query the clearance if in any doubt. Crews should be aware of the risks of non-compliance with a clearance, or with a restriction within a clearance. A significant number of height deviations have been reported where an aircraft had been cleared to change level after the next route waypoint and has done so immediately or has been cleared to change level immediately and had not done so until a later time. Both cases can very easily result in the loss of safe separation with other traffic. Such instances are often, but by no means exclusively, associated with misinterpretation of CPDLC message sets (a crew training/familiarity issue) whereby the words AT or BY are interpreted differently from their intended meaning. This is a problem particularly (but not exclusively) with crew members whose first language is not English. It is compounded in the cases of languages which have no directly equivalent words to differentiate between AT or BY, or perhaps use the same word for each (this is apparently true of a number of European languages, for example). The dangers associated with misinterpretation of conditional clearances must be appreciated. If an aircraft climbs or descends too soon or too late it is almost inevitable that it will lose separation with the other traffic that was the reason for the condition being applied by ATC.

d) not following the correct contingency procedures

e.g. following an engine failure a crew descended the aircraft on track rather than carrying out the correct contingency procedures (see Chapter 12).

Particularly when flying in the OTS, crews must appreciate that there is a significant likelihood of conflict with other aircraft at lower levels unless the appropriate contingency offset procedure is adopted. (See paragraph 13.3.4)

e) entering the NAT HLA/MNPSA at a level different from that contained in the received Oceanic Clearance.

e.g. a crew flying through Brest FIR at FL310 en-route to the Shanwick OCA boundary received an oceanic clearance for FL330. The crew requested a climb from Brest but it

had not been received when the aircraft reached the Shanwick boundary. The crew elected to continue into the NAT MNPSA at FL310. Separation was immediately lost with a preceding aircraft at that flight level.

Crews are responsible for requesting and obtaining any domestic ATC clearance necessary to climb (or descend) to the initial flight level specified in their received Oceanic Clearance, prior to reaching the oceanic boundary. While adjacent ACCs generally use their best endeavours to get an aircraft to its oceanic level before the boundary, it must be recognized that entry into NAT MNPSA (now HLA) at the cleared oceanic level is entirely the responsibility of the crew. It does appear from the relative frequency of this type of error that this is not widely understood. It should also be appreciated that such requests must be made sufficiently early to allow the domestic ATC unit time to respond.

15.3 LATERAL NAVIGATION ERRORS

More Common Causes Of Lateral Navigation Errors

15.3.1 The most common causes of GNEs, in approximate order of frequency, have been as follows:

a) having already inserted the filed flight plan route co-ordinates into the navigation computers, the crew have been re-cleared by ATC, or have asked for and obtained a re-clearance, but have then omitted to re-program the navigation system(s), amend the Master Document or update the plotting chart accordingly.

b) a mistake of one degree of latitude has been made in inserting a forward waypoint. There seems to be a greater tendency for this error to be made when a track, after passing through the same latitude at several waypoints (e.g. 57°N 50°W, 57°N 40°W, 57°N 30°W) then changes by one degree of latitude (e.g. 56°N 20°W). Other circumstances which can lead to this mistake being made include receiving a re-clearance in flight.

c) the autopilot has been inadvertently left in the heading or de-coupled mode after avoiding weather, or left in the VOR position after leaving the last domestic airspace VOR. In some cases, the mistake has arisen during distraction caused by SELCAL or by some flight deck warning indication.

d) an error has arisen in the ATC Controller/Pilot communications loop, so that the controller and the crew have had different understandings of the clearance. In some cases, the pilot has heard not what was said, but what he/she was expecting to hear.

Rare Causes Of Lateral Navigation Errors

15.3.2 To illustrate the surprising nature of things which can go wrong, the following are examples of some extremely rare faults which have occurred:

a) the lat/long co-ordinates displayed near the gate position at one international airport were wrong.

b) because of a defective component in one of the INS systems on an aircraft, although the correct forward waypoint latitude was inserted by the crew (51°) it subsequently jumped by one degree (to 52°).

c) the aircraft was equipped with an advanced system with all the co-ordinates of the waypoints of the intended route already in a database; the crew assumed that these co-ordinates were correct, but one was not.

d) when crossing longitude 40°W westbound the Captain asked what co-ordinates he should insert for the 50°W waypoint and was told 48 50. He wrongly assumed this to mean

48°50'N at 50°00W (when it really meant 48°N 50°W) and as a result deviated 50 NM from track.

e) the flight crew had available to them the correct co-ordinates for their cleared track, but unfortunately the data which they inserted into the navigation computer was from the company flight plan, in which an error had been made.

f) at least twice since 1989, longitude has been inserted with an error of magnitude of times 10. e.g. 100°W instead of 10°W, or 5°W instead of 50°W. Because of low angles of bank, the aircraft departed from track without the crews being aware, and both lateral and longitudinal separations with other aircraft were compromised.

g) a crew based at and usually operating from London Heathrow was positioned at London Gatwick for a particular flight. One pilot inadvertently loaded the Heathrow co-ordinates into the INS, instead of those for Gatwick. This initialization error was only discovered when the aircraft had turned back within the NAT after experiencing a GNE.

h) the pilot of a flight departing from the Caribbean area input the wrong departure airfield co- ordinates prior to departure. This error was discovered when deviation from cleared route seriously eroded separation with two other opposite direction aircraft.

15.4 LESSONS TO BE LEARNED

- **Never relax or be casual in respect of cross-check procedures.** This is especially important towards the end of a long night flight.
- **Avoid casual R/T procedures**. A number of GNEs have been the result of a misunderstanding between pilot and controller as to the cleared route and/or flight level. Adhere strictly to proper R/T phraseology and do not be tempted to clip or abbreviate details of waypoint co-ordinates.
- **Make an independent check on the gate position**. Do not assume that the gate co-ordinates are correct without cross-checking with an authoritative source. Normally one expects co- ordinates to be to the nearest tenth of a minute. Therefore, ensure that the display is not to the hundredth, or in minutes and seconds. If the aircraft is near to the Zero Degree E/W (Greenwich) Meridian, remember the risk of confusing east and west.
- **Before entering Oceanic Airspace** make a careful check of LRNS positions at or near to the last navigation facility – or perhaps the last but one.
- **Never initiate an on-track un-cleared level change**. If a change of level is essential and prior ATC clearance cannot be obtained, treat this situation as a contingency and execute the appropriate contingency offset procedure, when possible before leaving the last cleared flight level. Inform ATC as soon as practicable.
- **Do not assume** that the aircraft is at a waypoint merely because the alert annunciator so indicates. Cross-check by reading present position.
- **Flight deck drills**. There are some tasks on the flight deck which can safely be delegated to one member of the crew, but navigation using automated systems is emphatically not one of them, and the Captain should participate in all navigation cross-check procedures. All such cross-checks should be performed independently by at least two pilots.
- **Initialisation errors.** Always return to the ramp and re-initialize inertial systems if the aircraft is moved before the navigation mode is selected. If after getting airborne, it is found that during initialisation a longitude insertion error has been made, unless the crew thoroughly understand what they are doing, and have also either had recent training on the method or carry written drills on how to achieve the objective, the aircraft should not proceed into NAT HLA airspace, but should turn back or make an en-route stop.

- **Waypoint loading**. Before departure, at least two pilots should independently check that the following agree: computer flight plan, ICAO flight plan, track plotted on chart, and if appropriate, the track message. In flight, involve two different sources in the cross-checking, if possible. Do not be so hurried in loading waypoints that mistakes become likely, and always check waypoints against the current ATC clearance. Always be aware that the cleared route may differ from that contained in the filed flight plan. Prior to entering the NAT HLA ensure that the waypoints programmed into the navigation computer reflect the Oceanic Clearance received and not any different previously entered planned or requested route.
- **Use a flight progress chart on the flight deck.** It has been found that making periodic plots of position on a suitable chart and comparing with current cleared track, greatly helps in the identification of errors before getting too far from track.
- **Consider making a simple use of basic DR Navigation as a back-up.** Outside polar regions, provided that the magnetic course (track) is available on the flight log, a check against the magnetic heading being flown, plus or minus drift, is likely to indicate any gross tracking error.
- **Always remember** that something absurd may have happened in the last half-hour. There are often ways in which an overall awareness of directional progress can be maintained; the position of the sun or stars; disposition of contrails; islands or coast-lines which can be seen directly or by using radar; radio navaids, and so forth. This is obvious and basic, but some of the errors which have occurred could have been prevented if the crew had shown more of this type of awareness.
- **If the crew suspects** that equipment failure may be leading to divergence from cleared track, it is better to advise ATC sooner rather than later.

In conclusion, navigation equipment installations vary greatly between operators; but lessons learned from past mistakes may help to prevent mistakes of a similar nature occurring to others in the future.

CHAPTER 16

THE PREVENTION OF DEVIATIONS FROM TRACK AS A RESULT OF WAYPOINT INSERTION ERRORS

16.1 THE PROBLEM

16.1.1 During the monitoring of navigation performance in the NAT MNPS (HLA) airspace, a number of lateral deviations are reported. There were 57 in 2012 and 66 in 2013. A lateral deviation of 25NM or greater is classified as a Gross Navigation Error (GNE). Of the 57 lateral deviations in 2012 19 were GNE's and of the 66 lateral deviations in 2013 10 were GNE's. Such errors are normally detected by means of long range radars as aircraft leave oceanic airspace but are increasingly confirmed by means of ADS-C waypoint reporting. In addition, however, on 51 occasions in 2012 and 71 occasions in 2013, potential navigation errors were identified by ATC from routine aircraft position reports (from "next" or "next plus one" waypoints) and ATC were able to intervene to prevent incorrect routing by the aircraft. The vast majority of these instances were attributable to a crew error of following of the filed flight plan route rather than the cleared route.

16.1.2 Investigations into the causes of all recent lateral deviations show that about 23% are attributable to equipment control errors by crews and that almost all of these errors are the result of programming the navigation system(s) with incorrect waypoint data – otherwise known as waypoint insertion errors (WIEs). The remainder comprise mainly of incorrect transcript of ATC clearance.

16.2 THE CURE

16.2.1 Waypoint insertion errors can be virtually eliminated if all operators/crews adhere at all times to approved operating procedures and cross checking drills. This Manual provides a considerable amount of guidance and advice based on experience gained the hard way, but it is quite impossible to provide specific advice for each of the many variations of navigation systems fit.

16.2.2 The following procedures are recommended as being a good basis for NAT HLA operating drills/checks:

a) Record the initialization position programmed into the navigation computer. This serves two purposes:
   - it establishes the starting point for the navigation computations; and
   - in the event of navigation difficulties it facilitates a diagnosis of the problem.

b) Ensure that your flight log has adequate space for the ATC cleared track co-ordinates, and always record them. This part of the flight log then becomes the flight deck Master Document for:
   - read back of clearance;
   - entering the route into the navigation system;
   - plotting the route on your chart.

c) Plot the cleared route on a chart with a scale suitable for the purpose (e.g. Aerad, Jeppesen, NOAA en-route charts). This allows for a visual check on the reasonableness of the route profile and on its relationship to the OTS, other aircraft tracks/positions, diversion airfields, etc.

d) Plot your Present Position regularly on your chart.

- this may seem old-fashioned but, since the present position output cannot normally be interfered with and its calculation is independent of the waypoint data, it is the one output which can be relied upon to detect gross tracking errors. **A position should be checked and preferably plotted approximately 10 minutes after passing each waypoint, and, if circumstances dictate, midway between waypoints. e.g. if one system has failed.**

e) Check the present, next and next+1 waypoint co-ordinates as shown on the Master Document against those in the steering CDU before transmitting position reports (in performing these checks review the LRNS stored co-ordinates in expanded Lat/Long format (not abbreviated ARINC 424 format).

f) Check the LRNS indicated magnetic heading and distance to the next waypoint against those listed on the Master Document.

16.2.3 The procedures outlined in this Section will detect any incipient gross errors, providing that the recorded/plotted cleared route is the same as that provided by the controlling ATS authority. If there has been a misunderstanding between the pilot and controller over the actual route to be flown (i.e. an ATC loop error has occurred), then the last drill above, together with the subsequent passing of the position report, will allow the ATS authority the opportunity to correct such misunderstanding before a hazardous track deviation can develop. The vast majority of instances of waypoint insertion errors occur when the ATC cleared oceanic route segment differs (partly or wholly) from that included in the filed flight plan or that requested by the pilot. Thorough and diligent checking and cross-checking, by more than one crew member, of the waypoints entered into the navigation computer, against the received Oceanic Clearance would eliminate most of these unnecessary and avoidable errors.

CHAPTER 17

GUIDANCE FOR DISPATCHERS

17.1 GENERAL

17.1.1 The North Atlantic Region is essentially divided into two distinct areas for flight operation, i.e. NAT HLA airspace and non-NAT HLA airspace. Operations within NAT HLA airspace require the user to adhere to very specific operating protocols. The vertical dimension of NAT HLA airspace is between FL285 and FL420 (i.e. in terms of normally used cruising levels, from FL290 to FL410 inclusive).

17.1.2 The lateral dimensions include the following Areas:

a) Those portions of the NEW YORK OCEANIC East north of 27°N

b) And all of the REYKJAVIK, GANDER, BODO OCEANIC and SANTA MARIA OCEANIC Control Areas (CTAs)

c) SHANWICK OCA but excluding the areas of BOTA and SOTA.

17.2 REGULATORY REQUIREMENTS AND CONSEQUENTIAL ROUTING LIMITATIONS

State Approvals (NAT HLA MNPS/RVSM)

17.2.1 Before planning any operations within the North Atlantic HLA airspace operators and pilots must ensure that the specific State NAT HLA MNPS and RVSM Approvals are in place. These requirements are addressed in Chapter 1 of this Manual at paragraphs 1.1.1, 1.1.2 and 1.1.3.

17.2.2 Before planning any operations of ADS-B equipped aircraft into NAT ADS-B airspace operators and pilots must ensure that the aircraft is approved for flight in NAT ADS-B airspace. These requirements are addressed in Chapter 1 section 1.7 of this Manual.

Minimum Equipage (Navigation/Altimetry/Communications)

17.2.3 Section 1.3 discusses the minimum navigation equipage requirements for unrestricted flight in NAT HLA airspace.

17.2.4 The Minimum Aircraft Systems Performance Specifications for RVSM operations are common world-wide standards and are contained in ICAO Doc 9574 (Manual on a 300m (1 000ft) Vertical Separation Minimum between FL290 and FL410 inclusive.). They are also detailed in FAA Advisory Circular AC91-85, and in EASA CS-ACNS documentation ; which can currently be accessed respectively through (paragraph 9.1.5 also refers):

http://www.faa.gov/air_traffic/separation_standards/rvsm/

and http://www.eurocontrol.int/articles/library

However, notwithstanding the worldwide nature of RVSM MASPS, it must be recognised, as indicated in paragraph 1.2.2 above, that special provisions apply in the North Atlantic HLA airspace and in consequence all NAT crews/operators must **be State approved specifically for NAT RVSM operations**.

17.2.5 Many NAT air/ground ATC communications are still conducted on single side-band HF frequencies. For unrestricted operations in the NAT Region fully functioning HF Communications equipment is required. While SATCOM Voice and Data link communications are now in widespread use in NAT operations, HF also constitutes a required back-up.

Special non-compliance routings

17.2.6 Aircraft not equipped with two functioning Long Range Navigation Systems may only fly through NAT HLA Airspace via special designated routes. This is discussed in Chapter 1 at paragraph 1.4. Details of these special routes are contained in paragraph12.2.2 .

17.2.7 Aircraft not approved for NAT HLA MNPS/RVSM operations may climb and descend through NAT HLA/RVSM Airspace and in very limited, specified circumstances an NAT HLA MNPS Approved aircraft that is not Approved for RVSM operations may be granted permission to flight plan and operate through NAT HLA airspace at RVSM levels. (See sections 1.5 and 1.6).

17.2.8 Routings that may be flight planned and operated through NAT HLA airspace 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 above in more detail in paragraph 4.2.8.

17.3 ROUTE PLANNING

Lateral separation minima & resulting route definition conventions

17.3.1 In the North Atlantic HLA airspace the lateral separation standard is generally 60 NM. Since 60 NM is equivalent to one degree of latitude along any meridian and given that the vast majority of flights through this airspace are generally eastbound or westbound, this standard is deemed to be met by tracks separated by one degree of latitude at common meridians.

17.3.2 Radar/ADS-B data is only available in very limited areas of the North Atlantic Region. Therefore, ATC must depend 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 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 section 4.2, Attachment 4 and paragraph 17.6.9 below for more detail.

OTS – Rationale, Structure, CDM & Track Message

17.3.3 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.

17.3.4 The NAT HLA airspace 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 energetic nature of the NAT weather patterns, including the presence of jet streams, consecutive eastbound and westbound minimum time tracks are seldom identical. The creation of a different organised track system is therefore necessary for each of the major flows. Separate Organised Track System (OTS) structures are therefore published each day for eastbound and westbound flows.

17.3.5 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 at Section 2.2.

17.3.6 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 at Section 2.3 above and examples are shown at the end of Chapter 2.

17.3.7 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. Currently about half of NAT flights utilise the OTS.

Random Routings

17.3.8 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. A NAT route segment that does not follow a published OTS track, in its entirety, is known as a "Random Route". Aircraft may fly on random routes which remain clear of the OTS or may fly on any route that joins or leaves an outer track of the OTS. There is also nothing to prevent an operator from planning a route which crosses the OTS. However, in this case, operators must be aware that whilst ATC will make every effort to clear random traffic across the OTS at published levels, re-routes or significant changes in flight level from those planned are very likely to be necessary during most of the OTS peak traffic periods.

17.3.9 Outside of the OTS periods operators may flight plan any random routing, except that during the hour prior to each OTS period some additional restrictions apply. These are detailed in paragraph 4.1.6 above.

Adjacent Airspace, Route Structures, Links & Constraints

17.3.10 A large majority of flights through the NAT HLA airspace enter and/or leave it via the North American Region. To facilitate these busy 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 are the NAR, NOROTS and the US East Coast Link Route structures. Details of these routes and their associated procedures are contained in the AIS of the relevant State authorities and/or via their websites. The necessary Internet Links to obtain this information are listed above 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.

17.4 ALTITUDE & SPEED

Flight Levels

17.4.1 During the OTS Periods (eastbound 0100-0800 UTC, westbound 1130-1900 UTC) aircraft intending to follow an OTS Track for its entire length may plan at any of the levels as published for that track on the relevant current daily OTS Message. Aircraft following a "random route" (see above definition) or flying outside the OTS time periods, should normally be planned at flight level(s) appropriate to the direction of flight. (*Note: "Appropriate Direction Levels" within the NAT HLA are specified by the Semi-circular Rule in ICAO Annex 2, Appendix 3, Table a).* Planners should note however that the NAT Provider State AIPs specify some exceptions to use of "Appropriate Direction Levels" both during the OTS time periods and outside them. At specified times, some appropriate direction levels are in fact reserved for use by the opposite direction traffic flows that then predominate. The current usage allocation of flight levels in the NAT HLA is published in the UK and Canadian AIPs and shown at Attachment 6 below as the "North Atlantic Flight Level Allocation Scheme" (NAT FLAS). Hence, pilots and planners should always consult the current AIPs and any supporting NOTAMs when flight planning random routes through NAT HLA airspace. 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

17.4.2 In NAT HLA airspace the Mach Number technique is used to manage longitudinal separations between aircraft following the same track. Chapter 7 above provides more detailed information. Consequently, flight plans for the NAT HLA segment of flight must define aircraft speed in terms of a Mach Number. This is true even if procedures dictate that aircraft speed be defined in terms of TAS for other (continental airspace) segments of that same flight. Oceanic clearances include a True Mach Number to follow and because this is used by ATC to regulate longitudinal separations, no tolerance is permissible. Consequently, NAT flights should ***not*** be planned or flown on the assumption that LRC or ECON fuel regimes may be used.

17.5 ATC FPL COMPLETION

17.5.1 It is important that all of the foregoing conventions and protocols are adhered to when planning a flight through NAT HLA airspace. Guidance on the flight planning requirements for specific routes is given in Chapter 4 above. Correct completion and addressing of the filed ATC flight plan is extremely important. Non-observance of any of the NAT HLA airspace 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 ATC 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. Full and detailed explanations of how to complete an ATS Flight Plan in respect of the NAT portion of a flight are shown in Attachment 4 below. This Attachment highlights the more common completion errors that are made and includes example, correctly-completed-ICAO Flight Plan elements. New and/or infrequent North Atlantic operators are earnestly recommended to make diligent reference to this document. 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.

