NAT SPG/34

Summary of Discussions and Conclusions of the

Thirty-Fourth Meeting of the

North Atlantic Systems Planning Group

Brussels, 8 to 12 June 1998

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FOREWORD

i. Introduction

i.1 The Thirty-Fourth Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in the premises of Eurocontrol, Brussels from 8 to 12 June 1998. Mr Myles Murphy, the Member for Ireland, chaired the meeting.

i.2 In addition to the International Air Carriers Association (IACA), the International Aircraft Owners and Pilots Association (IAOPA), the International Air Transport Association (IATA), the International Business Aviation Council (IBAC), the International Federation of Air Line Pilots Associations (IFALPA), the International Federation of Air Traffic Controllers Associations (IFATCA) and the International Maritime Satellite Organization (Inmarsat), the Group had, as usual, invited the Russian Federation and Spain to attend the meeting as observers. A list of participants is at page 3.

i.3 The Mathematicians' Working Group (MWG) had met in Eurocontrol Brussels from 2 to 5 June 1998 to consider the mathematical and statistical aspects of the safety of separation minima in the NAT Region and to ensure that the Target Levels of Safety (TLS) were being met. **Mr Keith Slater** of the United Kingdom, the Rapporteur of the MWG, presented their report in support of the assessment of current system safety performance in terms of lateral, vertical and longitudinal collision risk.

i.4 The sub-group charged with the scrutiny of navigation performance in the NAT Region, which was chaired by **Mr Jim Benson** of the United Kingdom, had met in London on 12 May 1998 provided the NAT SPG with their report.

i.5 The Aeronautical Communications Sub Group (ACSG) had carried out its work by correspondence and had reviewed matters related to the NAT aeronautical telecommunications infrastructure. **Mr Phonsie O'Connor** of Ireland, in his capacity of rapporteur, provided the NAT SPG with their report.

i.6 The North Atlantic Implementation Management Group (NAT IMG) had met twice since NAT SPG/33 in order to develop the plans for the implementation of Reduced Vertical Separation Minimum (RVSM) and for the implementation of the ICAO Communications Navigation Surveillance/Air Traffic Management (CNS/ATM) systems in the NAT Region. Mr Myles Murphy, the Chairman of the NAT IMG, provided the NAT SPG with a progress report.

i.7 The NAT Operations Managers (OPS MNG) had met in New York from 4 to 5 September 1997 in order to address short term operational issues.

i.8 Mr Jacques Vanier from the ICAO European and North Atlantic (EUR/NAT) Office acted as Secretary of the meeting on behalf of Mr Christian Eigl who was unable to attend because of other commitments. To this effect, Mr Christian Eigl offered his apologies to the meeting. Mr Robert Kruger, Technical Officer for Communications Navigation Surveillance (CNS) from the EUR/NAT Office of ICAO and Mrs Olga Recasens, Chief of the Joint Financing Section from ICAO Headquarters, assisted the Secretary.

i.9 In his opening remarks, the Chairman welcomed Mr Jack Butt, the new Member for Canada and Mr Chuck Reavis the new Member of the United States of America. He also took the occasion to express the Group's appreciation for the work that had been carried out by Mr Don MacKeigan from Canada and Mr Gerry Richard from the United States of America, the out-going members. In addition, Mr Keith Slater was welcomed as the new rapporteur of the MWG. In this connection, the member for the United Kingdom

was requested to pass on the NAT SPG's appreciation for the excellent work carried out by Andrew du Boulay during his time as rapporteur of the MWG.

i.10 Mr Wolfgang Philipp, Senior Director Eurocontrol, welcomed the NAT SPG to Eurocontrol Headquarters and in his address he stressed the importance of co-ordination between regions in order to ensure interoperability.

i.11 Considering that the Meeting had been convened at Eurocontrol Headquarters because of the extensive renovations taking place at the EUR/NAT Office, Eurocontrol had been invited to attend the meeting. To this effect, Mr Eamon Cerasi, the Eurocontrol/ICAO co-ordinator attended.

i.12 The Secretary expressed ICAO's appreciation to Eurocontrol for the facilities that had been provided as well as the assistance given to the Secretariat. Mr Cerasi was requested to forward this appreciation to Mr Yves Lambert, the Director General of Eurocontrol.

LIST OF PARTICIPANTS

CANADA
Mr Jack BUTT*[*]
Mr John NAVAUX
Mr Earle SNOW

DENMARK/DANEMARK
Mr Lars Peter JENSEN*
Mr Per COULET
Mr Sven GRAVESEN
Mr Knud ROSING

FRANCE
Mr André BERMAN*
Mr Christian MARQUANT
Mr Pascal MEDAL

ICELAND/ISLANDE
Mr Asgeir PALSSON*
Mr Leifur HAKONARSON
Mr Haukur HAUKSSON

IRELAND/IRLANDE
Mr Myles MURPHY* *(Chairman)*
Mr Patrick RYAN
Mr Phonsie O'CONNOR

NORWAY/NORVÈGE
Mr Ommund MYDLAND*
Mr. Einar HAUGEN

PORTUGAL
Mr Carlos MONTEIRO*
Mr João COUTINHO
Mr Jorge FERREIRA
Mr Dinis RESENDES
Mr Luis RODRIGUES