17.5.2 The guidance in the paragraphs that follow here and also that which is detailed in Attachment 4 to this Document refer to the ICAO model Flight Plan Form as described in Chapter 4 of ICAO PANS/ATM Doc.4444 (Amendment No.1). However, it is very important to note that significant revisions to the format and content of the ICAO Flight Plan were effected from 15 November 2012. The changes applicable from that date are contained in a published Amendment No.1 to Doc.4444, which was approved by the ICAO Council on 27 May 2008. Mostly these changes relate to revised Communications and Navigation equipage codes for use in items 10 and 18; a detailed description of the changes is contained in the document "**Review of Amend 1 to PANS ATM**" available at www.icao.int/EURNAT/, following "Other Meetings Seminars and Workshops", then "Sub-Regional FPL2012 Workshop-Greece".

17.5.3 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 pilot, then ATC will clear the aircraft via another OTS track. When filing the ATC Flight Plan, the Dispatcher may enter the details of such an acceptable alternative track in Field 18 of the ICAO FPL. This will be taken into account by ATC if indeed having to clear the aircraft via a route other than that planned.

17.5.4 In order to signify that a flight is approved to operate in NAT HLA airspace, 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.

17.5.5 For flights which intend to operate through the New York Oceanic East or Santa Maria Oceanic FIRs or through the WATRS Plus Airspace, RNAV 10 (RNP 10) or RNP- 4 approval is required in order to benefit from the reduced lateral separations employed here. Any NAT HLA aircraft intending to fly within these airspaces should ensure that its RNP approval status is also included in the flight plan. Specifically such operators should annotate ICAO Flight Plan Item 10 (Equipment) with the letter "R" and annotate Item 18 (Other Information) with, as appropriate, "PBN/A1 (for RNAV 10 (RNP 10) Approval) or PBN/L1 (for RNP 4 Approval)" (see paragraph 4.1.16 above).

17.5.6 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.

17.6 DISPATCH FUNCTIONS

General

17.6.1 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.

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

17.6.3 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. A successful flight will always start with an intelligent, informed and conservative plan.

Flight Planning

Route Planning

17.6.4 The daily published OTS tracks provide near to optimum 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 paragraphs 2.2.3 and 2.2.4 above).

17.6.5 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

17.6.6 Dispatchers must pay particular attention to defined co-ordinates, 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 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.

17.6.7 Dispatchers should note that From 05 February 2015 Phase 2A of the NAT DLM was implemented. In this Phase CPDLC and ADS-C are required to plan or fly on any OTS track from **FL350** to 390 inclusive.

- 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), the Northern Organised Track System (NOROTS) 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 co-ordinates in latitude and longitude or as a named point.
- For flights operating along the entire length of an OTS track, estimated elapsed times (EET/ in Item 18) are only required for the commencement point of the track and for Oceanic FIR boundaries.

Planning a Random Route

17.6.8 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.

17.6.9 A Random route is described as follows : -

- For generally east-west flights operating at or south of 70°N, 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 or an Oceanic Exit Point within GOTA.
- For generally east-west flights operating north of 70°N and at or south of 80°N, by significant points formed by the intersection of parallels of latitude expressed in degrees and minutes with meridians normally spaced at intervals of 20 degrees from the Greenwich meridian to longitude 60°W, using the longitudes 000W, 020W, 040W and 060W.
- For generally east-west flights operating at or south of 80°N,the distance between significant points shall, as far as possible, not exceed one hour's flight time. Additional significant points should be established when deemed necessary due to aircraft speed or the angle at which the meridians are crossed, e.g.:
  a. at intervals of 10 degrees of longitude (between 5°W and 65°W) for flights operating at or south of 70°N; and
  b. at intervals of 20 degrees of longitude (between 10°W and 50°W) for flights operating north of 70°N and at or south of 80°N.
- When the flight time between successive such significant points is less than 30 minutes, one of these points may be omitted.
- For flights operating north of 80°N, the planned tracks shall normally be defined by significant points formed by the intersection of parallels of latitude expressed in degrees and

minutes with meridians expressed in whole degrees. The distance between significant points shall normally equate to not less than 30 and not more than 60 minutes of flying time.

- For generally north-south flights at or south of 80°N, by significant points formed by the intersection of whole degrees of longitude with specified parallels of latitude which are spaced at intervals of 5 degrees.
- For generally north – south flights operating north of 80°N, by significant points formed by the intersection of parallels of latitude expressed in degrees and minutes with meridians expressed in whole degrees. The distance between significant points shall normally equate to not less than 30 and not more than 60 minutes of flying time.

17.6.10 Random routes can be planned anywhere within NAT HLA airspace 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 co-ordinates before/after valid OTS times.

17.6.11 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 NAT HLA airspace/RVSM flight levels at FL280 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.

17.6.12 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 (FL260 or FL280) until east of 70˚W.

17.6.13 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.

17.6.14 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 30W at 1030 UTC or later; and Westbound traffic crossing 30W at 2400 UTC and later (See paragraph 4.1.6). If in any doubt it would be prudent to co-ordinate any such routes directly with appropriate OACs.

Flight Levels

17.6.15 Flight Dispatchers should be aware of the North Atlantic Flight Level Allocation Scheme (FLAS). This is subject to change and the current FLAS is published in the UK and Canadian AIPs and shown at Attachment 6 below.

17.6.16 Chapters 2 and 4 contain details on RVSM flight level guidance. Since virtually all airspace adjoining NAT HLA airspace is now RVSM, transition problems are no longer a major issue for ATC or dispatchers. Nevertheless dispatchers should be aware that some "opposite direction" levels, which may be flight planned for the NAT segment of a flight, may not be similarly allowed in adjacent domestic areas. Guidance for RVSM flight procedures in NAT HLA airspace can be found in Chapter 9 of this Manual.

17.6.17 RVSM allows more flight levels for planning and therefore provides better opportunity to fly closer to an optimum route/profile. As aircraft fly towards their destination they become lighter as fuel on-board is consumed and they are then able to climb to more fuel efficient altitudes. It is acceptable to plan and/or request step climbs within the OTS but because of traffic volumes and the difference in aircraft performance it is wise to plan conservatively. Climbs on random routes that are totally north or south of the track system are more readily approved. If a flight is planned without profiling a climb crews should be encouraged to request a climb as aircraft decreasing weight permits.

Communications

17.6.18 The availability of functioning HF ATS communications is mandatory for flights through the Shanwick OCA. Many States of Registry insist on two functioning long range communications systems for flights in Oceanic or Remote areas. Some States of Registry will allow their operators to substitute SATCOM Voice for one HF system. Dispatchers should ensure that they are fully aware of their State of Registry requirements in this regard. VHF communications (123.45 or 121.5 MHz) can be used as relay air-ground ATS communications as backup in case of en-route HF failure.

17.6.19 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 FANS1 or FANSA it should be utilised during the NAT segment of the flight and the appropriate descriptor should be inserted into the filed flight plan.

MEL Compliance

a) Dispatchers planning flights within NAT HLA airspace 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 8 and Chapter 11 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. HF is required for entering the Shanwick OAC. Many airline Operations Specifications require dual HF for operation in Remote or Oceanic airspace , even when aircraft are SATCOM Voice equipped. However, some States may permit Dispatch with only one serviceable HF system providing the aircraft is equipped with SATCOM Voice.

b) Even though a flight, that suffers a failure of a system (or component) once en-route, 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.

c) If an aircraft MEL (navigation, communications or altitude alerting/reporting system) prohibits operations in NAT HLA airspace it will be necessary to modify an aircraft's originally intended route of flight. An example would be an aircraft not equipped with two Long Range Navigation Systems (or LRNS's that are fully serviceable). This situation could occur before departure or once en-route but before entering NAT HLA airspace. Options that should be considered by the dispatcher are:

- operate above or below NAT HLA airspace;
- fly on special routes developed for aircraft equipped with limited LRNS equipment – see Sections 1.4, 3.2, and 12.2

ETOPS/EDTO

17.6.20 A large portion of NAT crossings are ETOPS operations. ETOPS rules require that one or more suitable en-route alternate airports are named prior to dispatch and then monitored while aircraft are en-route. En-route 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

17.6.21 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 en-route airports, more stringent planning conditions may apply. Guidance can be obtained from appropriate government and industry websites.

CDM Tools

17.6.22 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 are 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, CDR routes, preferred routing schemes and transition routes.

  http://www.eurocontrol.int/network-operation

  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 www.fly.faa.gov . Also for CDM participants, the FAA Air Traffic Control System Command Center website (www.fly.faa.gov/flyfaa/usmap.jsp) is available.

Flight Monitoring

Oceanic ATC Clearances

17.6.23 The Pilot can obtain Oceanic clearances by VHF, HF, domestic ATC agencies or data link. Chapter 5 in this manual can be referenced for complete oceanic clearance requirements. Be aware that for airports located close to oceanic boundaries (Prestwick, Shannon, Glasgow, Dublin, Belfast, Bristol, Edinburgh, Gander, Goose Bay and St Johns, etc.) oceanic clearances must be obtained before departure. Indeed on the east side of the NAT this will apply to departures from all Irish airfields, all UK airfields west of 2 degrees 30 minutes West and all French Airfields west of 0 degrees longitude. Oceanic Clearances for controlled flights leaving airports within the region (e.g. airports in Iceland, Greenland or the Azores) are issued by the relevant ATS unit prior to departure.

17.6.24 It is important for dispatchers to verify the contents of the oceanic clearance and check it against the filed route. 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 Use

17.6.25 All aircraft flying in NAT HLA airspace will set their transponders as follows:

17.6.26 Thirty minutes after oceanic entry crews should Squawk 2000, if applicable. There are some regional differences such as Crews transiting Reykjavik's airspace must maintain last assigned Squawk until advised by ATC. Also aircraft operating on airway Tango 9 North bound should squawk 2000 ten (10) minutes after passing BEGAS and South bound should squawk 2000 ten (10) minutes after passing LASNO.

Re-Routes.

17.6.27 When traffic exceeds track capacity, ATS providers may not be able to accommodate a flight's filed altitude or routing. A different flight level on the planned route will be offered as the first option. If this is not possible, ATC will offer an alternative route that may be stated in Field 18 of the ICAO flight plan. On an eastbound flight the pilot should anticipate a preferred route within the domestic route structure appropriate to the oceanic exit point of the re-route. For westbound flights into Canada, ATC will normally attempt to route the flight back to its original route unless the crew requests a new domestic routing. Many operators attach secondary flight plans on adjacent tracks that will include the preferred domestic routings. This will help flight crews evaluate and more quickly adjust when re-route situations are required.

En-route Contingencies

17.6.28 Dispatchers must also be aware of special procedures for In-Flight contingencies as published in Chapter 12 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 offset from the assigned track by 15 NM and climb or descend to a level differing from those normally used by 500 ft if below FL410 or 1000 ft if above FL410.

17.6.29 Procedures for loss of communications and HF failure are contained in Chapter 6 at paragraphs 6.6 of this manual.

Dispatcher guidance for NAT RVSM operations.

References

17.6.30 The FAA Guidance 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 FAA Guidance 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 pilots and dispatchers involved in RVSM operations. This particular dispatcher guidance, available at www.faa.gov/air_traffic/separation_standards/rvsm/, was developed using those appendices as the reference

Flight Planning

NAT RVSM Airspace

This is defined as any airspace between FL 285 - FL 420 where 1,000 ft vertical separation is applied (i.e. FLs 290 thru 410 inclusive).

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, 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 in this Manual). 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 each individual 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 ATS and obtain a new Oceanic Clearance to fly above or below NAT RVSM Airspace. The pilot 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 pilot 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);

(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. The pilot-in-command will maintain any offsets until a revised ATC clearance can be obtained.

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 en-route, 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 pilot 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 Field 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 en-route, with specific emphasis on conditions such as turbulence, which may affect an aircraft’s ability to maintain its level; and

vii) Determine if TCAS/ACAS is operational.

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 paragraph 1.6.2 above).

CHAPTER 18

FLIGHT OPERATIONS BELOW THE NAT HLA AIRSPACE

18.1 INTRODUCTION

18.1.1 The guidance contained in this Chapter primarily relates to flight operations below the NAT HLA airspace. This guidance was initially developed by the North Atlantic Systems Planning Group (NAT-SPG) to assist international general aviation (IGA) pilots 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). Pilots must consult relevant AIPs and Notices to Airmen (NOTAMs) when planning the flight and prior to departure.

18.1.2 The largest proportion of IGA operations through the ICAO NAT Region is business jet flights in or above the NAT HLA. All the foregoing chapters of this document provide the relevant guidance for the pilots/planners/operators of such flights and for their State regulators. This Chapter primarily concentrates on the issues pertaining to the safe planning and conduct of flights through the NAT Region at lower levels.

18.2 ENVIRONMENTAL CONSIDERATIONS

At FL290 and Above

18.2.1 Even at the mid and Northern latitudes of the North Atlantic, pilots must be aware of any convective activity or other weather related phenomena along their planned route, and shall ensure that they receive all proper weather related briefings prior to operating a Trans- Atlantic flight. Jet streams can be present here and flight planners will generally select Eastbound routes to take benefit of such tailwinds and Westbound routes to minimise the exposure to strong headwinds. This is the basic principle in the design of the daily OTS structure (see Chapter 2 above). Moderate or even severe clear air turbulence may be forecast or indeed present at the vertical and lateral boundaries of Jet streams. Turbulence of orographic origin can also be experienced downwind (i.e. to the east) of the Greenland Icecap. When areas of moderate/severe turbulence are forecast, the OTS will normally be planned to avoid them. When turbulence is repeatedly reported by pilots on particular tracks or through a noted area, ATC may temporarily suspend RVSM operations there and revert to standard 2,000 ft vertical separation. Particularly in the winter months, pilots should be aware that freezing fuel conditions may pertain.

Below FL290

18.2.2 For flights at lower levels the North Atlantic weather can be far from benign. Extreme seasonal weather variations exist in the North Atlantic. Rapidly changing weather conditions involving 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, will undoubtedly create problems for an ill-planned flight. Proper preparation, including route and emergency situation planning, will go a long way toward successful completion of a flight. The NAT meteorological environment is complex and often quick changing. Attachment 8 below provides further details of the general North Atlantic climate and the weather conditions and associated operational issues in particular areas.

18.3 NORTH ATLANTIC FLIGHT OPERATIONS

18.3.1 Flights by general aviation aircraft across the North Atlantic have increased dramatically. Because of the harsh climate, dearth of VHF communications and ground-based navigational aids, as well as the immense distances involved, **a trans-Atlantic flight is a serious undertaking**. While IGA flights constitute a relatively small percentage of the overall North Atlantic traffic, they account for the vast majority of search and rescue operations and expenses. The information contained in this chapter and in Attachment 8 below is intended to assist the IGA pilot in completing a safe flight.

18.3.2 Within the NAT Region there are both civil and military air traffic operations. The civil operations include a significant volume of commercial traffic, as well as an increasing number of IGA aircraft. In addition to routine trans-Atlantic military air traffic, at least twice annually large-scale joint-force military operations are conducted. These operations may restrict access by general aviation to portions of North Atlantic airspace.

18.3.3 Most of the airspace in Oceanic FIRs/CTAs is high seas airspace within which the International Civil Aviation Organization (ICAO) Council has resolved that the Rules of the Air, as specified in Annex 2 to the ICAO Convention, apply without exception. The majority of the airspace is also controlled airspace, and instrument flight rules (IFR) apply to all flights in oceanic airspace when at or above FL060 or 2000 ft. (600 m) above ground level (AGL), whichever is higher, even when not operating in Instrument Meteorological Conditions (IMC).

18.3.4 This controlled airspace includes:

1. New York Oceanic, Gander Oceanic, Shanwick Oceanic, Santa Maria Oceanic, Bodø Oceanic above FL195 and Reykjavik FIRs/CTAs;
2. Bodø Oceanic FIR/CTA when operating more than 100 NM seaward from the shoreline;
3. Søndrestrøm FIR when operating above FL195:
4. Reykjavik FIR/CTA at or above FL060 in the Oceanic Area and above 3000 feet in the Domestic Area or within the TMA/CTR.

18.3.5 It is important to keep in mind the following when considering a flight in this environment:

* Canada, Denmark and Iceland require that pilot and aircraft must be IFR rated for trans-oceanic flight, regardless of the altitude to be flown. Other NAT States do not have this requirement at or below FL055.
* However, it is highly unlikely that you will remain VMC on a trans-Atlantic flight. **IT IS THEREFORE STRONGLY RECOMMENDED THAT PILOTS BE INSTRUMENT RATED AND FILE AND FLY IFR.**

18.4 REQUIREMENTS

18.4.1 Regulatory requirements are established by all States providing Air Traffic services in the ICAO North Atlantic Region aimed at ensuring that all flights through the Region are conducted safely. 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. Following, as an example, are listed items that are required by Transport Canada Aviation Regulations (CAR's) for all flights beginning their trans-Atlantic crossing from Canada. For such flights this equipment is thus mandatory. Denmark/Greenland also require all the equipment mandated by these CARs. Operators must ensure that they are fully cognisant of the regulations imposed by any and all of the States through whose Airspace, or ICAO delegated International Airspace, their flight is planned.

Example – Canadian Legislation

18.4.2 CAR 602.39 – States that no pilot-in-command of a single-engine aircraft, or of a multi-engine aircraft that would be unable to maintain flight in the event of the failure of an engine, shall commence a flight that will leave Canadian Domestic Airspace and enter airspace over the high seas unless the pilot-in-command complies with the following requirements:

Pilot Qualifications

18.4.3 The Pilot-in-Command shall hold a valid pilot license endorsed with a valid instrument rating.

Aircraft Documentation

a) Certificate of Registration from the State of Registry;

b) Certificate of Airworthiness, Flight Permit, or Special Airworthiness Certificate;

c) Certification and special conditions issued by the State of Registry to allow over gross weight operation if applicable;

d) Certification issued by the State of Registry for fuel tank modification (e.g. FAA Form 337);

e) Revised weight and balance report in the case of aircraft modified to carry extra fuel.

Cautionary Notes

- *An Export Certificate of Airworthiness does not constitute authority to operate an aircraft. It must be accompanied by one of the above authorities.*

- *A Temporary Registration Certificate (FAA Pink Slip) is not valid for international operations.*

- *All aircraft entering Canada or transiting through Canada on transoceanic flights, which are operating with restricted Certificates of Airworthiness or Flight Permits, must be issued with Canadian validations of these flight authorities before entering Canada. Canadian validations will be issued upon receipt of a valid or foreign flight authority, and information relating to the dates and routing for the flight. This procedure does not apply to aircraft operating with unrestricted Certificates of Airworthiness.*

Fuel Reserves

18.4.4 An aircraft operated under an IFR flight plan on a transoceanic flight shall carry an amount of fuel that is sufficient to allow the aircraft to fly to and execute an approach and a missed approach at the destination aerodrome; to fly to and land at the alternate aerodrome; to fly for an extra period of forty-five (45) minutes, and in addition, carry contingency fuel equal to at least ten (10) per cent of the fuel required to complete the flight to the destination aerodrome. (N.B. Iceland fuel reserve requirements are couched in different terms – i.e. Destination Fuel plus 3 hours.)

Aircraft Instruments and Equipment

18.4.5 Aircraft must be approved for IFR flight, and equipped with the following instruments and equipment in serviceable condition.

a) a sensitive pressure altimeter adjustable for barometric pressure;

b) a magnetic compass that operates independently of the aircraft electrical generating system;

c) an airspeed indicator with a means of preventing malfunction due to icing (pitot heat);

d) a turn and slip indicator or turn coordinator;

e) an adequate source of electrical energy, and an adequate supply of fuses, if appropriate;

f) a stabilized magnetic direction indicator or a gyroscopic direction indicator;

g) an attitude indicator;

h) a vertical speed indictor;

i) an outside air temperature gauge;

j) appropriate engine power and performance indicating instruments;

k) a power failure warning device or vacuum indicator that shows the power available to gyroscopic instruments for each power source;

l) fuel tank quantity indicators;

m) an alternative source of static pressure for the altimeter, airspeed indicator and vertical speed indicator; and

n) if the flight is to be made at night;

- a means of illumination for all instruments used to operate the aircraft;
- when carrying passengers, a landing light; and
- navigation lights

NOTE -

1 All equipment and cargo carried in the cabin shall be secured to prevent shifting in flight and placed so as not to block or restrict the exits

2 Consider carrying portable oxygen equipment. It would be useful when trying to avoid icing, and for additional height over the Greenland icecap.

Communications Equipment

18.4.6 **Very High Frequency Radio.** Sufficient radio communications equipment to permit the pilot, in the event of failure of any item of that equipment, to conduct two-way communications on the appropriate frequency.

18.4.7 **High Frequency Radio.** An HF radio capable of transmitting and receiving on a minimum of two appropriate international air-ground general purpose frequencies. In general HF RTF communications equipment is mandatory outside of VHF coverage. However, in some circumstances, some States may allow a degree of MEL relief for HF Equipage, based on the carriage of Aeronautical Mobile Satellite (Route) Service (AMS(R)S), more commonly referred to as SATCOM Voice. (see 6.1.17 and 18.12.6). Operators must check the specific requirements of their State of Registry and or the relevant North Atlantic Air Traffic Services Provider States.

Navigation Equipment

18.4.8 ICAO Annex 2 requires an aircraft to be equipped with adequate navigation equipment to enable it to navigate in accordance with the flight plan and the air traffic control clearance.

18.4.9 The CARs require that sufficient radio navigation equipment be installed to permit the pilot, in the event of the failure at any stage of the flight of any item of that equipment, including any associated flight instrument display.

a) to proceed to the destination aerodrome or proceed to another aerodrome that is suitable for landing, and

b) where the aircraft is operated in IMC, to complete an instrument approach, and if necessary, conduct a missed approach.

18.4.10 A suitable interpretation of the above would permit an aircraft equipped with VOR/ILS/ADF and a single GPS approved for en-route flight to operate on any of the North Atlantic routes below FL285.

Maps and Charts

18.4.11 Each aircraft shall carry CURRENT aeronautical maps, charts, aerodrome data, and IFR approach plates covering the area over which the aircraft might be flown. This includes enroute and departure diversions as well as destination alternates. Whether planning to file VFR or IFR, there is always the potential for IMC in the NAT Region, therefore, pilots shall carry IFR publications.

18.4.12 Aircraft landing at Narsarsuaq shall carry a topographical chart of large enough scale to permit map-reading up the fjord.

Emergency Equipment

18.4.13 Aircraft operators shall comply with the requirements of the State of Registry with regard to overwater safety equipment, and overland safety equipment designated for areas in which search and rescue would be especially difficult, for example, Labrador, Greenland, and Iceland.

18.4.14 Overwater Survival Gear

ICAO Annex 6 and the CARs (relating to Canadian registered aircraft) require that the following be carried on single-engine flights over water beyond 100 NM gliding distance from land, or 200 NM in the case of multi-engine aircraft able to maintain flight on one engine:

a) Hypothermia protection (survival suits) for each occupant;

b) Life raft equipped with an attached survival kit, sufficient for the survival on water of each person on board the aircraft, given the geographical area, the season of the year and anticipated seasonal variations, that provides the means for:

1 Providing shelter,
2 Purifying water, and
3 Visually signalling distress

For U.S. registered aircraft, the 14 CFR Part 91 sea survival kit would be appropriate.

The sea temperatures in the North Atlantic rarely rise above 5 degrees Celsius, even in Summer months. It is important therefore to consider the following cold facts on how time and temperature dictates survival times, without an immersion suit, in these inhospitable waters:

Water Temperatures		*No Protection*	*Expected Survival*
Deg. C	*Deg. F*	*Exhaustion/Unconsciousness Sets in within*	*Time (with flotation)*
0°	*32°*	*under 15 min.*	*under 15 to 45 min.*
0-5	*32-41*	*15 to 30 min.*	*30 to 90 min.*
5-10	*41-50*	*30 to 60 min*	*1 to 3 hours*

In simple terms: The chances of surviving for more than an hour in North Atlantic waters without an immersion suit, are virtually zero. The ocean is therefore a very poor choice as a landing place. If a problem does develop consideration should be given to landing in Greenland, Iceland, the Faroe Islands or Scotland. Attachment 8 discusses particular issues pertaining to these choices.

18.4.15 Overland Survival Gear

ICAO Standards Annex 6 and the CARs (relating to Canadian registered aircraft) require that the following be carried on flight over or into the interior of Labrador, Greenland, Iceland and Scotland providing the means for:

a) starting a fire;

b) providing shelter;

c) purifying water, and

d) visually signaling distress

It is strongly recommended that transoceanic operators obtain a handbook on survival on the water and in inhospitable areas, and make up an appropriate kit from that book. .

Pilot familiarization with all aspects of emergency/survival equipment is vital if the occupants are to survive an unexpectedly early termination of a flight.

18.5 OPERATIONAL CONSIDERATIONS

Sparsely Settled Areas

18.5.1 Experience has shown that there is a tendency for pilots who are not familiar with the problems of navigating and the potential dangers of operating in the sparsely settled areas of Canada, Greenland, Iceland, and Scotland to underestimate the difficulties involved.

18.5.2 Some pilots assume that operating in these areas is no different than operating in the more populated areas. This can lead to a lack of proper planning and preparation which can result in the pilot-in-command exposing himself, his crew, his passengers, and his aircraft to unnecessary risks. This in turn can lead to considerable strain being placed on the limited local resources at stop-over or destination airports. Lengthy and expensive searches have resulted which, with careful planning and preparation, could have been avoided.

18.5.3 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.

18.5.4 In addition to the regulations concerning pilot qualifications and experience, it is recommended that the pilot 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

18.5.5 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 pilots/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. 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.

18.6 FLIGHT PLANNING

18.6.1 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 pilot of the flexibility of using the altitudes above FL055. The higher altitudes may enable a smoother flight, free of precipitation, icing or turbulence

18.6.2 IFR Flights (i.e. those operating in the NAT Region at FL060 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 ICAO Document 4444, Appendix 2; and in State AIPs. Chapter 4 above and Attachment 4 below in this Manual (NAT Doc 007) also provide all necessary guidance, with particular emphasis on NAT flight requirements.

18.6.3 Prospective transoceanic fliers familiar with FAA flight plan formats should carefully review the ICAO flight plan instructions as they are quite different from domestic U.S. flight plan formats. International flight service stations can provide assistance in filing an ICAO flight plan.

18.6.4 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.

18.6.5 Plan the flight using current aeronautical charts, the latest edition of pertinent flight supplements, NOTAMs, and particularly International NOTAMs. Pilots should familiarize themselves with the nature of the terrain over which the flight is to be conducted. If unfamiliar with the area, the Pilot should consult the aviation authority officials at appropriate local aviation field offices before departure. Such officials, as well as local pilots 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 en-route weather conditions. Pre-flight planning must ensure the availability of fuel, food, and services that may be required at intermediate stops and at destination.

18.6.6 The majority of military activity takes place in the NAT below NAT HLA. Military exercise particulars will be published in a NOTAM/International NOTAM, and should be reviewed during pre-flight briefing.

18.6.7 Planning a trans-Atlantic flight for the summertime will allow the pilot/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.

18.6.8 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 pilots plan to make trans-Atlantic flights preferably during the summer months.

18.7 PHYSIOLOGICAL FACTORS

18.7.1 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.

18.8 CLEARANCES

18.8.1 All flights planned at or above FL060 in oceanic CTAs are required to obtain an IFR clearance prior to leaving the CTA floor, which generally starts at FL055. It is important to note that the airspace over Southern Greenland (South of 63°30'N) above FL195 is controlled by Gander OAC.

18.8.2 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. In some NAT FIRs a change of true airspeed greater than 5% requires a re-clearance from ATC. In the Reykjavik FIR changes of airspeed of more than 5% must be notified to ATC. Weather deviations of a mileage that exceeds the limits outlined in the Strategic Lateral Offset Procedure (SLOP) i.e. 2 NM, requires a re-clearance from ATC. If a pilot cannot obtain a clearance in a timely manner and needs to execute pilot-in-command authority for safety of flight, they shall so inform ATC of the maneuver as soon as practicable.

18.8.3 Obtaining a Clearance

Pilots are required to obtain a clearance from the ATS unit responsible for their area of operation 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.

Canada–

Oceanic clearances for eastbound IGA NAT flights, departing from Eastern Canada, are obtained from the control tower or the flight service station at the aerodrome of departure prior to departure. Eastbound IGA NAT over-flights obtain their oceanic clearance directly from Gander ACC, Moncton ACC, or Montreal ACC, or through a flight service station, depending on the route of flight.

United Kingdom/Ireland–

At some airports situated close to oceanic boundaries, the oceanic clearance can be obtained before departure e.g. Prestwick, Shannon, Glasgow, Dublin. Westbound aircraft operating within the UK FIR should request oceanic clearance from Shanwick Oceanic on VHF at least 30 minutes before point of entry. Aircraft unable to get clearance on VHF should request clearance on NARTEL HF (North Atlantic Enroute HF RTL Network). Aircraft unable to contact Shanwick, as detailed above, should request the ATC authority for the airspace in which they are operating to relay their request for oceanic clearance to Shanwick. Flights planned to enter the Reykjavik OCA from the Scottish FIR east of 10°W, should request oceanic clearance from Reykjavik via Iceland Radio or data link.

United States–

Prior to entering oceanic airspace you must receive a specific oceanic clearance, detailing the oceanic entry point, route, landfall (or oceanic exit point), and airways to destination. The routing portion of the Oceanic Clearance shall be considered to be the routing received in the clearance at the originating aerodrome prior to takeoff. The final altitude, and if required, speed assignment, shall be the last assigned clearance issued by ATC prior to progressing the Oceanic entry fix. If you do not receive an oceanic clearance approaching the oceanic entry fix, **REQUEST ONE.**

18.9 NAVIGATION

18.9.1 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 paragraphs 18.4.8 through 18.4.10 – "Navigation Equipment").

18.9.2 On the Northern routes it is important to note the pronounced magnetic variation--up to approximately 40 to 45 degrees - and the "pull" this variation has on your compass. When performing turns or accelerations, this "pull', termed the "dip effect", causes your compass to turn slower than you are used to in the lower latitudes.

18.9.3 Even with a sophisticated navigation system such as GPS, it is still essential to maintain good navigation practices. Do not just blindly follow the numbers; awareness of the azimuth of the sun, cross-checking with other NAVAIDs and disposition of contrails from high level traffic are all obvious but many errors have occurred which could have been prevented had the pilot shown more awareness.

18.10 ROUTE CONCERNS

18.10.1 There are a few VOR/NDB routes in the North Atlantic. These routes are sometimes known as "Blue Spruce" routes and are depicted on navigation charts from Jeppesen and other sources. Details are also included in this Manual (Doc 007) in Chapter 12 and in relevant national AIPs. Other than on the Blue Spruce routes, there is little NAVAID coverage at the low altitudes in the NAT. If the flight is intended to be operated without HF communications equipment then the issues detailed in paragraph 4.2.18 must be considered and appropriately addressed.

18.11 COMMUNICATIONS

18.11.1 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 6.

18.11.2 As mentioned earlier, VHF radio coverage is very limited in the NAT. Charts in Attachment 5, depict theoretical VHF coverage at FL100, FL200 and FL300. 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 shall be tested by calling the nearest Aeronautical Radio or Flight Service Station for a ground radio check. If a contact cannot be made on the initial test frequency, try others. If no contact can be made, have the equipment checked. Do not leave the ground until everything is working satisfactorily.

18.11.3 Pilots 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, i.e., Aeronautical Radio Inc. (ARINC) or an international flight service station (IFSS), 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.

18.11.4 Remember, flights above FL060 must be operated under IFR procedures and therefore a continuous listening watch with ATC must be maintained.

18.11.5 An HF SELCAL device will ease the strain of a continuous listening watch on the designated HF R/T Frequency. Ensure that the SELCAL code selected in the aircraft is valid for the NAT Region (see paragraph 6.1.10). Also ensure that the Code is included in Item 18 of the filed ICAO Flight Plan.

18.11.6 Aeronautical Mobile Satellite (Route) Service (AMS(R)S), more commonly referred to as SATCOM Voice, may now be used for any routine, non-routine or emergency ATS air/ground communications throughout the NAT Region. Requirements and procedures for use are detailed in Chapter 6 above.

18.11.7 A listening watch should be maintained on the 121.5 MHz emergency frequency unless communications on another frequency prevents it. 121.5 MHz is not authorized for *routine* use.

> *Note- All civilian and military aircraft flying in the Elk area, as shown in the Chart in Attachment 8,* ***must*** *maintain listening watch on 121.5 MHz or 126.7 MHz.*

18.11.8 Controller Pilot Data Link Communications (CPDLC) provides a means for aircraft operators to communicate directly with ATC via standard messages outlined in the Global Operational Data Link (GOLD) document, and Automatic Dependent Surveillance-Contract (ADS-C) enables operators to provide position reporting through an aircraft's Flight Management system (FMS) through connections established with each ANSP. It is important to note that such equipage does not relieve the operator from having mandatory communication equipment on the aircraft as outlined in the AIP of each state.

Communications failures

18.11.9 Procedures to follow in the event of radio communications failures in the NAT Region **are not** those which are used in domestic airspaces. Chapter 6 and relevant national AIPs provide detail of the procedures to follow here.

18.11.10 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. 123.45 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.

18.12 SURVEILLANCE

18.12.1 Radar and or ADS-B coverage in the NAT Region is limited. Nevertheless the importance of an operable transponder cannot be over emphasized. Some radar sites that do cover portions of the NAT are secondary radar equipped only. Unlike primary radar, secondary radar can only "see" aircraft that have an operating transponder: it cannot "paint" a target based on a radar echo from the aircraft's skin. Similarly you must be ADS-B equipped to be able to receive ADS-B surveillance services. 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 10 above and coverage charts are shown at Attachment 9 below(still pending) and in individual national AIPs.

18.13 SEARCH & RESCUE (SAR)

18.13.1 Air traffic services authorities must receive position information on all aircraft within their jurisdiction at least once per hour. If these hourly reports are not received, SAR alert procedures are initiated.

18.13.2 Pilots 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 121.5 continuously. SAR aircraft are generally equipped with homing devices sensitive to VHF 121.5 Mhz. If unable to reach any facility, pilots should attempt contact with other aircraft on 123.45 MHz or 121.5 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 MHz beacon provides a more accurate position and also identification data, both of which improve SAR response efficiency.

18.13.3 At many locations throughout the North Atlantic neither search and rescue personnel nor equipment is available on a 24 hour basis. Rescue/recovery from the ocean will likely be by a Maritime craft in the vicinity. The primary SAR asset often will be civilian aircraft chartered from private companies at great expense. These aircraft and their crews are frequently exposed to dangers which could have been avoided simply by better preparation on the part of IGA pilots. The general reasons for the alerts, the searches, and the fatalities, are most often poor planning, poor navigation, insufficient fuel, and the lack of knowledge of flying in the NAT Region.

18.13.4 Should worse come to worse and the aircraft must be ditched in the North Atlantic, the pilot must fully appreciate the predicament that is entailed. All the pre-flight planning, the inspection at Departure aerodrome and all the equipment carried are of little use, if the crew and passengers cannot survive long enough to allow SAR services to recover them reasonably intact. If nothing else, the first two principles of survival – PROTECTION and LOCATION – should be remembered. In the NAT Region at any time of year, the weather is the enemy, so wear protective garments at all times. It is much too late to be climbing into clothing, while presiding over an engine that is refusing to cooperate, and at the same time trying to contact a friendly 747 to explain that you have a problem.

18.13.5 With excellent satellite coverage of the region, LOCATION is no problem provided that the ELT functions. Search and recovery may be conducted by various craft. Helicopters operate out to a maximum of 300nm 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 to find out what assistance can be provided by other craft in the area. This would often include ships or boats. Of particular help are merchant vessels contacted by means of the ship reporting system called AMVER. The further section below on aircraft ditching provides more insights.

Hypothermia

18.13.6 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 8 below.

18.14 CHECKLIST

18.14.1 A thorough pilot will make every attempt to avoid in-flight problems prior to departure. While each aircraft will require a different specific inspection, this section provides a general checklist for pre-flight preparation, inspection and in-flight contingencies.

18.14.2 Be prepared for systems failure. Know what to do in advance. Always plan a way out of a situation. If a borderline decision has to 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.

18.14.3 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.

18.14.4 Allow sufficient time for a thorough briefing, planning, and administrative details. Try to put the airplane to bed ready to go, avoiding the possibility of last minute mistakes.

Pre-Flight Preparation

18.14.5 The following checklist, cross-referenced to text appearing in this manual, will assist you during the preparation stages of your oceanic flight. It is not intended that this checklist address all aspects of oceanic flight preparation.

- Have you obtained all the current departure, en-route arrival and topographical charts for your entire route of flight and your alternate? (Chapter 18)
- Do you have an instrument rating and have you recently flown IFR? (Chapter 18)
- What long range NAVAIDS are you planning to use? When did you last practice long range navigation? (Chapter 8)

- What can you expect in terms of available daylight in Iceland, Greenland? (Chapter 18)
- Has your aircraft been thoroughly inspected by a licensed mechanic for suitability for a long, over water crossing? Do you have the necessary aircraft documents? (Chapter 18)
- If your flight will transit Canadian airspace, and chances are good that it will, do you have the required Sea/Polar Survival equipment necessary to adhere to Canadian Air Regulation 540? (Chapter 18)
- What is the proper format to be used when filing an oceanic flight plan? (Chapter 4 & Attachment 4)
- Are you aware of the proper procedures to be used in obtaining an oceanic clearance? (Chapter 5 & Attachment 7)
- What do you know of hypothermia? How can it be prevented? (Chapter 18)
- What can you expect in terms of VHF radio coverage in the NAT Region? (Chapter 6 & Attachment 5)
- Do you know what to include in a position report? When should a revised estimate be forwarded to ATC? (Chapter 6)
- Is the selected SELCAL Code valid for the FIRs in which you are planning to fly? (Chapter 6)
- If the flight is planned for FL285 or above, has the State of Registry approved the flight in NAT HLA airspace through a letter of authorization or its equivalent? (Foreword & Chapter 1)
- If your aircraft is ADS-B equipped, has the aircraft been approved for flight in ADS-B airspace? (Chapter 10).
- Are you fully briefed on what to expect in the way of Search and Rescue services? Do you understand the importance of an operable ELT ? (Chapter 1 & Chapter 18)
- Have you obtained the relevant meteorological information for your flight? (Chapter 18)
- Have you checked current NOTAMs with special regard to the status of radio-navigation aids and airport restrictions? (Chapter 18)

Pre-Flight Inspection

18.14.6 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

18.14.7 Check compass on nearest runway heading to your course (on a compass rose if available within 30 days prior to departure).

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.

18.15 IN-FLIGHT CONTINGENCIES

18.15.1 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.

18.15.2 Make all position reports, as detailed in Section 6.3, 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.

18.15.3 If you encounter difficulty, report immediately on the appropriate VHF/HF frequency or on VHF 121.5. Don't delay in making this call, as it could take SAR forces up to four hours to reach your position.

18.15.4 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 123.45 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 above). During daylight hours a Westbound OTS is in effect and at night an Eastbound structure is used. The location/co-ordinates 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.

18.15.5 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.

ATTACHMENT 1

SAMPLE OF ERROR INVESTIGATION FORM

(Name and address of reporting agency):				
Please complete Parts 2 and 3 (and Part 4 if applicable) of this investigation form. A copy, together with copies of all relevant flight documentation (fuel flight plan, ATC flight plan and ATC clearance) should then be returned to the above address and also to: the North Atlantic Central Monitoring Agency, -c/o National Air Traffic Services - Room G41 - Scottish & Oceanic Area Control Centre, Sherwood Road,- Prestwick, Ayrshire - KA9 2NR				
Part 1 – General Information				
Operator's name				
Aircraft identification				
Date/time of observed deviation				
Position (latitude and longitude)				
Observed by (ATC unit)				
Aircraft flight level				
Part 2 – Details of Aircraft and Navigation Equipment Fit				
Number Type	**INS**	**GNSS**	**IRS/FMS**	**OTHER (please specify)**
Single Dual Triple				
Model No				
Navigation system Programme No				
State which system coupled to autopilot				
Aircraft Registration and Model/Series				

Part 3 – Detailed description of incident

Please give your assessment of the actual track flown by the aircraft and the cause of the deviation (continue on a separate sheet if required)

Part 4 – Only to be completed in the event of Partial or Full Navigation failure

<table>
<tr><td>Indicate the number of equipment units which failed</td><td colspan="3">INS</td><td colspan="3">GNSS</td><td colspan="3">IRS/FMS</td><td colspan="4">OTHER</td></tr>
<tr><td>Circle estimated longitude at which equipment failed</td><td>60°W</td><td>55°W</td><td>50°W</td><td>45°W</td><td>40°W</td><td>35°W</td><td>30°W</td><td>25°W</td><td>20°W</td><td>15°W</td><td>10°W</td><td>5°W</td><td>0°E/W</td></tr>
<tr><td>Give an estimate of the duration of the equipment failure</td><td colspan="13">Time of failure :

Time of exit from NAT HLA:

Duration of failure in NAT</td></tr>
<tr><td>At what time did you advise ATC of the failure</td><td colspan="13"></td></tr>
</table>

Thank you for your co-operation

ATTACHMENT 2

ALTITUDE DEVIATION REPORT FORM

MESSAGE FORMAT FOR A REPORT TO THE CENTRAL MONITORING AGENCY OF AN ALTITUDE DEVIATION OF 300 FT OR MORE, INCLUDING THOSE DUE TO ACAS/TCAS ADVISORIES, TURBULENCE AND CONTINGENCY EVENTS

1. REPORT OF AN ALTITUDE DEVIATION OF 300 FT OR MORE
2. REPORTING AGENCY
3. DATE AND TIME
4. LOCATION OF DEVIATION
5. RANDOM / OTS[1]
6. FLIGHT IDENTIFICATION AND TYPE
7. FLIGHT LEVEL ASSIGNED
8. OBSERVED / REPORTED[1] FINAL FLIGHT LEVEL[2] MODE “C” / PILOT REPORT[1]
9. DURATION AT FLIGHT LEVEL
10. CAUSE OF DEVIATION
11. OTHER TRAFFIC
12. CREW COMMENTS WHEN NOTIFIED
13. REMARKS[3]

1. State one of the two choices.

2. In the case of turbulence, state extent of deviation from cleared flight level.

3. In the event of contingency action, indicate whether prior clearance was given and if contingency procedures were followed

When complete send this form to:

North Atlantic Central Monitoring
Agency c/o National Air Traffic
Services
Room G41
Scottish & Oceanic Area Control Centre,
Sherwood Road,
Prestwick, Ayrshire - KA9 2NR

natcma@nats.co.uk

ATTACHMENT 3

WAKE TURBULENCE REPORT FORM

For use by pilots involved in Wake Vortex incidents which have occurred in NAT HLA airspace.