RUSSIAN FEDERATION/
FÉDÉRATION DE RUSSIE
Mr. Oleg TROUKHTANOV

SPAIN/ESPAGNE
Mr José M. CURA
Mr. Francisco CASTRO RODRIGUEZ

UNITED KINGDOM/ROYAUME UNI
Mr George ENNIS*
Mr Jim BENSON
Mr John NORDBØ
Mr. Keith SLATER

UNITED STATES OF AMERICA/
ÉTATS UNIS D'AMÉRIQUE
Mr Gerald L. RICHARD*
Mr Roger KIELY
Mr David MALOY
Mr Gus K. NEZER
Mr Charles REAVIS
Mr William SEARS

[*] Member

IACA
Mr Helge Ingo FRANZ

IAOPA
Mr Sylvain DE WEERDT

IATA
Mr Alan GILBERT
Mr Paul FRANZ
Mr David STRAND
Mr Peter ZEPER
Mr Jerry WILMOT

IBAC
Mr Ron CHAFE

IFALPA
Mr Robert SWAIN

IFATCA
Ms Catharina DE DECKER

INMARSAT
Mr Lindsay NORRISH

1. AGENDA ITEM 1 - DEVELOPMENTS

1.1 Introduction

1.1.1 Under this Agenda Item, the Group considered the following specific subjects:

a) ICAO Panels and Committees

b) Adjacent Regions

c) NAT provider States

d) Technology

1.2 ICAO Panels and Committees

Establishment of an ICAO Air Traffic Management (ATM) Operations Concept Panel

1.2.1 The Group was informed that ICAO was in the process of establishing an ATM Operations Concept Panel. The Group felt that it would be necessary to closely follow the work of this new panel in order to ensure that the operational requirements of dense oceanic environments were taken into account.

Report of the Second ALLPIRG Advisory Group Meeting (ALLPIRG/2)

1.2.2 It was noted that the Chairman of the NAT SPG had attended the ALLPIRG/2 Meeting which had been held in Montreal in February 1998. It was noted that many of the Conclusions agreed to by ALLPIRG/2 had already been implemented in the NAT Region. However, some other issues were of concern to the Group, namely the implementation of World Geodetic System-1984 (WGS-84), the year 2000 (Y2K) date problem and the development of a list of shortcomings and deficiencies for the NAT Region. All of these issues were examined and are reported on in other sections of the report.

1.2.3 The Group was also provided with an update on the ICAO world-wide CNS/ATM Systems Implementation Conference that had been held in Rio de Janeiro from 11 to 15 May 1998. The Group noted that, following Council review of the outcome of the Conference, the NAT SPG work programme may need to be reviewed.

1.3 Adjacent Regions

European Region

1.3.1 The Group was informed that plans were to implement RVSM in the EUR Region in November 2001 from FL 290 up to FL 410 inclusive. Only State aircraft would be exempted from the requirement to obtain an RVSM approval to operate in the airspace concerned. It was further noted that Eurocontrol were developing an RVSM implementation programme that should be finalised by the end of 1998. In this connection, the Group agreed that, in order to avoid duplication of efforts, especially as regards the establishment and maintenance of RVSM data bases, the Central Monitoring Agency (CMA) should liaise with Eurocontrol in order to share monitoring data.

CONCLUSION 34/1 - CO-OPERATION BETWEEN THE CENTRAL MONITORING AGENCY (CMA) AND EUROCONTROL FOR THE SHARING OF MONITORING DATA

That the CMA liaise with Eurocontrol in order to arrange for the sharing of monitoring data related to Reduced Vertical Separation Minimum.

1.3.2 The Group was also informed that the implementation of mandatory carriage of on-board Area Navigation (RNAV) equipment meeting Required Navigation Performance –5 (RNP-5) for all General Air Traffic (GAT) operations in the airspace of European Civil Aviation Conference (ECAC) States had been delayed from January to April 1998. Exemptions could only be obtained up to August 1998.

1.3.3 The Group was informed that an amendment proposal concerning the mandatory carriage of 8.33 kHz frequency spaced radios had been approved by the ICAO Council. However, because of some technical problems, implementation that had been scheduled for 1 January 1999 has been postponed. The implementation date would be determined once the technical issues had been resolved. Although the initial implementation would be limited only to the core area of Western Europe, the effects would be felt over a wide area because of the extensive protection areas that are required.

1.4 NAT provider States

North American (NAM) Region

1.4.1 The Member from the United States indicated that planning for the implementation of RVSM in United States domestic airspace had not progressed to the extent desired. However, their plan was still to implement RVSM circa 2005. In this context, plans for the implementation of RVSM in the West Atlantic Route System (WATRS), scheduled for 2001, were contained in the Federal Aviation Administration's (FAA) Strategic Plan for Oceanic Airspace Enhancements and Separations Reductions.

1.4.2 The Group noted that Canada had begun implementing its new airspace policy for its East Coast. The initial action consisted of transferring a large portion of airspace in Moncton Flight Information Region (FIR) to Gander. This would facilitate co-ordination between the Area Control Centres (ACC) concerned and had permitted Gander to extend the size of its RVSM transition area.

1.5 Technology

1.5.1 The Group was presented with information on updates that were being made to current oceanic systems. It was also provided with information on the status of implementation of new systems in Iceland and Portugal.

2. AGENDA ITEM 2 - PLANNING AND IMPLEMENTATION

2.1 Introduction

2.1.1 Under this Agenda Item, the Group considered the following specific subjects:

a) NAT Traffic Forecasting Group (NAT TFG) report

b) NAT IMG report

c) Implementation planning

d) Other issues

2.2 Report of the NAT Traffic Forecasting Group (NAT TFG)

2.2.1 The NAT TFG did not meet in 1998 and it was therefore not able to update the NAT Region forecasts. Nevertheless, Canada had processed the data for July 1 to 7 1997 and for November 1 to 7 1997 and carried out a limited analysis of the information. It was shown that the busiest July week had a total of 7,457 flights and the average daily traffic had been 1065.3. For November the total weekly traffic had been 6,259 and the average daily traffic had been 894.1. There was a 7% increase in July whereas the increase in November was 9% over 1996.

2.2.2 In addition to highlighting changes in the traffic, the analysis also outlined the software tools used to manipulate the data. In this connection, Canada was working on a comprehensive user guide for the software which should be ready in June 1998 and would be distributed to the other members of the NAT TFG.

2.2.3 Several points of clarification were sought, mainly dealing with the definition of aircraft categories. The Secretary agreed to obtain the information and further agreed to provide the NAT TFG with some of the latest information concerning business aviation activities.

2.2.4 Finally, the NAT TFG expects to meet in 1999 at which time the NAT Region forecasts will be updated.

2.3 Report of the NAT Implementation Management Group

2.3.1 The NAT IMG met twice since NAT SPG/33. The Air Traffic Management Group (ATMG), the Communications Automation and Data Link Applications Group (CADAG) and the Mathematicians Implementation Group (MIG) had also met twice. Although the Reduced Separations Standards Implementation Group (RSSIG) had only met once, its Operations and Airworthiness (OPS/AIR) and Airspace Monitoring (AMSG) sub-groups had met twice. The reports of all the meetings were sent to all regular participants of the NAT SPG. In addition to the foregoing meetings, a special one-off meeting of some members of the ATMG and of the CADAG had been convened to address the development of a FANS 1/A Implementation Plan and of a NAT ATM Concept of Operations.

2.3.2 In accordance with the mandate given to the NAT IMG by NAT SPG/32 (Conclusion 32/9 refers), the NAT IMG and its contributory bodies had spent a considerable amount of time ensuring that the implementation of RVSM in Minimum Navigation Performance Specifications (MNPS) airspace was carried out in a safe and efficient manner. The NAT IMG had also initiated work on the development of a FANS 1/A Implementation Plan and of a NAT ATM Concept of Operations. The other major task addressed by the

NAT IMG was the development of the Air Traffic Management Implementation Plan for the NAT Region to 2015 (ATMIP) (paragraphs 2.3.19 through 2.3.21 also refer).

Planning process and documentation

2.3.3 As had been reported to NAT SPG/33, the Programme Co-ordination Office (PCO) has set up a World Wide Web (WWW) site which contains relevant planning information and would also provide a useful tool to carry out work between meetings. The web site has been up and running in a limited capacity since 8 June 1998. The site has been registered "NAT-PCO" as a domain with Internet institutions and has the following address <http://www.nat-pco.org>.

2.3.4 The site provides the following four primary functions as well as automatic linking to the IATA and ICAO web sites:

a) background on ICAO's NAT planning activities including the terms of reference for the PCO;

b) e-mail services to the NAT IMG working group rapporteurs and members. It is intended that external interested parties have access to rapporteurs but no direct access to group members. Rapporteurs and group members will, however, be able to send "global" messages to entire groups;

c) a documentation download facility where electronic copies of NAT specific documents can be obtained. These will be available in the word processor formats used to generate them and additionally in Portable Document Format (PDF). This allows users to read documents without maintaining a collection of word processor programmes; and

d) for registered users, discussion groups where the business of planning future ATM in the NAT can be carried out. Each NAT IMG working group will be allocated a discussion group for the exchange of views, papers etc. between meetings. These areas can also be used to distribute Summaries of Discussions, Agendas as well as Working and Information Papers relevant to meetings.

Amendments to the NAT Regional Supplementary Procedures NAT (SUPPs)

2.3.5 As a result of examining the in-flight contingency procedures for Supersonic Transport (SST) aircraft, the NAT IMG agreed that all in-flight contingency procedures be reviewed and that an amendment to the NAT SUPPs should be prepared. In order to expedite the process, the Group agreed that the draft amendment proposal be circulated to the NAT SPG for their endorsement prior to initiating the formal amendment process.

CONCLUSION 34/2 - AMENDMENT TO THE NAT REGIONAL SUPPLEMENTARY PROCEDURES

That the NAT Implementation Management Group, following consultation with the NAT SPG, make arrangements to amend the in-flight contingency procedures contained in the NAT Regional Supplementary Procedures (Doc 7030).

The implementation of Reduced Vertical Separation Minimum

2.3.6 The NAT MWG provided the latest risk assessment concerning the implementation of RVSM. The NAT SPG was very pleased to note that the technical risk due to RVSM was well within the TLS. Nevertheless, it noted that the NAT IMG remained concerned over the incidence of operational errors.