This information is requested by the North Atlantic Central Monitoring Agency and will be forwarded for inclusion in the UK National Air Traffic Services Limited Wake Vortex database.

SECTION A

<table>
<tr><td colspan="2">DATE OF OCCURRENCE</td><td colspan="2">TIME (UTC)

*DAY/NIGHT</td><td colspan="2">OPERATOR</td><td>FLIGHT NUMBER</td></tr>
<tr><td colspan="4">AIRCRAFT TYPE & SERIES</td><td>REGISTRATION</td><td colspan="2">AIRCRAFT WEIGHT (KG)</td></tr>
<tr><td colspan="2">ORIGIN & DESTINATION</td><td colspan="2">POSITION IN
LAT & LONG</td><td colspan="3">CLEARED TRACK CO-ORDINATES</td></tr>
<tr><td colspan="2">FLIGHT LEVEL</td><td colspan="2">SPEED/MACH
NBR.</td><td colspan="2">FLIGHT PHASE:

*CRUISE/CLIMB/DESCENT</td><td>WERE YOU
TURNING?

*YES/NO</td></tr>
<tr><td>DID YOU APPLY A
TRACK OFFSET?

*YES/NO</td><td colspan="3">SIZE OF TRACK OFFSET?

Nautical Miles</td><td colspan="3">WAS ATC INFORMED?

*YES/NO</td></tr>
<tr><td>MET

CONDITIONS IMC

VMC</td><td colspan="3">ACTUAL WEATHER

WIND VISIBILITY
CLOUD
TEMPERATURE</td><td colspan="3">DEGREE OF TURBULENCE

*LIGHT/MODERATE/SEVERE</td></tr>
<tr><td colspan="7">OTHER SIGNIFICANT WEATHER?</td></tr>
</table>

(*Circle the appropriate

reply only) SECTION B

1 What made you suspect Wake Vortex as the cause of the disturbance? ______________________________

____

____

____

2 Did you experience vertical acceleration? *YES/NO
If YES please describe briefly ____

____

3 What was the change in attitude? (please estimate angle)
Pitch__________________º Roll_____________º Yaw____________________º

4 What was the change in height if any?________________________ *INCREASE/DECREASE

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5 Was there buffeting? *YES/NO

6 Was there stick shake? *YES/NO

7 Was the Autopilot engaged? *YES/NO

8 Was the Auto throttle engaged? *YES/NO

9 What control action was taken?

Please describe briefly ____

____

____

10 Could you see the aircraft suspected of causing the wake vortex? *YES/NO

11 Did you contact the aircraft suspected of causing the vortex? *YES/NO

12 Was the aircraft suspected of causing the vortex detected by ACAS/TCAS? *YES/NO

If YES to any of questions 10 to 12, what type of aircraft was it? ______________________

and where was it relative to your position?______________________

(Estimated separation distance) ______________________

Were you aware of the preceding aircraft before the incident?

*YE

S/NO OTHER INFORMATION

13 Have you any other comments that you think may be useful? ______________________

____

____

____

____

____

Signed ____

Name (BLOCK CAPITALS)______________________DATE ______________

(*Circle the appropriate reply only)

When complete send this form to:

North Atlantic Central Monitoring Agency
c/o National Air Traffic Services
Room G41
Scottish & Oceanic Area Control Centre,
Sherwood Road,
Prestwick, Ayrshire - KA9 2NR

natcma@nats.co.uk

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ATTACHMENT 4

ICAO FPL COMPLETION FOR A NAT FLIGHT

1. Introduction

This document outlines the requirements and procedures necessary for the correct filing of flight plans for flights operating in the North Atlantic Region. It includes examples of the more common errors which lead to a failure of automatic processing of these flight plans. Information is also provided on the availability of Flight Levels at various times.

This document is for guidance only and must be read in conjunction with the following publications, which detail the regulatory material relating to North Atlantic aircraft operations:

ICAO PANS/ATM (DOC 4444) Amendment No.1 (15 Nov 2012);

ICAO Regional Supplementary Procedures (DOC 7030/4) and

Relevant parts of State Aeronautical Information Publications (AIP) and Aeronautical Information Circulars (AIC). *(Individual Air Traffic Services (ATS) data systems may impose their own constraints on information in flight plans and any such constraints are notified in the relevant Aeronautical Information Publications (AIP).*

The ICAO Air Traffic Management Requirements and Performance Panel (ATMRPP) has developed a concept for a flight planning system to support future operations in accordance with the Global ATM Concept. Flight planning provisions had not been addressed for many years and did not accurately reflect advances that had been made in both airborne and ground-based systems. The concept that has been developed defines information requirements for flight planning, flow management and trajectory management and aims to facilitate the best possible integrated past, present and future ATM situation. This exchange of information will enable improved decision making by the ATM providers involved in the entire duration of a flight, i.e. gate-to-gate, thus facilitating 4-D trajectory operations.

Work is ongoing to develop the necessary standards and documentation, including implementation and transition guidance, to allow elements of the concept to be introduced as early as possible ahead of full implementation of the Collaborative Environment envisaged by the Global ATM Concept and the programme of Aviation System Block Upgrades initiated by ICAO, of which the future flight planning process is a part. As an interim step, ICAO published Amendment No.1 to the Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM, Doc 4444) 15th Edition. This amendment allows the flight plan to accurately reflect the equipment on board the aircraft and the capabilities of both it and the crew and also changes the way certain other information elements are presented in the flight plan. These changes became globally applicable on 15 November 2012.

The amendment to the ICAO flight planning provisions is available on the ICAO European and North Atlantic website (www.paris.icao.int) by following the links to 'Other Meetings, Seminars & Workshops', then to 'FPL 2012 ICAO EUR Region Plan' and then to 'Documentation related to FPL 2012 Amendment'.

2. General

The guidance that follows here refers to the ICAO model Flight Plan Form as described in Chapter 4 of ICAO PANS/ATM Doc.4444.

2.1 General Principles

(a) USE BLOCK CAPITALS;

(b) Adhere to the prescribed formats and manner of specifying data;

(c) Insert all clock times and estimated elapsed times, in hours and minutes, as four figures, UTC, or as six digits if including the date;

(d) Shaded areas preceding Item 3 to be completed by ATS and COM

services; Items 3 to 19 to be completed only as indicated below.

(e) If it is necessary to subsequently modify an item in a filed flight plan by means of a CHG message,the data for the complete item must be re-provided and not just the modified elements, this is particularly significant for modifications to Item 18.

3. Instructions for the Completion of the Flight Plan Message

3.1 Message Envelope:

The Message Envelope is that part of the flight plan outside the open and close brackets. It should not contain any information other than the Annex 10 message header and optional extra addresses (for IFPS, see below). Any other information inserted into the message envelope will invalidate the entire message and prevent its correct processing.

Message addressing

Flight plans for flights operating to or from the IFPS zone in Europe should be filed with IFPS, not the individual NAT centres. However, with the exception of the Shanwick, Santa Maria FIR and Bodø FIR, the NAT region lies outside the IFPS zone. When submitting flight plans for trans- Atlantic flights to IFPS, operators should therefore specify the relevant NAT centre(s) using the IFPS "extra address (AD line)" feature. Note that flight plans for flights not entering the IFPS zone will not be accepted by IFPS and should therefore be sent directly to the relevant centre(s).

3.2 General Message Content

The letter “O” and the digit “0” are not interchangeable. Inappropriate use of these characters will prevent the correct processing of the flight plan.

The line length must not exceed 69 character columns. Lines exceeding the Annex 10 maximum of 69 columns are invariably broken at that position by intervening AFTN communication centres, without any regard for content, causing the creation of unintelligible fragments.

3.3 Item 3: Message Type

Enter FPL for any initial filing of a Flight Plan. For filing of subsequent flight plans use either the “modification” (CHG) or “cancellation” (CNL) format as outlined in ICAO DOC 4444.

Common Error:

It is common for CNL messages to be received without a subsequent FPL message. This is equivalent to having received no flight plan at all. If an Airline Operator still intends to operate the flight, another FPL must be sent.

Also note that there is no guarantee that messages are received in the same order they are transmitted. If a CNL (referring to a previous FPL) is sent and immediately followed by a new FPL it is quite possible that the FPL arrives first and is then immediately cancelled by the delayed CNL.

Creative use of time stamps does not help, it is the arrival sequence rather than the time stamp that determines how messages are processed. It is therefore recommended that a few minutes be allowed to elapse between the CNL and a subsequent FPL.

Another common error occurs when using CHG messages. Transmitting only those parts of an item that have changed is not acceptable because the new item will replace the entire contents of that item in the original message.

3.4 Item 7: Aircraft Identification (ACID)

The explanation of this provision has been clarified in the recent Amendment to specify that the aircraft identification cannot exceed 7 alphanumeric characters and is not to include hyphens or symbols. No other changes were made to the provision.

One of the following ACIDs must be included:

(a) The registration marking of the aircraft (e.g. EIAKO, 4XBCD, N2567GA)

(b) The ICAO designator for the aircraft operating agency followed by the flight identification (e.g. KLM511, NGA213).

(c) The call sign determined by the military authorities if this will be used to identify the aircraft during flight.

Common Errors:

The ACID must not exceed 7 characters. An ACID of more than 7 characters will invalidate the message. Furthermore it will be impossible to manually correct the data as computer systems are only designed to handle the ICAO stipulated maximum of 7 digit aircraft identification strings.

The hyphen, often used in the graphical representation of aircraft registration, is also used as the item separator in all flight related ICAO messages and so must not be used in the flight plan ACID.

All-numeric ACIDs must be avoided. Even when the registration of a military flight is all numeric it is expected to be preceded by the operating agency descriptor assigned to the military operator in question.

3.5 Item **8: Flight Rules and Type of Flight**

The explanation of the provision related to indicating flight rules has been clarified in the recent Amendment. It was further clarified that the point or points at which a change in flight rules is planned, must also be specified in Item 15 (Route). Additional text was also added to highlight that the status of the flight is to be denoted in Item 18 following the STS indicator, using one of the defined descriptors, or that other reasons for specific handling by ATS are to be denoted in Item 18 following the RMK indicator.

Flight Rules

Insert one of the following letters to denote the category of flight rules with which the pilot intends to comply:

I	if IFR;
V	if VFR;
Y	if IFR first
Z	if VFR first

Specify in item 15 the point(s) where the change of flight rules is planned.

Type of Flight

Insert one of the following letters to denote the type of

flight: S if Scheduled Air Service;
N if Non-scheduled Air Transport Operation;
G if General Aviation;
M if Military;
X if the type of flight does not match any of the predefined categories.

Common Error:

It is imperative that the letter ‘X’ is used when the type of flight does not match any of the predefined categories. Failure to do so causes the message to fail processing.

3.6 Item 9: Number and Type of Aircraft and Wake Turbulence

category Number of Aircraft

Insert the number of aircraft only when that number exceeds one, using two digits (e.g. 03).

Type of Aircraft

Insert the appropriate designator as specified in ICAO DOC 8643 – “Aircraft Type

Designators”, OR

If no designator has been allocated insert ZZZZ and specify in Item 18 the type of aircraft, using the “TYP/…” sub-**item** and free text.

OR

In the case of flight plans covering more than one aircraft type, insert ZZZZ and specify in Item 18 the types of aircraft using the “TYP/…” sub-item with the format used in Item 9 (e.g. TYP/02F18 KC135).

Common Errors:

Including the number of aircraft as 1 or 01. ICAO DOCs clearly state that the number of aircraft shall only be specified when there are more than 1.

Inserting a space between the number and type of aircraft. The correct format is to specify the number and type as a single group, any intervening blanks will cause a syntax error.

Wake Turbulence Category

Insert an oblique stroke followed by one of the following letters to indicate the wake turbulence category of the aircraft:

H HEAVY, to indicate an aircraft type with a maximum certificated take-off weight of 136 000 kg (300 000 lb) or more;

M MEDIUM, to indicate an aircraft type with a maximum certificated take-off weight of less than 136 000 kg (300 000 lb) but more than 7 000 kg (15 500 lb);

L LIGHT, to indicate an aircraft type with a maximum certificated take-off weight of 7 000 kg (15 500 lb) or less.

3.7 Item 10: Equipment and Capabilities

In the recent Amendment to PANS/ATM Doc.4444 numerous changes were made to this provision. It is important to note that Item 10 now also indicates “capabilities”, which consists of three elements:

presence of relevant serviceable equipment on board the aircraft;
equipment and capabilities commensurate with crew qualifications;
and, where applicable, authorization from the appropriate authority.

The following provisions are applicable to Item 10a (Radio communication, navigation and approach aid equipment and capabilities):

INSERT one letter as follows:

N if no COM/NAV/approach aid equipment for the route to be flown is carried, the equipment is unserviceable,

OR S if standard COM/NAV/approach aid equipment for the route to be flown is carried and serviceable (see Note 1)

AND/OR

INSERT one or more of the following letters to indicate the serviceable COM/NAV/approach aid equipment and capabilities available:

A	GBAS landing system	J7	CPDLC FANS 1/A SATCOM (Iridium)
B	LPV (APV with SBAS)	K	MLS
C	LORAN C	L	ILS
D	DME	M1	ATC RTF SATCOM (INMARSAT)
E1	FMC WPR ACARS	M2	ATC RTF (MTSAT)
E2	D-FIS ACARS	M3	ATC RTF (Iridium)
E3	PDC ACARS	O	VOR
F	ADF	P1-P9	Reserved for RCP
G	GNSS (See Note 2)	R	PBN approved (see Note 4)
H	HF RTF	T	TACAN
I	Inertial Navigation	U	UHF RTF
J1	CPDLC ATN VDL Mode 2 (See Note 3)	V	VHF RTF
J2	CPDLC FANS 1/A HFDL	W	RVSM approved
J3	CPDLC FANS 1/A VDL Mode 4	X	NAT HLA MNPS approved
J4	CPDLC FANS 1/A VDL Mode 2	Y	VHF with 8.33 kHz channel spacing
J5	CPDLC FANS 1/A SATCOM ARSAT)	Z	Other equipment carried or other capabilities (see Note 5)
J6	CPDLC FANS 1/A SATCOM (MTSAT)		

Any alphanumeric characters not indicated above are reserved.

Note 1: If the letter S is used, standard equipment is considered to be VHF RTF, VOR and ILS, unless another combination is prescribed by the appropriate ATS authority. ADF ("F") is now a represented by a separate equipage letter. It is no longer considered as included in Standard equipment ("S").

Note 2: If the letter G is used, the types of external GNSS augmentation, if any, are specified in Item 18 following the indicator NAV/ and separated by a space.

Note 3: See RTCA/EUROCAE Interoperability Requirements Standard For ATN Baseline 1 (ATN B1 INTEROP Standard - DO-280B/ED-110B) for data link services air traffic control clearance and information/air traffic control communications management/air traffic control microphone check.

Note 4:: If the letter R is used, the performance based navigation levels that can be met are specified in Item 18 following the indicator PBN/. Guidance material on the application of performance based navigation to a specific route segment, route or area is contained in the Performance-Based Navigation Manual (Doc 9613).

Note 5: If the letter Z is used, specify in Item 18 the other equipment carried or other capabilities, *preceded by COM/, NAV/ and/or DAT, as appropriate*.

Note 6: Information on navigation capability is provided to ATC for clearance and routing purposes.

For all flights intending to operate in the NAT Region the ICAO Regional Supplementary Procedures for the North Atlantic (Doc 7030/5) specify that:

RNAV 10 (RNP 10) approved aircraft shall insert the letter R in Item 10a of the flight plan and the A1 descriptor in Item 18 of the flight plan, following the PBN/ indicator.

RNP 4 approved aircraft shall insert the letter R in Item 10a of the flight plan and the L1 descriptor in Item 18 of the flight plan, following the PBN/ indicator.

NAT HLA MNPS approved aircraft shall insert the letter X in Item 10a of the flight plan.

RVSM approved aircraft , regardless of the requested flight level, shall insert the letter W in Item 10a of the flight plan.

Aircraft planning to operate in the NAT Region and intending to use data link services shall insert the appropriate descriptor (J2, J5 or J7) in Item 10a of the flight plan to indicate FANS 1/A interoperable equipment.

The following provisions are applicable to Item 10b (Surveillance equipment and capabilities):

INSERT N if no surveillance equipment for the route to be flown is carried, or the equipment is unserviceable,

OR

INSERT one or more of the following descriptors, to a maximum of 20 characters, to describe the serviceable surveillance equipment and/or capabilities on board:

SSR Modes A and C

A Transponder - Mode A (4 digits - 4 096 codes)

C Transponder - Mode A (4 digits - 4096 codes) and Mode C SSR Mode S

E Transponder - Mode S, including aircraft identification, pressure-altitude and extended squitter (ADS-B) capability

H Transponder - Mode S, including aircraft identification, pressure-altitude and enhanced surveillance capability

I Transponder - Mode S, including aircraft identification, but no pressure-altitude capability

L Transponder - Mode S, including aircraft identification, pressure-altitude, extended squitter (ADS-B) and enhanced surveillance capability

P Transponder - Mode S, including pressure-altitude, but no aircraft identification capability

S Transponder - Mode S, including both pressure altitude and aircraft identification capability X Transponder

- Mode S with neither aircraft identification nor pressure-altitude capability

Note: Enhanced surveillance capability is the ability of the aircraft to down-link aircraft derived *data via a Mode S transponder.*

ADS-B

B1 ADS-B with dedicated 1090 MHz ADS-B ‘out’ capability

B2 ADS-B with dedicated 1090 MHz ADS-B ‘out’ and ‘in’

capability U1 ADS-B ‘out’ capability using UAT

U2 ADS-B ‘out’ and ‘in’ capability using UAT

V1 ADS-B ‘out’ capability using VDL Mode 4

V2 ADS-B ‘out’ and ‘in’ capability using VDL Mode 4

Note : ADS-B approved aircraft intending to operate in the NAT Region shall insert either the B1 or B2 descriptor as appropriate in Item 10b of the flight plan. Eligibility for ADS-B service in the NAT Region is detailed in Chapter 10.

ADS-C

D1 ADS-C with FANS 1/A

capabilities G1 ADS-C with ATN

capabilities

Note: Any additional surveillance application should be listed in Item 18 following the indicator SUR/.

Common Errors

The filing of correct and complete NAV codes in Items10 and 18 is important. Within the NAT Region some procedures and separation standards employed by ATC depend upon ATC's knowledge of the equipage and/or the approval status of individual aircraft/crew. The following errors in completing these itemshave been noted. These errors create difficulties for ATC and can result in unnecessary penalties or unachieved benefits for the flights involved.

- The filing of only a "G" or "I" rather than filing both when the aircraft is so equipped.

3.8 Item 13: Departure aerodrome and time

Insert the ICAO four-letter location indicator of the aerodrome of departure and, without a space, the estimated off-block time.

Note: If no location indicator has been assigned, use ZZZZ and insert in Item 18 the group DEP/ followed immediately by the name of the aerodrome.