Furthermore, it was noted that the frequency or extent of many operational errors was not RVSM induced, nor was the risk to the system increased by the introduction of RVSM. The Group noted that the risk with many operational errors would likely be greater in a 2000 ft VSM environment than in an RVSM environment due to the higher traffic densities in the former case. In this context, the importance of using standard phraseology was stressed as a means to reducing the number of operational errors.

2.3.7 It was noted that the statistics on large height deviations included two extraordinary occurrences where aircraft operated at the wrong flight level for extended periods of time. These two occurrences were the main contributing factors causing the risk associated with operational errors to exceed the more stringent RVSM TLS. These incidents were treated with concern and the circumstances and follow-up actions that had been taken were reviewed. As a consequence, the Group agreed to endorse the establishment of an educational programme that would allow for lessons learned to be widely disseminated throughout the NAT community and further agreed that action be taken to reduce the number of operational errors in the NAT Region (paragraphs 3.2.36 to 3.2.40 refer).

CONCLUSION 34/3 - DEVELOP MEASURES TO REDUCE THE INCIDENCES OF OPERATIONAL ERRORS IN THE VERTICAL PLANE

That the NAT Implementation Management Group develop:

a) additional measures to reduce operational errors in the vertical plane;

b) an education programme to reduce operational errors; and

c) report to NAT SPG/35.

2.3.8 One of the difficulties that had emerged as a result of the initial analysis was the lack of a classification scheme for aircraft operating at incorrect flight levels, especially when the operational error was not related to the separation minima used. The Group agreed that a classification scheme be developed along the same lines as the one for the lateral plane which had been endorsed by NAT SPG/23. With this in mind, the Group felt that the role of the Scrutiny group would need to be expanded as a result of the implementation of RVSM. To this end, Scrutiny group meetings may have to be extended to at least two days. Of particular importance was the need to classify the aforementioned operational errors that occur in the vertical plane so that their effect on the TLS can be analysed with greater precision (paragraph 3.2.59 also refers).

CONCLUSION 34/4 - ROLE OF THE SCRUTINY GROUP

That the Scrutiny Group:

a) in co-ordination with the NAT Implementation Management Group, develop a classification scheme for operational errors that occur in the vertical plane;

b) expand its activities to include the classification of operational errors in the vertical plane; and

c) provide NAT SPG/35 with the classification scheme for endorsement.

2.3.9 The agreement reached at NAT SPG/33 (Report of NAT SPG/33, paragraph 2.3.19 refers) provided that the transfer of the responsibility for the risk assessments from the NAT IMG to the MWG as soon as Phase 2 RVSM was implemented (8 October 1998). However, and in view of the need to closely monitor operational errors and the effects that new measures might have to reduce them, the Group agreed

that the NAT IMG continue to oversee the risk assessments for at least another year and that this matter be reviewed at NAT SPG/35.

CONCLUSION 34/5 - MONITORING THE RISK IN REDUCED VERTICAL SEPARATION MINIMUM (RVSM) AIRSPACE

That the NAT Implementation Management Group:

a) continue to monitor the risk in RVSM airspace; and

b) report to NAT SPG/35.

2.3.10 It was recalled that, with the above in mind, the NAT SPG had declared RVSM operational on 27 March 1998 as had been foreseen.

2.3.11 In accordance with NAT SPG Conclusion 32/9, the NAT IMG had carried out an extensive evaluation to determine when and to what levels RVSM airspace could be expanded. Taking into account the concerns of the NAT user community, including the International General Aviation (IGA) and the military, the Group noted that it had been decided that RVSM airspace be expanded up to FL 390 and down to FL 310 on 8 October 1998. As regards further expansion of RVSM airspace in the NAT Region down to FL 290 and up to FL 410, the consensus was that this should be harmonized with the implementation time-scales for Europe. In any event, expansion should take place not later than the implementation of full RVSM in the EUR Region.

2.3.12 The Group was presented with an update on RVSM approvals for IGA. The Group was encouraged by the rapid increase in IGA RVSM approvals. However, of particular interest to the Group was that the vast majority of IGA operations were being conducted at FL 390 and above (72% for Gander and 68% for Shanwick). On the basis of this information the representative from IBAC requested that this aircraft population be taken fully into account when planning changes to the air navigation system that would affect these high flight levels. IBAC also presented information about the world-wide business aviation fleet and business aviation activities. In this connection, the representative from IBAC requested that members use the information submitted to the meeting as a means of informing their planning staffs of business aviation concerns.

2.3.13 Non-approved aircraft operating in RVSM airspace continued to be a significant concern for the NAT SPG. The Group recalled that the implementation of NAT SPG Conclusion 33/3 was predicated on NAT provider States confirming with their respective legal departments whether a common approach to the exclusion of non-approved aircraft from RVSM airspace was possible. In this regard, it was recalled that the CMA is able to investigate such occurrences and inform the state of registry of those concerned, but it has no legal enforcement power (paragraph 3.2.23 refers).

2.3.14 The Group was informed that differences from legal and operational perspectives prevented a common approach as was envisaged by NAT SPG Conclusion 33/3. However, the Group was pleased to note that the collective efforts of the NAT provider States had continued to reduce the number of non-approved aircraft operating in RVSM airspace.