3.9 Item 15: Route

This item starts with the initial cruising speed and level. The basic structure of the item following this group consists of a sequence of entries, each of which contains a route (or the text “DCT” to signal a direct routing) and a fix. In addition, a diagonal slash and a new speed/level group can be appended to a fix.

Exceptions to this simple structure are:

a) The route part may be omitted from the first entry.

b) The route part may be omitted between points encoded as geographic coordinate.

c) The fix part may be omitted from the last entry.

The following example shows a typical route broken down into such entries:

```
>____GELKI<                        (note a)
>UP600 GOW/N0473F360<
>UN615 STN<
>UN601 AKIVO<
>UP60 ATSIX/M081F360<
>DCT 62N020W<
>____63N030W<                      (note b)
>____63N040W<                      (note b)
>____62N050W<                      (note b)
>____62N060W<                      (note b)
>DCT TANTI/N0467F380<
>DCT FEDDY<
>SCAI 5321N09000W/N0459F390<
>SCAI YRL/N0338F160<
>V304 VBI/N0466F410<
>J538 DLH<
>J89 BAE<
>V63 JVL<
>JVL4____<                         (note c)
```

It will be obvious from this description that listing routes without an intervening fix is an error, so is a sequence of fixes without either a route or the text “DCT” connecting them (except as per c) above) – or indeed any text that doesn’t adhere to this format.

The following provisions are applicable to Item 15c

An editorial change was made to clarify that it is possible to indicate, at a single point, where it is planned that a change of speed or level or both is planned to commence, or a change of ATS route and/or a change of flight rules.

The provision was also expanded to include the possibility of describing a significant point in the route as a bearing or distance from a ‘reference point’, rather than only from a navigational aid.

Important Note : *However, in respect of this “global provision” it is important to note that a safety issue has been identified with the use of waypoints in the North Atlantic Region when they are defined as a range and bearing from a significant point or a navigation aid. Magnetic variations, in the North Atlantic, particularly in the western portions of that airspace can be large. It has been noted that navigational data bases used on-board aircraft, by Flight Planning systems and by ANSPs do not always define the same magnetic variation for the same locations. As a result, the actual position of an aircraft could be considerably different from that calculated by the ATS ground systems. The actual and expected separation between two aircraft could differ significantly. Accordingly, NAT ATS Providers have agreed that in the North Atlantic Region in airspace where ATS surveillance service is not provided, route clearances will not include waypoints defined as a range and bearing from a navigation aid or significant point. When submitting Flight Plans or re-clearance requests, Operators and Flight Planning Service providers are advised to avoid using such waypoint definitions in any North Atlantic segment of the Flight route.*

Requirements for Flight Plans on Organised Track System (OTS)

Insert speed in terms of Mach number at commencement point of

OTS. Insert flight level requested at commencement point of OTS.

Insert the abbreviation “NAT” followed, without a space, by the code letter assigned to the track if, and only if, the flight is planned to operate along the whole length of one of the organised tracks as detailed in the NAT track message.

Note: Flights wishing to join or leave an organised track, or change from one organised track to another, 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 or Track letters should not be used to abbreviate any portion of the route in these circumstances.

Each point at which either a change in speed and/or level is requested must be specified as geographical co- ordinates in latitude and longitude, or as a named waypoint.

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

For flights operating **at or south of 70°N**, the planned tracks shall normally be defined by significant points formed by the intersection of half or whole degrees of latitude with meridians spaced at intervals of 10 degrees from the Greenwich meridian to longitude 70°W.

For flights operating north **of 70°N and at or south of 80°N**, the planned tracks shall normally be defined by significant points formed by the intersection of parallels of latitude expressed in degrees and minutes with meridians normally spaced at intervals of 20 degrees from the Greenwich meridian to longitude 60°W, using the longitudes 000W, 020W, 040W and 060W.

For flights operating **at or south of 80°N,** Tthe distance between significant points shall, as far as possible, not exceed one hour's flight time. Additional significant points should be established when deemed necessary due to aircraft speed or the angle at which the meridians are crossed, e.g.:

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

b) at intervals of 20 degrees of longitude (between 10°W and 50°W) for flights operating **north of 70°N and at or south of 80°N**.

When the flight time between successive such significant points is less than 30 minutes, one of these points may be omitted.

For flights operating **north of 80°N**, the planned tracks shall normally be defined by significant points formed by the intersection of parallels of latitude expressed in degrees and minutes with meridians expressed in whole degrees. The distance between significant points shall normally equate to not less than 30 and not more than 60 minutes flight time.

Flights Planning on Routes Predominantly North/South or South/North

Note: The ICAO Regional Supplementary Procedures for the NAT Region (Doc.7030) state 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.

For flights whose flight paths **at or south of 80°N** are predominantly oriented in a north-south direction, the planned tracks shall normally be defined by significant points formed by the intersection of whole degrees of longitude with specified parallels of latitude which are spaced at intervals of 5 degrees.

For flights operating **north of 80°N**, the planned tracks shall normally be defined by significant points formed by the intersection of parallels of latitude expressed in degrees and minutes with meridians expressed in whole degrees. The distance between significant points shall normally equate to not less than 30 and not more than 60 minutes flight time.

Requirements for Flight Plans on NAM/CAR Route Structure (WATRS Plus Airspace)

Insert speed in terms of Mach number for turbo-jet aircraft, and TAS in knots for all other aircraft. The speed is to be specified at the commencement point of the NAM/CAR route structure.

Insert the flight level for oceanic entry point specified at the commencement point of the NAM/CAR route structure.

Insert the route of flight described in terms of NAM/CAR ATS route identifier(s).

Note: Each point at which either a change in speed and/or level is requested must be specified and followed in each case by the next route segment expressed by the appropriate ATS route identifier(s), or as a named waypoint.

Flights Outside Designated ATS Routes

Insert DCT between successive points unless both points are defined by geographical co-ordinates. USE ONLY the conventions in (1) to (5) below and SEPARATE each sub-item by a SPACE.

(1) **ATS Route** (2 to 7 characters)

The coded designator assigned to the route or route segment (e.g. BCN1, B1, R14, UB10, KODAP2A)

(2) **Significant Point** (2 to 11 characters)

The coded designator (2 to 5 characters) assigned to the point (e.g. LN, MAY, HADDY)

OR

If no coded designator has been assigned, one of the following ways:

(3) Degrees only (7 characters)

Two figures describing latitude in degrees followed by “N” (North) or “S” (South), followed by three figures describing longitude in degrees followed by “E” (East) or “W” (West). Where necessary make up the correct number of figures by insertion of zeros (e.g. 46N050W).

(4) Degrees and minutes (11 characters)

Four figures describing latitude in degrees and tens and units of minutes followed by “N” (North) or “S” (South), followed by five figures describing longitude in degrees and tens and units of minutes followed by “E” (East) or “W” (West). Where necessary make up the correct number of figures by insertion of zeros (e.g. 4620N05005W).

Note: As previously advised, although Doc.4444 includes the global provision for defining waypoints in terms of “range and bearing from a navaid”, use of this convention should be avoided for any North Atlantic route segment definition.

Common Error:

It is often observed that a mixture of the above is used e.g- 46N05450W, 5455N030W. This is not an acceptable format.

Change of Speed or Level (maximum 21 characters)

The point at which a change of speed (5% TAS or 0.01 Mach or more) or a change of level is planned, expressed exactly as in (2) above, followed by an oblique stroke and both the cruising speed and the cruising level, WITHOUT A SPACE BETWEEN THEM, even when only one of those quantities will be changed.

Examples
LN/N0284A045;
MAY/N0305F180;
HADDY/M084F330;
4620N05005W/M082F350.

Note: "N" = knots; "M" = Mach; "F" = flight level; "A" = altitude in hundreds of feet. (for other expressions of height see ICAO Doc 4444).

Cruise Climb (maximum 28 characters)

The letter C followed by an oblique stroke then the point at which cruise climb is planned to start, expressed exactly as above, followed by an oblique stroke; then the speed to be maintained during cruise climb followed by the two levels defining the layer to be occupied during cruise climb, or the level at which cruise climb is planned followed by the letters "PLUS", WITHOUT A SPACE BETWEEN THEM.

Examples
C/48N050W/M082F290F350;
C/48N050W/M082F290PLUS;

Note: On the basis of current NAT traffic densities, separation minima and ground system capabilities, a clearance for a cruise climb is unlikely to be given, particularly at peak times or in the busier portions of the airspace. Unless participating in a published trial and with the prior agreement of the relevant ATS Providers, operators should not plan for a cruise climb regime in the NAT Region, or to utilise LRC or ECON FMS modes.

Common Errors:

The use of spurious names for unnamed fixes (typically extracted from navigation data bases) is to be avoided. In addition to being undefined the names fail to adhere to the format specified for fixes (five alphabetical characters) and so cause a syntax error in addition to the logical error. **ARINC 424 type position codes are not to be used.**

When specifying speeds in knots a leading zero is required if the speed is less than 1000 knots.

No blank spaces are to be inserted between speed and level.

The ICAO convention for specifying latitude and longitude in flight plan related messages differs from that used by data base vendors in that the hemisphere indicators (N/S, E/W) should follow, not precede, the numeric component. Therefore specifying a position as "N60W010" represents an error.

The use of FIR designators as fix names is invalid, these designators should only be used in the EET sub-item of Item 18. Some flight plans contain such designators in Item 15 to indicate the transition between two FIRs at an unnamed fix. This is a syntax error. The latitude and longitude should be used.

3.10 Item 16: Destination Aerodrome and Total Estimated Elapsed Time, Destination Alternate Aerodrome(s)

In the recent Amendment to Doc.4444 the title of Item 16 was clarified to specify that the 'alternate aerodrome(s)' being referred to is(are) the destination alternate aerodrome(s). Additionally, the provision related to estimated elapsed time was clarified, along with the descriptions of how to indicate the locations, as follows:

Destination aerodrome and total estimated elapsed time (8 characters)

INSERT the ICAO four-letter location indicator of the destination aerodrome as specified in Doc 7910,

Location Indicators,

OR if no location indicator has been assigned,

INSERT ZZZZ and SPECIFY in Item 18 the name and location of the aerodrome, preceded by DEST/.

THEN WITHOUT A SPACE

INSERT the total estimated elapsed time.

Destination alternate aerodrome(s)

INSERT the ICAO four-letter location indicator(s) of not more than two destination alternate aerodromes, as specified in Doc 7910, Location Indicators, separated by a space,

OR, if no location indicator has been assigned to the destination alternate aerodrome(s),

INSERT ZZZZ and SPECIFY in Item 18 the name and location of the destination alternate aerodrome(s), preceded by ALTN/.

Notes:

a) *Total Estimated Elapsed Time*
   i) *For IFR flights this is the total estimated time from take-off until arriving over the designated point from which it is intended that an Instrument Approach Procedure, defined by reference to navigation aids, will commence, or, if no navigation aid is associated with the destination aerodrome, until arriving over the destination aerodrome itself.*
   ii) *For VFR flights this is the total estimated time from take-off until arriving over the destination aerodrome.*
b) *For a flight plan received from an aircraft in flight, total estimated elapsed time starts from the first point of the route to which the flight plan applies*

3.11 Item 18 - Other Information:

Significant changes have been made to these provisions.

The provision was clarified to indicate that hyphens '-' or oblique strokes '/' should only be used as described.

The provision was amended such that only indicators described in the provisions may be used, and they must be inserted in the order shown. The indicators defined are as follows, and are listed in the order in which they are to be inserted, if used:

STS/ Reason for special handling by ATS, e.g. a search and rescue mission, as follows:

ALTRV: for a flight operated in accordance with an altitude reservation;

ATFMX: for a flight approved for exemption from ATFM measures by the appropriate ATS authority.

FFR: fire-fighting;
FLTCK: flight check for calibration of navaids;

HAZMAT: for a flight carrying hazardous

material;

HEAD: a flight with Head of State status;
HOSP: for a medical flight declared by medical authorities;

HUM: for a flight operating on a humanitarian mission;
MARSA: for a flight for which a military entity assumes responsibility for separation of military aircraft;

MEDEVAC: for a life critical medical emergency evacuation;
NONRVSM: for a non-RVSM capable flight intending to operate in RVSM airspace; SAR: for a flight engaged in a search and rescue mission; and
STATE: for a flight engaged in military, customs or police services.

Other reasons for special handling by ATS shall be denoted under the designator RMK/.

PBN/ Indication of RNAV and/or RNP capabilities. Include as many of the descriptors below, as apply to the flight, up to a maximum of 8 entries, i.e. a total of not more than 16 characters.

RNAV SPECIFICATIONS	
A1	RNAV 10 (RNP 10)
B1	RNAV 5 all permitted sensors
B2	RNAV 5 GNSS
B3	RNAV 5 DME/DME
B4	RNAV 5 VOR/DME
B5	RNAV 5 INS or IRS
B6	RNAV 5 LORANC
C1	RNAV 2 all permitted sensors
C2	RNAV 2 GNSS
C3	RNAV 2 DME/DME
C4	RNAV 2 DME/DME/IRU
D1	RNAV 1 all permitted sensors
D2	RNAV 1 GNSS
D3	RNAV 1 DME/DME
D4	RNAV 1 DME/DME/IRU

RNAV SPECIFICATIONS	
RNP SPECIFICATIONS	
L1	RNP 4
O1	Basic RNP 1 all permitted sensors
O2	Basic RNP 1 GNSS
O3	Basic RNP 1 DME/DME
O4	Basic RNP 1 DME/DME/IRU
S1	RNP APCH
S2	RNP APCH with BARO-VNAV
T1	RNP AR APCH with RF (special authorization
T2	RNP AR APCH without RF (special

Note: For flights intending to operate through the New York Oceanic East or Santa Maria Oceanic FIRs or through the WATRS Plus Airspace, RNAV 10 (RNP 10) or RNP 4 approval is required in order to benefit from reduced horizontal separations employed here. Any NAT HLA aircraft intending to also fly in these airspaces should ensure that its RNP approval status is also included in the flight plan. Annotate as PBN/A1 (for RNAV 10 (RNP 10)) or PBN/L1 (for RNP 4). (see Chapter 4 *– Note following paragraph 4.1.15).*

NAV/ Significant data related to navigation equipment, other than specified in PBN/, as required by the appropriate ATS authority. Indicate GNSS augmentation under this indicator, with a space between two or more methods of augmentation, e.g. NAV/GBAS SBAS

COM/ Indicate communications applications or capabilities not specified in Item 10a. DAT/ Indicate data applications or capabilities not specified in 10a..

SUR/ Include surveillance applications or capabilities not specified in Item 10b.

DEP/ Name and location `of departure aerodrome, if ZZZZ is inserted in Item 13, or the ATS unit from which supplementary flight plan data can be obtained, if AFIL is inserted in Item 13. For aerodromes not listed in the relevant Aeronautical Information Publication, indicate location as follows:

With 4 figures describing latitude in degrees and tens and units of minutes followed by “N” (North) or “S” (South), followed by 5 figures describing longitude in degrees and tens and units of minutes, followed by “E” (East) or “W” (West). Make up the correct number of figures, where necessary, by insertion of zeros, e.g. 4620N07805W (11 characters).

OR, Bearing and distance from the nearest significant point, as follows:

The identification of the significant point followed by the bearing from the point in the form of 3 figures giving degrees magnetic, followed by the distance from the point in the form of 3 figures expressing nautical miles. In areas of high latitude where it is determined by the appropriate authority that reference to degrees magnetic is impractical, degrees true may be used. Make up the correct number of figures, where necessary, by insertion of zeros, e.g. a point of 180° magnetic at a distance of 40 nautical miles from VOR “DUB” should be expressed as DUB180040.

OR, The first point of the route (name or LAT/LONG) or the marker radio beacon, if the aircraft has not taken off from an aerodrome.

DEST/ Name and location of destination aerodrome, if ZZZZ is inserted in Item 16. For aerodromes not listed in the relevant Aeronautical Information Publication, indicate location in LAT/LONG or bearing and distance from the nearest significant point, as described under DEP/ above.

DOF/ The date of flight departure in a six figure format (YYMMDD, where YY equals the year, MM equals the month and DD equals the day).

REG/ All aircraft intending to operate in the NAT Region shall insert the aircraft registration

Notes:

- *If the aircraft registration is missing, or if it is different from that contained in the AFN CONTACT message, the ground system will not establish a CPDLC connection with that aircraft.*
- *Hyphens contained in an aircraft registration must not be entered into the ICAO flight plan form.*

EET/ Followed by waypoints or FIR Boundary designators plus accumulated estimated elapsed times from take-off to such points.

For flights conducted in the NAT Region on random routes, accumulated estimated elapsed times will be required for:

a) The last domestic reporting point prior to ocean entry.

b) The oceanic entry point.

c) Each significant point described in Item 15. (see note 2)

d) The oceanic exit point.

e) The first reporting point on the domestic track.

For flights operating along the entire length of a NAT organised track, estimated elapsed times will be required for the commencement point of the track and for FIR boundaries.

For flights operating along the fixed ATS route network between NAM/CAR, no EETs are required.

Examples: EET/CAP0745 XYZ0830

EET/EISN0204

Notes: Elapsed times to the oceanic entry point (e.g. EGGX0105) are required by Shanwick, New York and Santa Maria OACCs only.

SEL/ SELCAL Code, for aircraft so equipped.

Note: As directed above, if no SELCAL code has been prescribed, this sub- item should be omitted rather than inserting such data as, e.g., SEL/NIL or SEL/NONE or SEL/ followed by no data.

TYP/ Type(s) of aircraft, preceded if necessary without a space by number(s) of aircraft and separated by one space, if ZZZZ is inserted in Item 9.

Example: TYP/2F15 5F5 3B2

CODE/ Aircraft address (expressed in the form of an alphanumerical code of six hexadecimal characters) when required by the appropriate ATS authority. Example: 'F00001' is the lowest aircraft address contained in the specific block administered by ICAO.

DLE/ En-route delay or holding, insert the significant point(s) on the route where a delay is planned to occur, followed by the length of delay using four figure time in hours and minutes (hhmm).

Example: DLE/MDG0030

OPR/ ICAO designator or name of the aircraft operating agency, if different from the aircraft identification in item 7.

ORGN/ The originator's 8 letter AFTN address or other appropriate contact details, in cases where the originator of the flight plan may not be readily identified, as required by the appropriate ATS authority.

Note.- In some areas, flight plan reception centres may insert the ORGN/ identifier and originator's AFTN address automatically

PER/ Aircraft performance data, indicated by a single letter as specified in the Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS, Doc 8168), Volume I - Flight Procedures, if so prescribed by the appropriate ATS authority.

ALTN/ Name of destination alternate aerodrome(s), if ZZZZ is inserted in Item 16. For aerodromes not listed in the relevant Aeronautical Information Publication, indicate location in LAT/LONG or bearing and distance from the nearest significant point, as described in DEP/ above.

RALT/ ICAO four letter indicator(s) for en-route alternate(s), as specified in Doc 7910, Location Indicators, or name(s) of en-route alternate aerodrome(s), if no indicator is allocated. For aerodromes not listed in the relevant Aeronautical Information Publication, indicate location in LAT/LONG or bearing and distance from the nearest significant point, as described in DEP/ above.

TALT/ ICAO four letter indicator(s) for take-off alternate, as specified in Doc 7910, Location Indicators, or name of take-off alternate aerodrome, if no indicator is allocated.