CONCLUSION 34/6 - EXCLUSION OF NON-APPROVED REDUCED VERTICAL SEPARATION MINIMUM (RVSM) AIRCRAFT FROM RVSM AIRSPACE

That:

a) NAT provider States continue their efforts to exclude non-approved aircraft from RVSM airspace;

b) all States review their notification and promulgation processes to ensure that the Central Monitoring Agency (CMA) is advised as soon as possible of new RVSM approvals; and

c) user organizations inform their members that, for safety reasons, they should not operate in RVSM airspace if they are not RVSM approved.

Wake turbulence and multiple Traffic Alert and Collision Avoidance System (TCAS) Traffic Advisors (TA)

2.3.15 In follow up to NAT SPG Conclusion 33/5, in-flight contingency procedures had been developed to mitigate the effects of wake vortex in RVSM airspace. The procedures had been promulgated by all States concerned and will form part of the amendment to the NAT SUPPs (paragraph 2.3.5 refers).

2.3.16 As regards multiple TCAS TAs, the FAA had undertaken a study to determine whether TCAS Version 7 would eliminate the problem. Preliminary results indicate that this problem would be mitigated by the implementation of TCAS Version 7 or ACAS II.

RVSM Financial Considerations

2.3.17 Considerable progress had been made towards successfully implementing the Gander Height Monitoring Units (HMU). Although the commissioning of the HMU would be somewhat later than desired (autumn 1998), it should now be completed within the approved cost ceilings and within the time window. Both production HMUs should therefore be available towards the end of 1998.

2.3.18 The Group was provided with an update on the cost sharing/recovery mechanism for the height monitoring system. As regards the need to continue to monitor beyond the year 2000 using the Global Positioning System (GPS) based Monitoring System (GMS), it was agreed that the NAT IMG should address this matter.

CONCLUSION 34/7 - FUTURE FINANCIAL CONSIDERATIONS RELATING TO THE REDUCED VERTICAL SEPARATION MINIMUM (RVSM) HEIGHT MONITORING SYSTEM

That the NAT Implementation Management Group (NAT IMG) define future requirements for monitoring aircraft using the Global Positioning System Monitoring System.

Air Traffic Management Implementation Plan for the NAT Region to 2015

2.3.19 Because of the need of the ATMIP to take account of FANS 1/A and of the need to develop a NAT ATM Concept of Operations, the NAT IMG had agreed that no further action could be taken on the ATMIP at this time. In doing so, it was understood that it would not be possible to complete work on these documents in time to obtain NAT SPG/34 endorsement (paragraph 2.3.2 refers).

2.3.20 The Group was informed that the NAT IMG had recalled that NAT SPG/33 had endorsed the proposal that FANS 1/A equipped aircraft be accommodated in the NAT Region with the understanding that the Aeronautical Telecommunication Network (ATN) remained the end state (NAT SPG/33, paragraph 2.3.29 refers). Accordingly, the NAT IMG had tasked its ATMG and CADAG with developing an Operational Concept based on this premise. Work on the document has been based on the NAT Concept Description that had been endorsed by NAT SPG/28 and subsequently used as the basis to develop the NAT Air Navigation Plan (ANP). The timeframe for completion is NAT SPG/35.

2.3.21 The Group was informed that the NAT IMG had also tasked its ATMG and CADAG with initiating the development of a FANS 1/A Implementation Plan which would allow aircraft equipped with suitable avionics to make some use of FANS 1/A while operating in the NAT Region. This activity was well advanced and the deadline should be achieved so that NAT IMG/12 (September 1998) can endorse the plan. The Group noted the draft FANS 1/A Implementation Plan and expressed their appreciation to Airbus Industries and Boeing for their support in developing the plan.

NAT IMG Cost Effectiveness (NICE) programme

2.3.22 The NICE programme was well advanced in developing the necessary infrastructure. However, the timetable was predicated on a timely delivery of flight plans from Lufthansa and the final development of flight planners (software tools) in the United Kingdom and the United States models. However, preliminary results were available but it had not been possible to validate the results of the three models.

2.3.23 The preliminary indications were that the implementation of RVSM has surpassed expectations in terms of reducing the fuel burn penalty. Indeed, it would appear that RVSM will remove approximately 40 to 50 % of the penalty. This would indicate that the NAT system was already very efficient and that these results may have an effect on the benefit/cost and associated time-scales for further developments. The basic assumption that implementation would be benefit driven may also have to be reviewed. This may also lead to changes in planning. The results should be available in the last quarter of 1998 and the NAT SPG will be kept informed.

2.3.24 As regards financing, the project was still within budget, although additional tasks, not taken into account when the initial cost estimates were calculated, had been added. In particular, it was mentioned some thought ought to be given to the viability of using the product for future planning so that the necessary budgetary provisions could be made in a timely fashion. This matter would be kept under review.

Reduced Horizontal Separation Minima (RHSM)

2.3.25 Now that RVSM has been successfully implemented, the NAT IMG and its contributory bodies have shifted their work programmes to reductions in horizontal separation minima, beginning with longitudinal separation. However, an important difficulty has arisen, namely issues relating to time-keeping, both on the ground and in the air. A draft Notice to Airmen (NOTAM) concerning airborne time-keeping procedures has been developed. In this context, it was agreed that time-keeping procedures should be part of the MNPS approval process and that the MNPS Operations Manual and the NAT Guidance Material should be amended accordingly.

2.3.26 The above referenced procedure only addresses the need to ensure that the aircraft clock is properly set; it does not and cannot address the issue of how the Flight Management System (FMS) displays time to the pilot. Nevertheless, a data collection exercise will be undertaken in the third quarter of 1998 in support of the safety case to reduce longitudinal separation minima. In addition, ground systems will need to adopt a common system of displaying time to air traffic controllers. Because of these difficulties, reductions in longitudinal separation from 15 to 10 minutes for intersecting track and from 10 to 7 minutes for along the same track (RHSM Phases I and II respectively) cannot be envisaged before the first quarter of 2000.

2.4 Implementation planning

Airborne Collision Avoidance Systems (ACAS)

2.4.1 The Group noted that the NAT IMG, at its tenth and eleventh meetings, had discussed issues related to the use of ACAS II and transponders in the NAT Region. Regarding the carriage of ACAS II, it was noted that Annex 6, Part I, paragraph 6.18.1, as amended by Amendment 23, specifies that the carriage of ACAS II, from 1 January 2003 for all turbine engine aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg or authorized to carry more than 30 passengers and from 1 January 2005 for all turbine engine aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than 19 passengers, shall be mandatory. It was also noted that the carriage and operation of TCAS is mandatory in the United States for aircraft with a seating capacity for 30 persons or more and that ACAS II is mandatory for the Africa and Indian Ocean (AFI) and EUR Regions from 1 January 2000 (aircraft over 15 000 kg or more or capacity to carry 30 passengers or more) and 1 January 2005 (aircraft of 5 700 kg or more or capacity to carry 19 passengers or more). The Group noted that the Annex 6 provisions were slightly different than those approved for the AFI and EUR Regions.

2.4.2 In order to enhance safety in the NAT Region, it was proposed that the carriage and operation of ACAS II should also be made mandatory within the Region as soon as practicable. The mandatory operation of existing TCAS |equipment could take effect immediately whilst the mandatory carriage requirement would only take effect when feasible. Although Annex 6 provisions recommend a lead time of not less than five years, the agreement concerning the mandatory ACAS II carriage requirements in the AFI and EUR Regions has had a de facto effect on almost all aircraft operating in the NAT Region; therefore, a target date of 1 January 2001 for large aircraft should be considered as justified taking account of the availability of equipment. A further requirement for aircraft of at least 5 700 kg or a capacity to carry more than 19 passengers should also be considered; this would also be in line with Annex 6 requirements.

2.4.3 In order to implement a mandatory requirement in advance of the Standards and Recommended Practices (SARPS) provisions, a regional air navigation agreement in the form of an amendment to the NAT RAC SUPPs is required. With this in mind, the amendment proposal which is at the **Appendix A** to the Report on Agenda Item 2 was developed.

2.4.4 In addition to the foregoing, provisions in Annex 6, Operation of Aircraft, Part I (paragraph 6.19) and Part II (paragraph 6.13) relating to pressure-altitude reporting transponders indicate that carriage is required "to fly in designated airspaces". Furthermore, designation of airspaces may be on a State-by-State basis, or on the basis of regional agreement as reflected in the Supplementary Procedures. It was recognized that the operation of a pressure-altitude reporting transponder was essential in order to generate resolution advisories in ACAS II equipped aircraft. Therefore, it was considered essential to mandate the carriage of pressure-altitude reporting transponders in the NAT Region. Continuous operations of SSR transponders have already been mandated in accordance with the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS, Doc 8168), as well as the continuous use of Mode C (NAT SUPPS paragraph 9.1.1.1 also refers).

2.4.5 In the discussion, it was pointed out that the Mode S transponder requirement associated with ACAS II was not relevant to the NAT Region and that TCAS with Version 7 software would meet the NAT requirements. It was also proposed that some Minimum Equipment List (MEL) relief would be required in order not to have to install redundant ACAS II. As regards the implementation of TCAS Version 7 instead of ACAS II, it was pointed out that this was a State regulatory matter and therefore outside the remit of the NAT SPG itself.

2.4.6 As regards MEL relief, it was agreed to make provision for aircraft that have experienced an ACAS II equipment failure to operate through the NAT Region in order to return to base for repair. The NAT Oceanic Area Control Centre (OAC) would accommodate such situations, on a case by case basis.

CONCLUSION 34/8 - CARRIAGE AND OPERATION AIRBORNE COLLISION AVOIDANCE SYTEMS (ACAS) IN THE NAT REGION

That:

a) ICAO make arrangements to amend the NAT Regional Supplementary Procedures in accordance with Appendix A to the report on Agenda Item 2; and

b) NAT provider States make provisions for aircraft that have experienced an ACAS II failure to be able to return to base for repairs

Insertion of the letter "W" in the ICAO flight plan

2.4.7 The Group was presented with a proposal to limit the use of "W" in ICAO flight plans to aircraft approved for flights at RVSM levels within MNPS airspace and intending to operate within that airspace. There was no support for the proposal due to the variety of procedures and practices within transition areas. Furthermore, many flight planning systems automatically insert "W" in the flight plan for RVSM approved aircraft and changes would therefore be expensive.