RIF/ The route details to the revised destination aerodrome, following by the ICAO four-letter location indicator of the aerodrome. The revised route is subject to reclearance in flight

Examples: RIF/DTA HEC

KLAX RIF/ESP G94 CLA YPPH

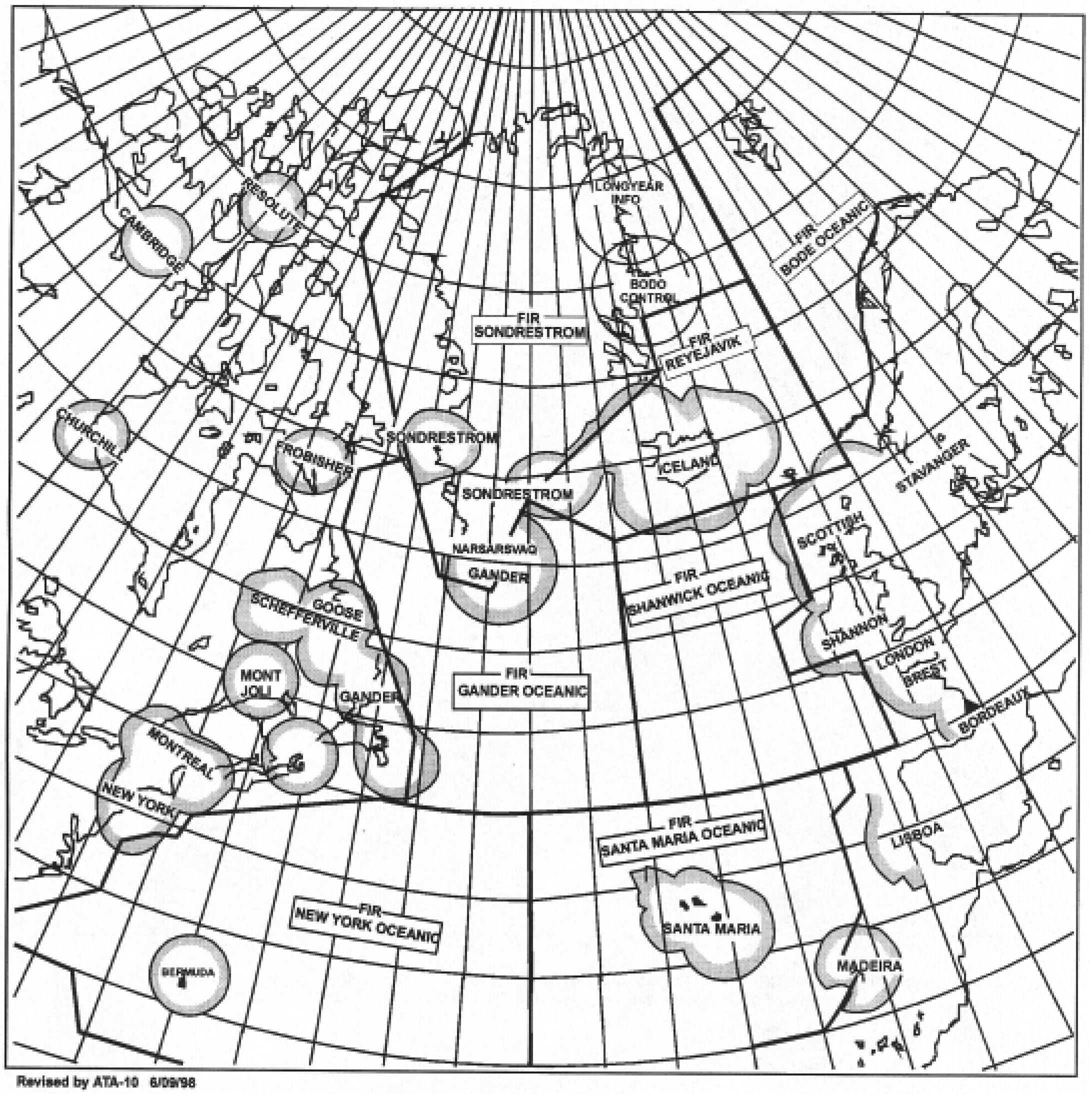
RMK/ Being a free text item, this is a useful sub-item for the inclusion of data only defined in particular regions (e.g. RMK/AGCS EQUIPPED RVR/800). Unrecognised sub-items embedded within the RMK/ sub-item would simply form part of the remarks and would not be processed. Hyphens must not be used in this sub-item.

ATTACHMENT 5

VHF AIR/GROUND COMMUNICATIONS COVERAGE EXISTING IN THE NAT REGION

Chart #1

VHF RADIO COVERAGE IN THE NAT REGION AT FL100 ***(Map to be updated)***



NOTE-

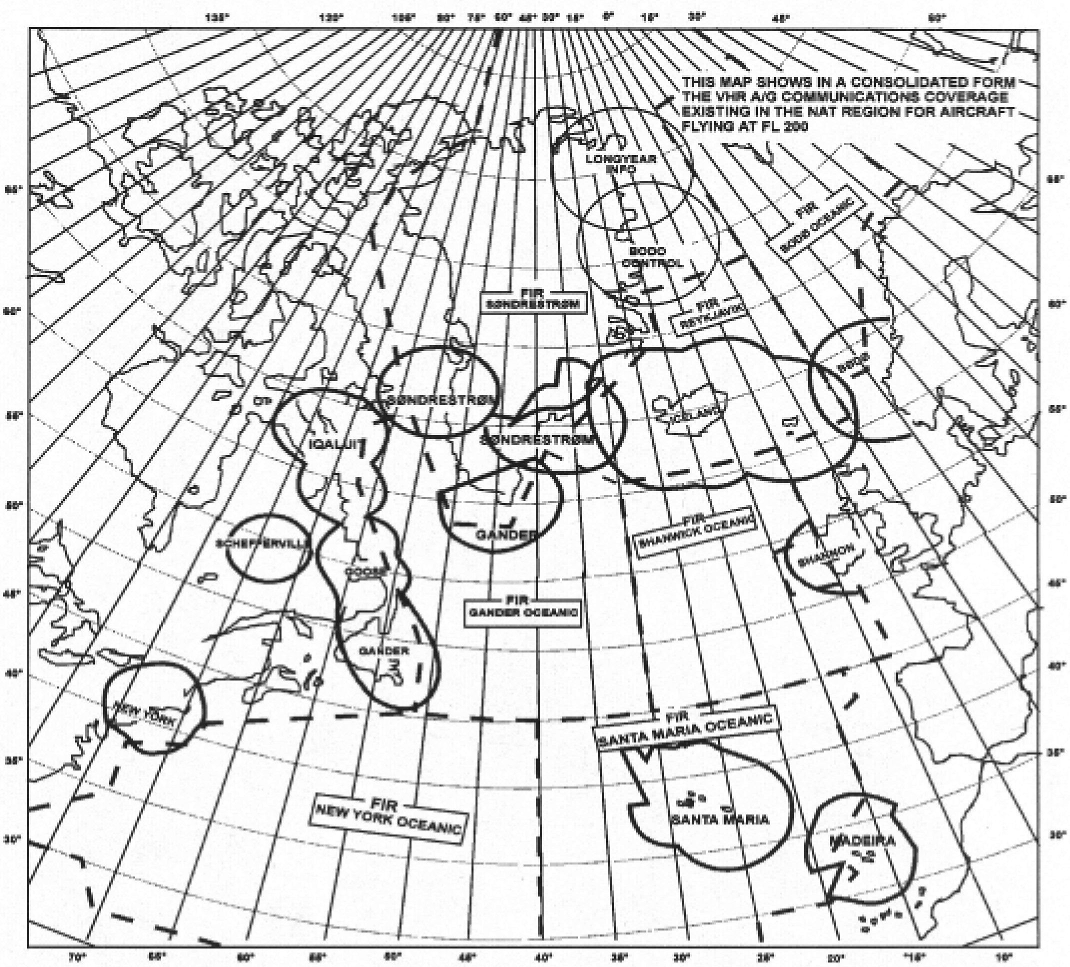
[1] The VHF cover depicted in the transition area between the NAT and the EUR Regions has only been shown to complete the picture of the communications cover. The VHF air/ground communication stations at Stavanger, Scottish, London, Brest, Bordeaux, and Lisboa do not form part of the communication system serving the NAT Region.

[2] The VHF cover provided by the Oaqatoqaq and Kulusuk stations in Greenland (Søndrestrøm) serves Søndrestrøm FIC only (below FL195)

[3] NARSARSVAQ information serves Søndrestrøm FIC only (below FL195).

Chart #2

VHF RADIO COVERAGE IN THE NAT REGION AT FL200 ***(Map to be updated)***

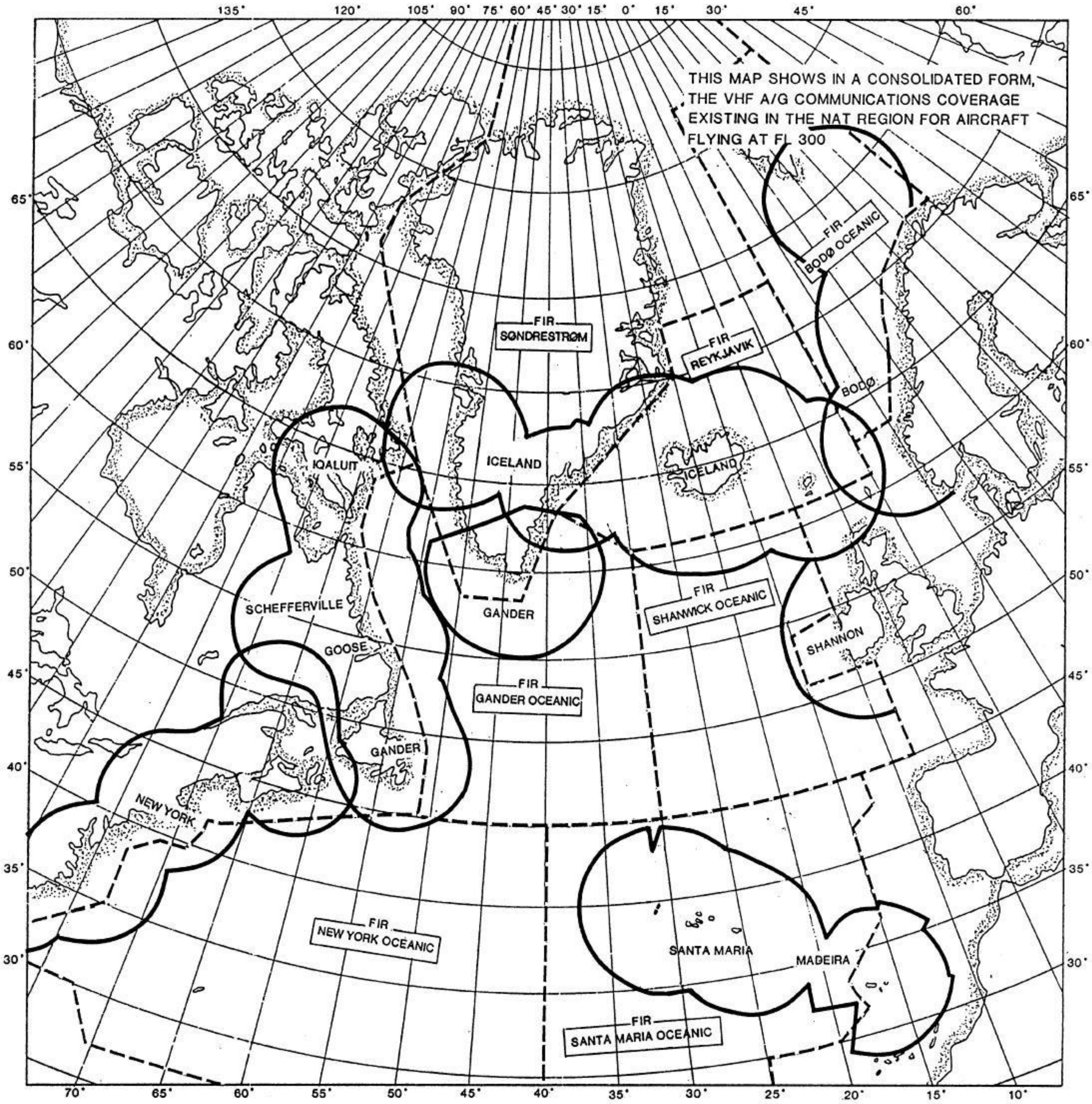


The VHF coverage provided by the QAQATOQAQ and KULUSUK stations in Greenland (Søndre Strømfjord), serves Søndre Strømfjord FIC only (below FL 195).

***NOTE** 1: The VHF cover depicted in the transition area between the NAT and the EUR Regions has only been shown to complete the picture of the communication cover. The VHF air/ground communication stations at Stavanger, Scottish, London, Brest, Bordeaux, and Lisboa do not form part of the communication system serving the NAT Region.*

Chart #3

VHF RADIO COVERAGE IN THE NAT REGION AT FL300 ***(Map to be updated)***



ATTACHMENT 6

NORTH ATLANTIC FLIGHT LEVEL ALLOCATION SCHEME

Flight Level Availability

1. *Introduction*

Following statistical analysis and discussions between the NAT ATSUs, the North Atlantic Flight Level Allocation System has been agreed to:

(i) Utilise additional levels, made available by RVSM expansion.

(ii) Standardise the flight level profiles available for eastbound traffic, originating in the New York/ Santa Maria areas, during the eastbound flow, with a view to incorporating the functionality of ADT links.

(iii) Ensure that economic profiles are available for westbound aircraft routing from Reykjavik OACC.

The procedures entail the establishment of a Night Datum Line, south of which is reserved principally for traffic originating in New York/ Santa Maria.

The procedures entail the establishment of a North Datum Line, on or north of which is reserved for late running westbound traffic from Reykjavik to Gander.

Aircraft Operators are advised that the altitude scheme described herein should primarily be used for Flight Planning using the flight levels specified in this document, relative to their particular flight(s). However, final altitude assignments will be assigned tactically by ATC, reference traffic, and that any requested altitude profile changes will be processed and approved if available.

Procedures

2. *General*

The westbound OTS signal will be published by Shanwick using FL310 to FL390. Gander will publish the eastbound OTS signal using FL310 to FL400. However, FL310 will only be used for “New York Tracks” as described in “*Eastbound Traffic originating in New York/Santa Maria, during the eastbound OTS*”, especially its 4th paragraph.

The activation times of the westbound OTS shall be published as 1130z to 1900z at 30W.

The activation times of the eastbound OTS shall be published as 0100z to 0800z at 30W.

3. *Delegated Opposite Direction Levels (ODLs)*

Gander will accept FL310 as a westbound level H24 subject to eastbound CAR/SAM traffic, as described in “*Eastbound Traffic originating in New York/Santa Maria, during the eastbound OTS*”.

During the eastbound OTS, a static Datum Line, known as the Night Datum Line, is established with the following co-ordinates:

45N030W 49N020W SOMAX ATSUR.

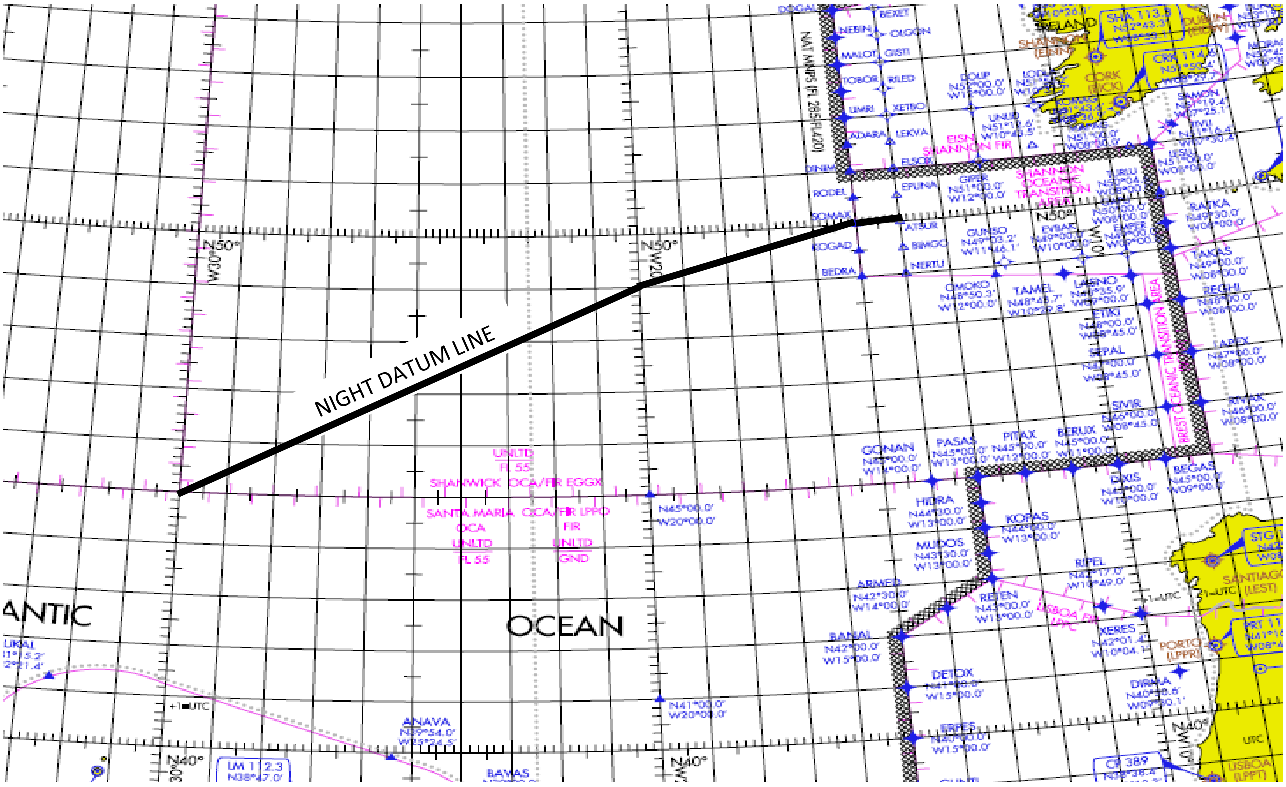
On and to the north of the Night Datum Line FL340 and FL380 are delegated to Gander for use by

Eastbound traffic.

To the south of the Night Datum Line FL340 will not be used for Gander eastbound traffic.

To the south of the Night Datum Line or the eastbound OTS, whichever is further South, FL340 and FL380 will not be used for Gander eastbound traffic.

During the westbound OTS, FL330 is delegated by Gander to Shanwick for use by westbound traffic.

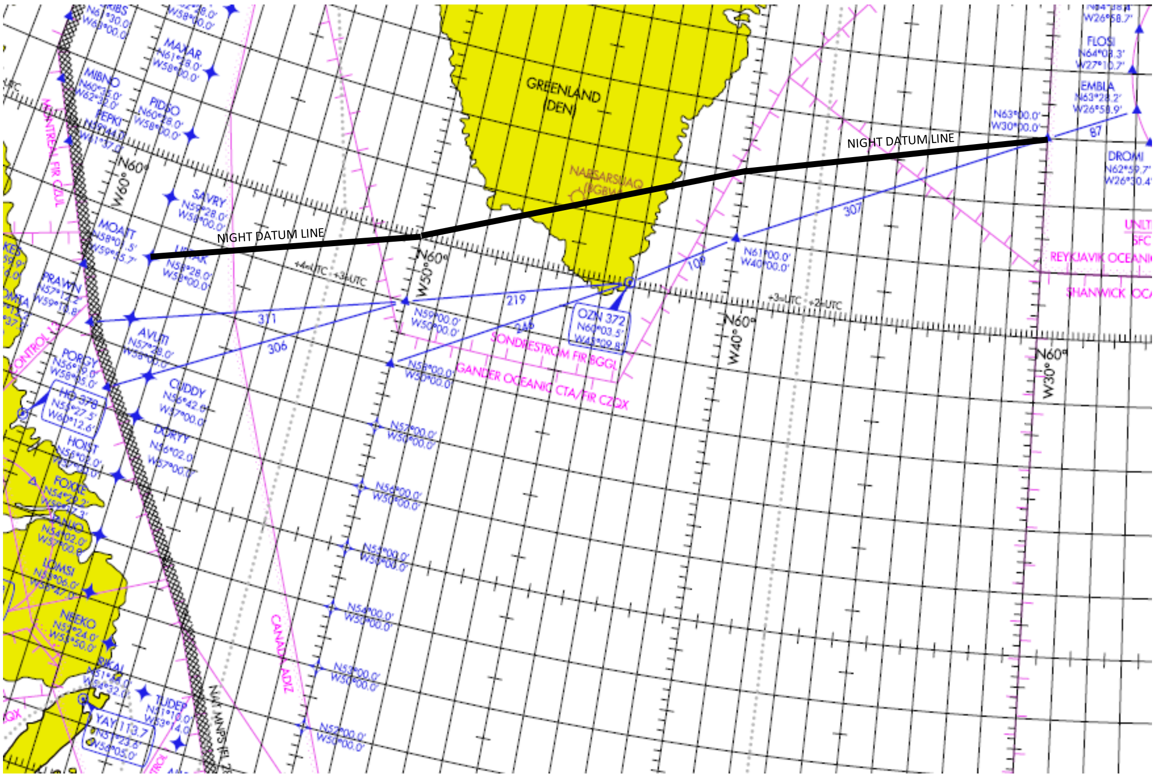


Between 0300Z and 0700Z, a static Datum Line, known as the North Datum Line, is established with the following coordinates:

URTAK 60N50W 62N40W 63N30W

On and to the north of the North Datum Line FL380 is delegated to Reykjavik for use by Westbound traffic.

In the event of a high volume of North Random Flights and/or OTS Tracks the North Datum Line may be suspended to accommodate the dominant Eastbound flow.



4. *Eastbound Traffic originating in New York/Santa Maria, during the eastbound OTS*

Eastbound traffic routing, both south of the Night Datum Line, and the main OTS, should flight plan using FL310, FL340, FL360 or FL380.

Eastbound traffic remaining south of the Night Datum Line should flight plan using FL310, FL340 FL380 or FL400.