GPS Notice to Airmen (NOTAM)

2.4.8 The Group noted the Aeronautical Information Circular (AIC) issued by France in support of the use of GPS, particularly as regards the availability of the satellite constellation. In this context, it was noted that Wide Area Augmentation System (WAAS) and/or European Geostationary Navigation Overlay Service (EGNOS) should eliminate the need for Fault Detection and Exclusion (FDE).

Establishment of an RVSM transition area South of 27N in Santa Maria Oceanic FIR

2.4.9 The Group was presented with information on the establishment of an RVSM transition area in the Southern part of Santa Maria FIR. The establishment of the transition area has increased ATC flexibility and reduced the complexity of handling traffic to/from New York OAC.

2.5 Other issues

Implementation of the World Geodetic System – 1984 Standards (WGS-84)

2.5.1 The Group reviewed the status of implementation of the WGS-84. It was pleased to note that all NAT provider States had implemented WGS-84 or its equivalent or would do so by the end of 1998.

Year 2000 computer conformity activities

2.5.2 The Group reviewed activities related to the Year 2000 (Y2K) conformity requirements. The Group noted that all States concerned had put in place programmes to ensure Y2K conformance and that IATA had put in place a special task force to assist States in ensuring that they were Y2K conformant. In this context, it was recommended that States co-ordinate with the IATA task force as this might obviate the need to respond to individual airline enquiries. The Group was also presented the latest ICAO State letter (AN 13/46-98/37 refers) relating to this matter.

2.5.3 Although recognising that this issue was one for States and airspace users, it was also recognised that interoperability needed to be ensured. Accordingly, it was agreed that interoperability testing was an extremely important issue and that such tests needed to be carried out on the basis of bi-lateral or multi-lateral agreements. In addition, it was felt that States should develop comprehensive plans for Y2K contingencies and that the NAT Regional contingency plan should also be updated.

CONCLUSION 34/9 - THE IMPACT OF THE YEAR 2000 (Y2K) DATE PROBLEM ON COMPUTER-BASED AVIATION SYSTEMS

That:

a) States ensure that individual contingency plans concerning Y2K are developed and put in place; and

b) the NAT Implementation Management Group arrange to update the NAT Regional contingency plan.

APPENDIX A

PROPOSAL FOR AMENDMENT OF THE NAT REGIONAL SUPPLEMENTARY PROCEDURES

(Serial No.: EUR/NAT-S 97/xx - NAT RAC/x)

a) **Regional Supplementary Procedures**:

Doc 7030/4- North Atlantic Regional Supplementary Procedures Part 1 RAC as amended by Amendment 191 dated 17 February 1998.

b) **Proposed Amendment**:

"Add to the Table of Contents, Part 1, the following new Chapter:

Airborne Collision Avoidance Systems 14"

"**Add** a new requirement for the mandatory carriage and operation of secondary surveillance radar (SSR) transponders as follows:

9.1 Carriage and operation of pressure-altitude reporting SSR transponders

9.1.1 With effect from 1 January 2000, all aircraft operating as IFR flights in the NAT Region shall be equipped with a pressure-altitude SSR transponder.

Renumber subsequent paragraphs"

"**Add** a new Chapter 14 concerning the requirement for the mandatory carriage and operation of Airborne Collision Avoidance Systems (ACAS II) as shown below:

14.0 Use of Airborne Collision Avoidance Systems (ACAS II)
(A2 - 3.2; A6, Part I - 6.18; A10 - Vol IV, A11 - 2.4.2; P-OPS, Vol I, Part VIII, P-RAC, Part II and Part X)

14.1 Carriage and operation of ACAS II

14.1.1 ACAS II shall be carried and operated in the NAT Region by all aircraft which meet the following criteria:

1) with effect from 1 January 2001, all turbine engine aeroplanes having a maximum certificated take-off mass exceeding 15 000 kg or authorised to carry more than 30 passengers.

2) with effect from 1 January 2005, all turbine engine aeroplanes having a maximum certificated take-off mass exceeding 5 700 kg or authorised to carry more than 19 passengers.

14.2 Responsibility for separation of aircraft during manoeuvres in compliance with a Resolution Advisory (RA)

14.2.1 On being notified that an aircraft, under air traffic control, is manoeuvring in accordance with a resolution advisory (RA), a controller should not issue instructions to that aircraft, which are contrary to the RA as communicated by the pilot. Once an aircraft departs from the current ATC clearance in compliance with an RA, the controllers cease to be responsible for providing separation between that aircraft and other aircraft affected as a direct consequence of the manoeuvre induced by the RA. However, when circumstances permit, the controller should endeavour to provide traffic information to aircraft affected by the manoeuvre. The controller's responsibility for providing separation for all the affected aircraft resumes when:

1) the controller acknowledges a report from the pilot that the aircraft has resumed the current clearance; or
2) the controller acknowledges a report from the pilot that the aircraft is resuming the current clearance and issues an alternative clearance which is acknowledged by the flight crew.

14.3 ACAS II performance monitoring

14.3.1 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.