The levels allocated to New York Tracks entering Shanwick which cross, or route south of, the Night Datum Line, may be any combination of FL310, FL340, FL360, FL380, or as otherwise agreed between Santa Maria and New York. Additional levels will be allocated to New York Tracks if the core OTS is located in that area.

For this procedure, "New York Tracks" are any eastbound OTS Tracks which originate in the New York area and enter Gander or Shanwick OACC.

5. *Iberian Tracks*

Iberian Tracks are eastbound or westbound organised Tracks, routing between New York and Santa Maria, and lying south of the core OTS, which do not enter Gander or Shanwick airspace.

The Flight Levels allocated to Iberian Tracks will normally be limited to FL350 and FL370, and can be adjusted to accommodate traffic if necessary as agreed between Santa Maria and New York.

OTS Design & Use

For all westbound Tracks which landfall at or north of AVUTI, Reykjavik require FL340 to be omitted from that Track to allow profiles for aircraft originating in the Reykjavik OCA.

During the westbound OTS validity times, Shanwick shall not clear westbound aircraft which landfall at or north of AVUTI at FL340, except random flights that remain clear of the OTS and Gander OCA. Such flights may be cleared at FL340 without prior coordination with Reykjavik.

Note: The effect of this particular ATS co-ordination restriction on Operators is that NAT flights originating from the Shanwick OCA which landfall at or between AVUTI and AVPUT should not be flight planned at FL340.

FL320 on eastbound OTS lying south of Shannon Oceanic Transition Area (SOTA) and which exit the Shanwick OCA at positions OMOKO or south, will be published as not being available as track levels after 0600z at 30W.

Note that Shanwick may tactically release FL320 back to Gander should there be insufficient demand on the TANGO routes, or that the demand on the eastbound tracks is sufficiently greater.

6. *Summary*

The availability of RVSM levels, between 0100z and 0800z (at 30W), is summarised in the following diagrams.

Diagram 1 below illustrates the use of the Night Datum line (coloured red) in a situation when there are no Gander eastbound NAT Tracks in the vicinity.

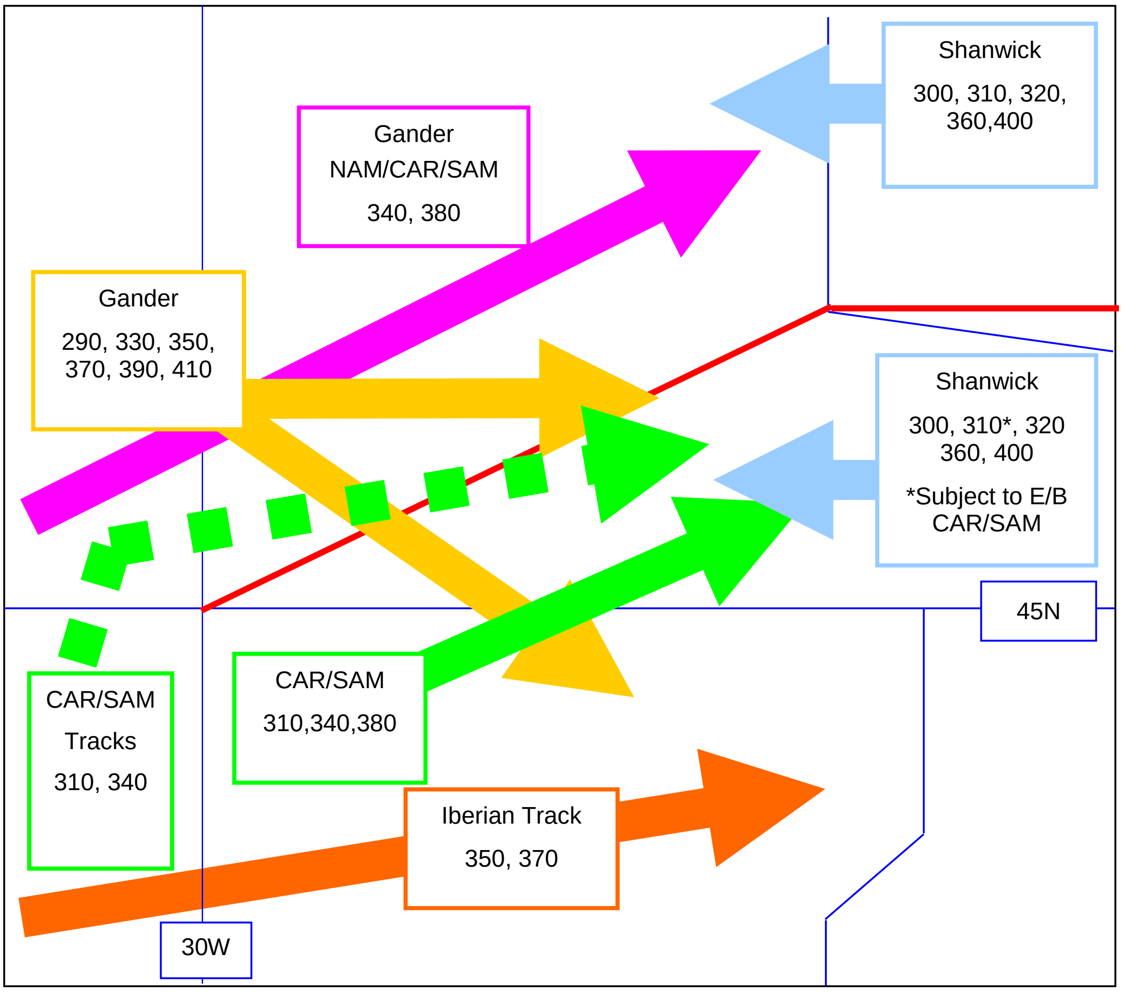
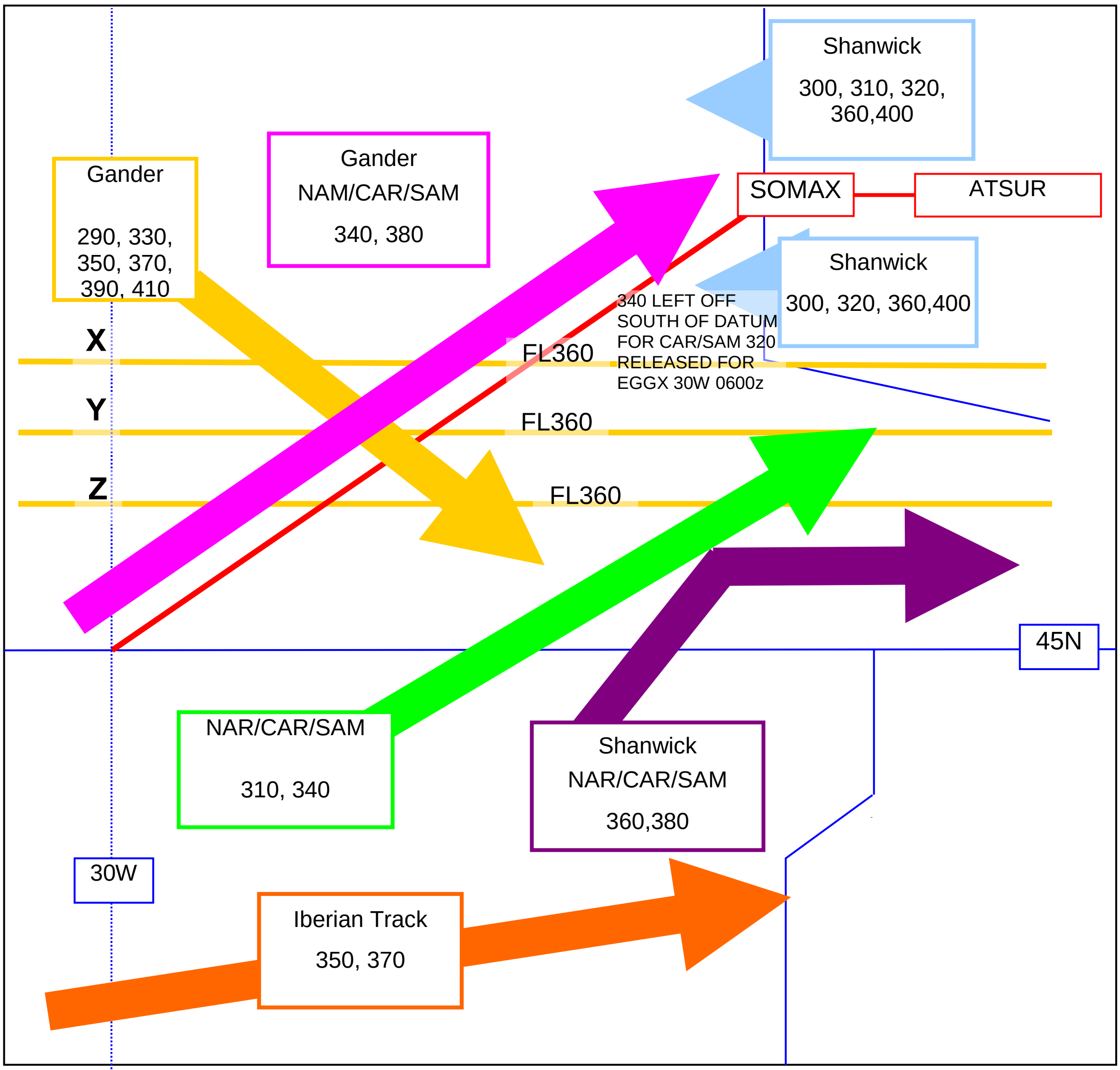


Diagram 1

Diagram 2 illustrates the situation when there are Gander eastbound NAT Tracks in the vicinity.



7.

Diagram 2

Transition Periods

The time period between one set of OTS expiring and another set commencing is known as the transition period. The following procedures are in place to accommodate the majority of aircraft:

8. ***Basic Principles:***

All times relate to 30W.

OTS Transition rules apply between 0801z to 1129z and 1901z to 0059z. During these times flight levels shall be applied in accordance with direction of flight other than as stated below.

9. ***General principles:***

Westbound traffic crossing 30W, 2230z to 0059z, shall remain clear of the incoming OTS and shall not use delegated ODLs (FL340 and FL380). After 2230z, the OTS and ODLs (F340 and FL380) are released to Gander, who may clear eastbound aircraft, taking cognisance of, and giving priority to, already cleared westbound aircraft.

Eastbound traffic crossing 30W 1000z to 1129z, shall remain clear of the incoming OTS at FL350 and shall not use delegated ODL (FL330). After 1000z, the OTS (at FL330 and FL350) and ODL (FL330) are released to Shanwick, who may clear westbound aircraft, taking cognisance of, and giving priority to, already cleared eastbound aircraft.

Eastbound traffic, at FL370 and FL390, crossing 30W 1030z to 1129z, shall remain clear of the incoming OTS. After 1030z, the OTS (at FL370 and FL390) are released to Shanwick, who may clear westbound aircraft, taking cognisance of, and giving priority to, already cleared eastbound aircraft.

At the day-OTS end-time, Westbound aircraft crossing 30W up to 1900z, at ODL~~s~~ (FL330) or on the OTS, shall have priority over eastbound aircraft. Eastbound aircraft shall be cleared, taking cognisance of, and giving priority to, already cleared westbound aircraft.

At the night-OTS end-time, Eastbound aircraft crossing 30W up to 0800z, at ODLs (F340, FL380) or on the OTS, shall have priority over westbound aircraft. Westbound aircraft shall be cleared, taking cognisance of, and giving priority to, already cleared eastbound aircraft.

The table below summarises the above:

Level	Time	Direction
FL430	H24	Westbound. May be Flight Planned as eastbound by non-RVSM aircraft.
FL410	H24	Eastbound.
FL400	0801 – 2229 2230 – 0059 0100 – 0800	Westbound. Westbound (avoiding OTS). Eastbound OTS (subject to westbounds). Westbound (avoiding OTS). Eastbound (OTS).
FL390	1901 – 1029 1030 – 1129 1130 – 1900	Eastbound. Eastbound (avoiding OTS). Westbound OTS (subject to eastbounds). Eastbound (avoiding OTS). Westbound (OTS).
FL380	0300 – 0700 0801 – 2229 2230 – 0059 0100 – 0800	Westbound (ODL, on and to the North of the North datum line). Westbound. Eastbound (subject to westbounds). Eastbound (OTS and ODL).
FL370	1901 – 1029 1030 – 1129 1130 – 1900	Eastbound. Eastbound (avoiding OTS). Westbound OTS (subject to eastbounds). Eastbound (avoiding OTS). Westbound (OTS).
FL360	0801 – 2229 2230 – 0059 0100 – 0800	Westbound. Westbound (avoiding OTS.) Eastbound OTS (subject to westbounds). Westbound (avoiding OTS). Eastbound (OTS).
FL350	1901 – 0959 1000 – 1129 1130 –2000	Eastbound. Eastbound (avoiding OTS). Westbound OTS (subject to eastbounds). Eastbound (avoiding OTS). Westbound (OTS).
FL340	0801 – 2229 2230 – 0059 0100 – 0800	Westbound. Eastbound (subject to westbounds). Eastbound OTS (subject to westbounds). Eastbound (OTS and ODL).
FL330	1901 – 0959 1000 – 1129	Eastbound. Westbound (subject to eastbounds).

Level	Time	Direction
	1130 – 1900	Westbound (OTS and ODL).
FL320	0801 – 2229 2230 – 0059 0100 – 0800	Westbound. Westbound (avoiding OTS). Eastbound OTS (subject to westbounds). Westbound (avoiding OTS). Eastbound (OTS).
FL310	H24	Westbound. (ODL).
FL300	H24	Westbound.
FL290	H24	Eastbound.

ATTACHMENT 7

OCEANIC CLEARANCES DELIVERY/FORMAT/CONTENT

OCEANIC CLEARANCE

There are three elements to an Oceanic Clearance: Route, Speed and level. These elements serve to provide for the three basic elements of separation: lateral, longitudinal and vertical

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

a) use of published VHF clearance delivery frequencies;

b) by HF communications to the OAC through the appropriate aeradio station (in accordance with specified timeframes

c) a request via domestic or other ATC agencies;

d) by data link, when arrangements have been made with designated airlines to request and receive clearances using on-board equipment (ACARS). Detailed procedures for its operation may vary. Gander, Shanwick, Santa Maria and Reykjavik OACs provide such a facility and the relevant operational procedures are published in national AIS and also as NAT OPS Bulletins which are available for download from the ICAO Paris website (see http://www.paris.icao.int/documents_open/subcategory.php?id=106). New York OAC uses the FANS 1/A CPDLC function to uplink oceanic clearances to all aircraft utilising CPDLC

Format of Oceanic Clearance messages delivered via voice

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

format: "OCEANIC CLEARANCE [WITH A <list of ATC info>]. <atc unit> CLEARS

<ACID> TO

<clearance

limit>, VIA <route>, FROM <entry point> MAINTAIN <level> [<speed>] [.<free text>]"

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

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

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

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

Delivery method for Oceanic Clearance messages delivered via voice

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

Example exchange

1. *Controller/radio operator:*

"DLH458- (ATC /radio operator´s unit callsign) - OCEANIC CLEARANCE WITH A LEVEL CHANGE AND SPEED CHANGE."

Pilot:

". (ATC /radio operator´s unit callsign) DLH458""

2. *Controller/radio operator:*

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

REVISIONS/AMENDMENTS

When delivering any subsequent Revisions/Amendments to previous delivered clearanceswhich 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 Oceanic Clearance Revision 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 an Oceanic Clearance Revision delivered via voice

1. *Controller/radio operator:*

"DLH458- 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 – Oceanic clearance to follow a NAT track when the details are "as filed" or "as requested".

Example 1a – Oceanic clearance delivered via voice (aeradio or clearance delivery), for a flight cleared on a NAT track GANDER OCEANIC CLEARS ABC123 TO PARIS CHARLES DE GAULLE VIA CARPE, NAT TRACK WHISKEY. FROM CARPE MAINTAIN FLIGHT LEVEL 330, MACH 082.	**Meaning** ABC123 is cleared to destination LFPG via oceanic entry point CARPE and NAT track W. The cleared oceanic flight level is FL330. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CARPE at FL330. If the flight is unable to cross CARPE at FL330 air traffic control must be advised immediately. The assigned true Mach number is M082. The flight must maintain this Mach from CARPE until landfall at BEGID. Any required or unexpected deviation must be immediately reported to air traffic control.
Example 1b – Oceanic clearance delivered via voice (DCPC), for a flight cleared on a NAT track ABC123 CLEARED TO PARIS CHARLES DE GAULLE VIA CARPE, NAT TRACK WHISKEY. FROM CARPE MAINTAIN FLIGHT LEVEL 330, MACH 082.	**Meaning** ABC123 is cleared to destination LFPG via oceanic entry point CARPE and NAT track W. The cleared oceanic flight level is FL330. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CARPE at FL330. If the flight is unable to cross CARPE at FL330 air traffic control must be advised immediately. The assigned true Mach number is M082. The flight must maintain this Mach from CARPE until landfall at BEGID. Any required or unexpected deviation must be immediately reported to air traffic control.

Example 1c – the same clearance delivered via data link using the ED/106 Standard CLX 1259 060224 CYQX CLRNCE 026 ABC123 CLRD TO LFPG VIA CARPE NAT W CARPE 54N050W 56N040W 57N030W 57N020W BILTO BEGID FM CARPE/1348 MNTN F330 M082 END OF MESSAGE	**Meaning** Data link clearance number 026, sent from the Gander Area Control Centre at 1259 UTC on 24 February 2006. ABC123 is cleared to destination LFPG via oceanic entry point CARPE and NAT track W. NAT track W is defined as CARPE, 54N050W, 56N040W 57N030W 57N020W BILTO to the landfall point BEGID. The clearance is based upon an expectation that ABC123 will reach CARPE at 1348. If the flight crew estimate differs from this time by 3 minutes or more, the flight should advise the current air traffic controller. The cleared oceanic flight level is FL330. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CARPE at FL330. If the flight is unable to cross CARPE at FL330 air traffic control must be advised immediately. The assigned true Mach number is M082. The flight must maintain this Mach from CARPE until landfall at BEGID. Any required or unexpected deviation must be immediately reported to air traffic control.

Example 2 – Oceanic clearance to follow a random route when the details are "as filed" or "as requested".

Example 2a – Oceanic clearance delivered via voice (aeradio or clearance delivery) for a flight cleared on a random route. GANDER CENTRE CLEARS ABC456 TO LONDON HEATHROW VIA CRONO, 52 NORTH 050 WEST, 53 NORTH 040 WEST, 53 NORTH 030 WEST, 52 NORTH 020 WEST, LIMRI, XETBO. FROM CRONO MAINTAIN FLIGHT LEVEL 350, MACH 080.	**Meaning** ABC456 is cleared to destination EGLL via oceanic entry point CRONO, 52N050W, 53N040W, 53N030W, 52N020W, LIMRI to the landfall point XETBO. The cleared oceanic flight level is FL350. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CRONO at FL350. If the flight is unable to cross CRONO at FL350 air traffic control must be advised immediately. The assigned true Mach number is M080. The flight must

Example 2b – Oceanic clearance delivered via voice (DCPC) for a flight cleared on a random route.	**Meaning**
ABC456 CLEARED TO LONDON HEATHROW VIA CRONO, 52 NORTH 050 WEST, 53 NORTH 040 WEST, 53 NORTH 030 WEST, 52 NORTH 020 WEST, LIMRI, XETBO. FROM CRONO MAINTAIN FLIGHT LEVEL 350. MACH 080.	ABC456 is cleared to destination EGLL via oceanic entry point CRONO, 52N050W, 53N040W, 53N030W, 52N020W, LIMRI to the landfall point XETBO. The cleared oceanic flight level is FL350. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CRONO at FL350. If the flight is unable to cross CRONO at FL350 air traffic control must be advised immediately. The assigned true Mach number is M080. The flight must maintain this Mach from CRONO until landfall at XETBO. Any required or unexpected deviation must be immediately reported to air traffic control.
Example 2c – the same clearance delivered via data link using the ED/106 Standard	**Meaning**
CLX 1523 060530 CYQX CLRNCE 118 ABC456 CLRD TO EGLL VIA CRONO RANDOM ROUTE CRONO 52N050W 53N040W 53N030W 52N020W LIMRI XETBO FM CRONO/1632 MNTN F350 M080 END OF MESSAGE	Data link clearance number 118, sent from the Gander Area Control Centre at 1523 UTC on 30 May 2006. ABC456 is cleared to destination EGLL via oceanic entry point CRONO and then a random route. The detailed route description is CRONO 52N050W 53N040W 53N030W 52N020W LIMRI to the landfall point XETBO. The clearance is based upon an expectation that ABC456 will reach CRONO at 1632. If the flight crew estimate differs from this time by 3 minutes or more, the flight should advise the current air traffic controller. The cleared oceanic flight level is FL350. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CRONO at FL350. If the flight is unable to cross CRONO at FL350 air traffic control must be advised immediately. The assigned true Mach number is M080. The flight must maintain this Mach from CRONO until landfall at XETBO. Any required or unexpected deviation must be immediately reported to air traffic control.

Example 2d – Similar clearance, delivered via HF, relayed through ARINC	**Meaning**
ATC CLEARS ABC123 CLEARED DESTINATION AIRPORT UUDD DIRECT BALOO 36N060W 38N050W 43N045W 47N040W 52N030W 56N020W BALIX UP59 NINEX. MAINTAIN FLIGHT LEVEL 330. MAINTAIN MACH POINT EIGHT TWO.	ABC123 is cleared to Moscow via the route specified. The altitude, route and speed elements of the Oceanic Clearance are derived from the aircraft’s current route, altitude and speed. These may change prior to entering or exiting oceanic airspace via an ATC clearance to do so. At all times, the aircraft is expected to maintain the route, altitude and speed last assigned by ATC.

Example 3 – Oceanic clearance, change to the flight plan route

Example 3a – Oceanic clearance delivered via voice (aeradio or clearance delivery), where the route differs from the flight plan route OCEANIC CLEARANCE WITH A REROUTE. GANDER OCEANIC CLEARS ABC456 TO LONDON HEATHROW VIA CRONO, 52 NORTH 050 WEST, 53 NORTH 040 WEST, 53 NORTH 030 WEST, 52 NORTH 020 WEST, LIMRI, XETBO. FROM CRONO MAINTAIN FLIGHT LEVEL 350, MACH 080.	**Meaning** The route included in the oceanic clearance is not the same as the flight plan route. ABC456 is cleared to destination EGLL via oceanic entry point CRONO, 52N050W, 53N040W, 53N030W, 52N020W, LIMRI to the landfall point XETBO. The cleared oceanic flight level is FL350. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CRONO at FL350. If the flight is unable to cross CRONO at FL350 air traffic control must be advised immediately. The assigned true Mach number is M080. The flight must maintain this Mach from CRONO until landfall at XETBO. Any required or unexpected deviation must be immediately reported to air traffic control.
Example3b –Oceanic clearance delivered via voice (DCPC), where the route differs from the flight plan route OCEANIC CLEARANCE WITH A REROUTE. ABC456 CLEARED TO LONDON HEATHROW VIA CRONO, 52 NORTH 050 WEST, 53 NORTH 040 WEST, 53 NORTH 030 WEST, 52 NORTH 020 WEST, LIMRI, XETBO. FROM CRONO MAINTAIN FLIGHT LEVEL 350, MACH 080.	**Meaning** The route included in the oceanic clearance is not the same as the flight plan route. ABC456 is cleared to destination EGLL via oceanic entry point CRONO, 52N050W, 53N040W, 53N030W, 52N020W, LIMRI to landfall point XETBO. The cleared oceanic flight level is FL350. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CRONO at FL350. If the flight is unable to cross CRONO at FL350 air traffic control must be advised immediately. The assigned true Mach number is M080. The flight must maintain this Mach from CRONO until landfall at XETBO. Any required or unexpected deviation must be immediately reported to air traffic control.

Example 3c – the same clearance delivered via data link using the ED/106 Standard	**Meaning**
CLX 1523 060530 CYQX CLRNCE	Data link clearance number 118, sent from the Gander Area Control Centre at 1523 UTC on 30 May 2006.
118 ABC456 CLRD TO EGLL VIA CRONO RANDOM ROUTE	ABC456 is cleared to destination EGLL via oceanic entry point CRONO and then a random route.
CRONO 52N050W 53N040W 53N030W 52N020W LIMRI DOLIP	The detailed route description is CRONO 52N050W 53N040W 53N030W 52N020W LIMRI to landfall point XETBO.
M CRONO/1632 MNTN F350 M080	The clearance is based upon an expectation that ABC456 will reach CRONO at 1632. If the flight crew estimate differs from this time by 3 minutes or more, the flight should advise the current air traffic controller.
ATC/ ROUTE AMENDMENT	The cleared oceanic flight level is FL350. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CRONO at FL350. If the flight is unable to cross CRONO at FL350 air traffic control must be advised immediately.
END OF MESSAGE	The assigned true Mach number is M080. The flight must maintain this Mach from CRONO until landfall at DOLIP. Any required or unexpected deviation must be immediately reported to air traffic control.

Example 3d – Revised oceanic clearance delivered via data link using the ED/106 Standard	**Meaning**
CLX 1558 060530 CYQX CLRNCE 135 ABC456 CLRD TO EGLL VIA CRONO RANDOM ROUTE	Data link clearance number 135 sent from the Gander OceanicArea Control Centre at 1558 UTC on 30 May 2006. ABC456 is cleared to destination EGLL via oceanic entry point CRONO and then a random route.
CRONO 52N050W 53N040W 53N030W 53N020W LIMRI XETBO	The detailed route description is CRONO 52N050W 53N040W 53N030W 52N020W LIMRI to landfall point XETBO.
FM CRONO/1702 MNTN F340 M082 ATC/ ROUTE AMENDMENT LEVEL CHANGE MACH CHANGE	The clearance is based upon an expectation that ABC456 will reach CRONO at 1702. If the flight crew estimate differs from this time by 3 minutes or more, the flight should advise the current air traffic controller.
	The cleared oceanic flight level is FL340. The flight should ensure that an air traffic control clearance is obtained in sufficient time to allow the flight to cross CRONO at FL340. If the flight is unable to cross CRONO at FL340 air traffic control must be advised immediately.
	The assigned true Mach number is M082. The flight must maintain this Mach from CRONO until landfall at XETBO. Any required or unexpected deviation must be immediately reported to air traffic control.
	The cleared route, oceanic flight level and assigned true Mach number have been revised from those contained in the previously sent oceanic clearance.
RECLEARANCE 1 END OF MESSAGE	This is the first revision to the originally sent oceanic clearance.
Example 3e – Similar clearance, delivered via HF, relayed through ARINC	**Meaning**
ATC CLEARS ABC123 CLEARED DESTINATION AIRPORT UUDD DIRECT BALOO 36N060W 38N050W 43N045W 47N040W 52N030W 54N020W DOGAL BEXET. MAINTAIN FLIGHT LEVEL 330. MAINTAIN MACH POINT EIGHT TWO, ROUTE HAS BEEN CHANGED.	ABC123 is cleared to Moscow via the route specified. The altitude and speed elements of the Oceanic Clearance are derived from the aircrafts current altitude and speed. These may change prior to entering or exiting oceanic airspace via an ATC clearance to do so. At all times, the aircraft is expected to maintain the route, altitude and speed last assigned by ATC. In this particular case, the route of flight that is issued in the Oceanic Clearance is not the same as that filed in the FPL. The aircraft is advised of the fact that it is receiving an airborne reroute by the statement “ROUTE HAS BEEN CHANGED”.

Example 4 – Re-route clearances

Example 4a –Revised route clearance delivered via voice (aeradio) ABC123 AMENDED ROUTE CLEARANCE SHANWICK OCEANIC RE-CLEARS ABC123 AFTER 57 NORTH 20 WEST TO 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 4b –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 4c – 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 5 – level clearances – no restrictions

Example 5a –Revised level clearance delivered via voice (aeradio) 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 FL340. If the instruction to "report leaving" is included, flight is to report leaving its current level. The flight is to report reaching FL340.
Example 5b –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 FL340. If the instruction to "report leaving" is included, flight is to report leaving its current level. The flight is to report reaching FL340.

Example 5c – 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 FL320, is cleared to climb to and maintain FL340. The flight is to send a CPDLC downlink message to report leaving FL320 and to send another CPDLC downlink message to report when the flight has levelled at FL340.

Example 6 – level clearances – with geographic restrictions/conditions

Example 6a –Revised level clearance delivered via voice (aeradio) – 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 FL320. Climb must be arranged so that the flight is level in sufficient time to cross 41N020W already level at FL320. The flight is to report leaving its current level and also to report reaching FL320.
Example 6b – 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 FL320. Climb must be arranged so that the flight is level in sufficient time to cross 41N020W level at FL320. The flight is to report leaving its current level and also to report reaching FL320.
Example 6c –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 FL320. Climb must be arranged so that the flight is level in sufficient time to cross 41N020W already level at FL320. The flight is to report leaving its current level and also to report reaching FL320.
Example 6d - 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 FL310, is cleared to climb to and maintain FL320. Climb must be arranged so that the flight is level in sufficient time to cross 41N020W already level at FL320. The flight is to send a CPDLC downlink message to report leaving FL310 and to send another CPDLC downlink message to report when the flight has levelled at FL320.

Example 6e – Revised level clearance delivered via voice (aeradio) – 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 FL300, is cleared to climb to and maintain FL320; 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 FL320. 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 6f – 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 FL300, is cleared to climb to and maintain FL320; 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 FL320. 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 6g – 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 FL300, is cleared to climb to FL320; however, climb must not commence until the flight reaches 41N020W. The flight is to send a CPDLC downlink message to report leaving FL300 and to send another CPDLC downlink message to report when the flight has levelled at FL320. 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 7 – level clearances – with time restrictions/conditions

Example 7a – Revised level clearance delivered via voice (aeradio) –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 FL320. Climb must be arranged so that the flight is level at FL320 no later than 1337 UTC. The flight is to report leaving its current level and also to report reaching FL320.
Example 7b –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 FL320. Climb must be arranged so that the flight is level at FL320 no later than 1337 UTC. The flight is to report leaving its current level and also to report reaching FL320.
Example 7c – the same clearance delivered via CPDLC CLIMB TO REACH F320 BY 1337 REPORT LEAVING F310 REPORT LEVEL F320	**Meaning** ABC123, which is currently at FL310, is cleared to climb to and maintain FL320. Climb must be arranged so that the flight is level at FL320 no later than 1337 UTC. The flight is to send a CPDLC downlink message to report leaving FL310 and to send another CPDLC downlink message to report when the flight has levelled at FL320.
Example 7d – Revised level clearance delivered via voice (aeradio) –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 FL300, is cleared to climb to and maintain FL320; however, climb cannot be commenced until 1337 UTC, or later. The flight is to report leaving its current level and also to report reaching FL320. 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 7e – 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 FL300, is cleared to climb to and maintain FL320; however, climb cannot be commenced until 1337 UTC, or later. The flight is to report leaving its current level and also to report reaching FL320. 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 7f – 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 FL300, is cleared to climb to FL320; however, climb must not commence until 1337 UTC. The flight is to send a CPDLC downlink message to report leaving FL300 and to send another CPDLC downlink message to report when the flight has levelled at FL320. 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 8 – time restrictions/conditions – reach a point no later than a specified time

Example 8a – time restriction delivered via voice (aeradio), 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 8b – 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 8c – 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 8d – time restriction delivered by aeradio 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 8e – 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 9 – time restrictions/conditions – cross a point no earlier than a specified time

Example 9a–. time restriction delivered via voice (aeradio) – 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 9b–. 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 9c – 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 9d – time restriction delivered by aeradio 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 9e – 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 8

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 problems in this area are produced mainly by frontal depressions. Hurricanes and tropical storms affect the southern regions of the North Atlantic 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 in the winter. 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 Canaries 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 FL235 in the area near the highest terrain, and FL190 over the icecap. On the route between Søndrestrøm and Kulusuk the lowest usable flight level in general is about FL130. 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 FL130. On the route from Nuuk/Godthaab towards Iceland either direct or via Kulusuk NDB, the lowest usable flight level will often be FL150. 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 center of the sun's disc is 6 degrees below the horizon, and begins in the morning when the center 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 and 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 FL120.

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 FL075.

6. WATER TEMPERATURES

6.1 In conjunction with changeable weather, the water in the North Atlantic is cold.The following temperatures were taken from the Bunkor Climate Atlas of the North Atlantic and represent average temperatures based on data assembled between 1941 and 1972. All values are in degrees Celsius.

	Frobisher	**Goose Bay**	**Labrador Sea**	**South Greenland**
Jan.	0°	0°	2°	2-4°
Feb.	0°	0°	2°	2-4°
Mar.	0°	0°	2°	2-4°
Apr.	0°	0°	2°	2-4°
May	2°	2°	2°	2-4°
Jun.	2°	4°	2°	2-4°
Jul.	4°	6°	2°	2-4°
Aug.	6°	6-8°	8-10°	6-8°
Sep.	6°	6°	2°	2-4°
Oct.	4°	4°	2°	2-4°
Nov.	2°	2°	2°	2-4°
Dec.	0°	0°	2-4°	2-4°

7. HYPOTHERMIA

7.1 Causes

7.1.1 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.

7.1.2 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.

7.1.3 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).

7.2 Symptoms

7.2.1 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.

7.2.2 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 movementsare 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 centers 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.

7.3 Treatment

7.3.1 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.

7.4 Prevention

7.4.1 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.

7.4.2 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.

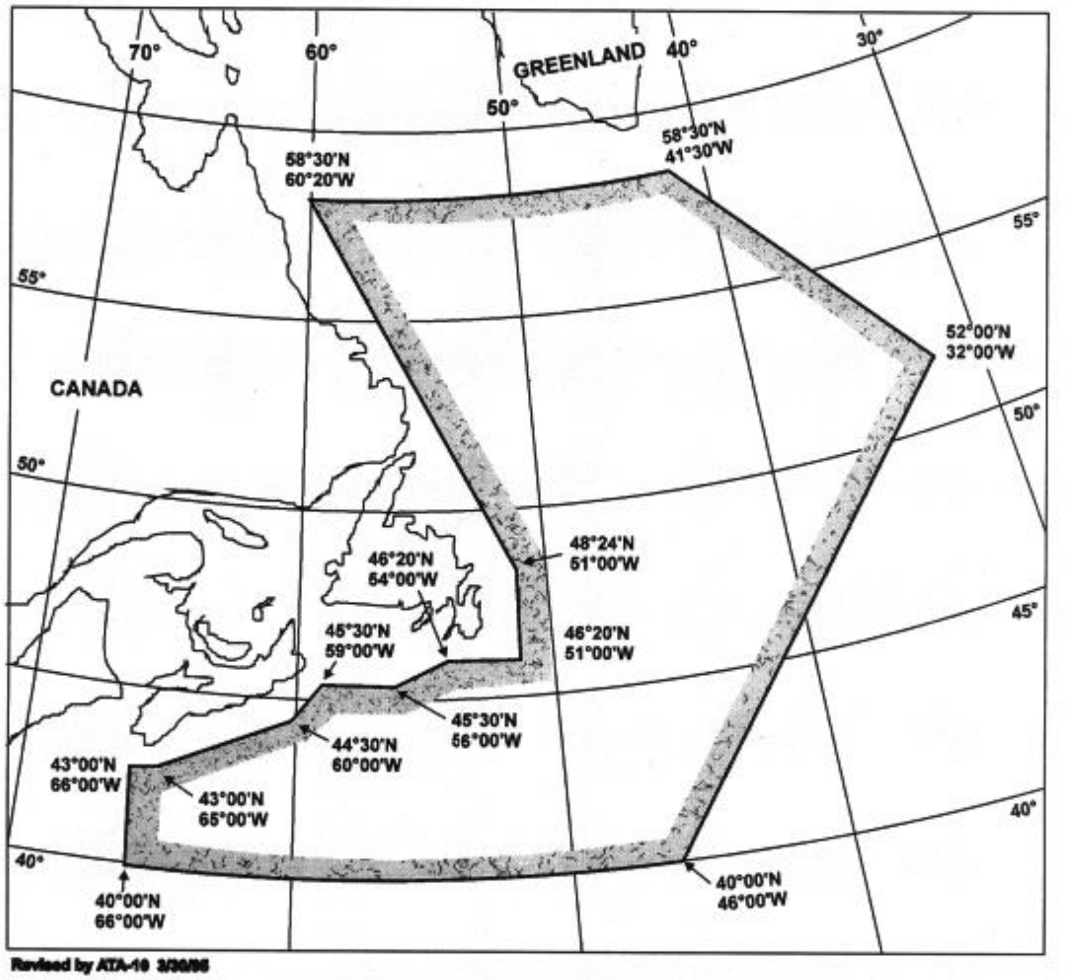
7. Distribute candies or other nibble food.

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.

7. PERMANENT MILITARY OPERATIONS

8.1 AREA ELK FL 50 AND BELOW



8.2 Maritime surveillance aircraft conduct daily all-weather operational flights in Area ELK. These aircraft are required to operate on various headings and altitudes up to and including FL50 and to make rapid climbs and descents without prior warning. Because of operational considerations they operate without navigation or identification lights during the hours of darkness and often without SIF/IFF.

8.3 The Canadian Maritime COmmand (CANMARCOM) provides advisory information between maritime aircraft and other aircraft in Area ELK based on known air traffic.

8.4 Standard pressure setting 29.92 inches is used for transit and separation within the entire area.

8.5 In the interest of flight safety it is essential that CANMARCOM be informed in advance of all flights or proposed flight in or through Area ELK. Aircraft flight level(s), track and approximate times of ELK penetration and exit are required. Military aircraft are encouraged to communicate directly with CANMARCOM. On prior request, frequencies will be assigned on which to report position and obtain ELK clearance. ASW aircraft will be routed clear of all known military and civil traffic.

8.6 CANMARCOM may be contacted by the following means:

a) Letter to Commander maritime Command, Halifax, N.S., Canada.
b) Message to MOC HALIFAX.
c) Telephone Maritime Operations Centre 902-427-2501, 902 427 2502, Autovon 447-2502.
d) On request of the pilot when filing flight plans at departure points in North America, aircraft flight plans may be relayed through ATC channels to Moncton ACC for Maritime Command Operations.
e) In-flight position reports or advisories when not transmitted directly as in paragraph 4 above may be relayed through Gander or MonctonACC. These messages should specify "Pass to Maritime Operations Centre."

ATTACHMENT 9

NORTH ATLANTIC ATS SURVEILLANCE COVERAGE CHARTS

(RADAR COVERAGE)
(ADS-B COVERAGE)

CHARTS CURRENTLY UNDER PRODUCTION.

IN THE MEANTIME CONSULT NATIONAL AIPs

ATTACHMENT 10

BIBLIOGRAPHY AND OTHER REFERENCE MATERIAL

Australian Civil Aviation Order 20.18 Appendix XI

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* (PBN) Performance-Based Navigation Manual

www.icao.int

ICAO NAT HF Guidance Material (NAT Doc 003)

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > NAT Doc 003

ICAO Sample Oceanic Checklist

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > NAT OES Bulletins

* ICAO saleable documents - Please contact ICAO Headquarters, Montreal sales@icao.int

ICAO Sample Oceanic Expanded Checklist

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > NAT OES Bulletins

ICAO Oceanic Errors Safety Bulletin

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > NAT OES Bulletins

ICAO NAT OPS Bulletins

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > NAT OPS Bulletins

ICAO Global Operational Data Link Document (GOLD)

www.icao.int/EURNAT/ > EUR & NAT Documents > NAT Documents > GOLD

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 Traffic Density Analyser (TDA)

https://extranetapps.navcanada.ca/NATTDA/TDAListing.aspx?reqDirection=East

Canadian Flight Supplement - A saleable document which can be ordered via**:**

http://products.navcanada.ca

JAA TGL-6 –Revision 1

EASA AMC 20-24

easa.europa.eu/system/files/dfu/Annex%20II%20-%20AMC%2020-24.pdf

ETSO-C129a

www.easa.europa.eu/ws_prod/g/doc/Agency_Mesures/Certification%20Spec/CS-ETSO.pdf

Iceland AIP

www.isavia.is

Ireland AIP

www.iaa.ie/safe_reg/iaip/

RTCA DO 260/A/B

www.rtca.org/Files/ListofAvailableDocsMarch2013.pdf

UK AIP

www.ais.org.uk

UK "TrackWise" video

https://www.youtube.com/watch?v=EJTjwW5ZYas

USA FAA TSO-C129 (GPS Certification)

www.airweb.faa.gov

USA FAA AC 20-138D (Airworthiness Approval of GPS)

www.airweb.faa.gov

USA FAA AC 20-165A (Airworthiness Approval of ADS-B)

www.airweb.faa.gov

USA FAA AC91-85 (RVSM MASPSs)

www.faa.gov/air_traffic/separation_standards/rvsm/

USA FAA NAT Resource Guide for U.S. Operators

www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs400/afs470/media/NAT.pdf

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 (WATRS)

http://www.faa.gov/pilots/intl/oceanic_ops/

USA US Coastguard GPS NOTAMs

www.navcen.uscg.gov

— END —