14.3.2 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 the completed reports (to whom) through established channels."

c) **Originated by**:

The International Civil Aviation Organization (ICAO)

d) **Originator's reason for amendment**

1)
2)
3)

e) **Intended dates of implementation**

1 January 2001 - for all turbine engine aeroplanes having a maximum certificated take-off mass exceeding 15 000 kg or authorised to carry more than 30 passengers.

1 January 2005 - for all turbine engine aeroplanes having a maximum certificated take-off mass exceeding 5 700 kg or authorised to carry more than 19 passengers.

f) **Proposal circulated to the following States and organizations**

To be added later

g) **Secretariat's comment**

To be added later

3. AGENDA ITEM 3 - AIR NAVIGATION SYSTEM REVIEW

3.1 Introduction

3.1.1 Under this Agenda Item, the Group considered the following specific subjects:

a) Review of system safety performance; and

b) Review of systems operations.

3.2 Review of system safety performance

SCRUTINY MATTERS

General

3.2.1 When considering scrutiny matters, the Group reviewed the following specific subjects:

a) the lateral navigation performance accuracy achieved in the NAT Region during the period 1 January 1997 to 31 December 1997; and

b) methods of improving the observed standard of navigation performance in the NAT Region.

Lateral navigation performance accuracy achieved in the NAT Region during the period 1 January 1997 to 31 December 1997

3.2.2 The Group completed a scrutiny of observed Gross Navigation Errors (GNE) in the NAT Region and found that a total of 33 (36)* errors were reported during the period under review. Of these errors, 9 (14)* occurred outside MNPS airspace and were classified as Table 'Charlie' errors. From the remaining 24 (22)*, 12 (11)* were not eligible for inclusion in the risk analysis as defined at NAT SPG/17 (amended by NAT SPG/23) and were classified as Table 'Bravo' errors. A review of these Table 'Bravo' errors is given at 3.2.8 and 3.2.9. The remaining 12 (11)* errors, which form the basis of the scrutiny, were classified as Table 'Alpha' errors.

3.2.3 The Group was disappointed to note an increase in the combined number of Table 'Alpha' and “Bravo” errors compared with the previous 12 month period. However, it noted that the overall numbers of GNEs in the NAT Region as a whole had decreased and recognising that there had been an 8.3 % increase in the level of traffic using MNPS airspace, the Group considered that, as a generic measure of safety, the number of GNEs in MNPS airspace did not give cause for concern.

3.2.4 The breakdown of the 12 Table 'Alpha' errors is shown below in Table 1 below.

* the number in brackets is for 1996

Table 1. Breakdown of Risk Bearing Effect of Table 'Alpha' Errors

CLASSIFICATION (See Note 2)	ETA ERRORS	RISK BEARING ERROR WEIGHTINGS		
		TOTAL MNPS TRAFFIC	OTS TRAFFIC	RANDOM TRAFFIC
A	[0] (2) Note 1	0	0	0
B	1 (1)	0.33	0	0.33
C1/C2/C3	10 (6)	3.9	0	3.9
D	0 (1)	0	0	0
E	0 (1)	0	0	0
F	1(2)	0.58	0	0.58
UNCLASSIFIED	0 (0)	0	0	0
TOTAL	12	4.81	0	4.81
TOTAL IN LASTPERIOD	11	3.96	1.25	2.71
OBSERVED TRAFFIC '97		259,053	146,414	112,639
OBSERVED TRAFFIC '96		238,684	139,991	98,693

Note 1:- Not the primary cause of observed error

Note 2:- A. *Aircraft not certified for MNPS Operations.*
B. *ATC System Loop error.*
C1/C2/C3 *Equipment Control/Waypoint Insertion/Wrong Information*
D. *Other navigation errors, including equipment failure notified to ATC in time for action.*
E. *Other navigation errors, including equipment failure notified to ATC too late for action.*
F. *Other navigation errors including equipment failure of which notification was not received by ATC.*

3.2.5 The breakdown of the 12 Table 'Alpha' errors points to 4 areas of particular note namely:

a) a significant increase in the number of waypoint insertion/equipment control errors [10(6)] accounting for around 83% of the reported Table 'Alpha' errors - a figure 30% greater than those of the previous two reporting periods;

b) two errors attributable to military aircraft;

c) zero errors attributable to non-approved users (not including State aircraft); and

d) zero equipment failure errors.

3.2.6 The Group noted that there had been a significant increase in the number of Table "Alpha" errors attributable to the waypoint insertion category. It also noted that, without exception, these errors occurred after a re-clearance had been issued and that had the procedures set out in the MNPS Operations Manual been adhered to, it is unlikely that any of these errors would have occurred.

3.2.7 On the positive side, this was the first monitoring period where no errors had been caused by equipment failure and, furthermore, not one error was caused by a non-approved user nor were their any risk bearing errors on the Organized Track System (OTS).

3.2.8 In reviewing the 12 (11) Table 'Bravo' errors the Group noted an increase in the number of these errors over the previous year. Table 2 shows a breakdown of the Table 'Bravo' errors into the established error classifications.

Table 2. Breakdown of Table 'Bravo' Errors

ERROR CLASSIFICATION	NUMBER OF ERRORS
A	[1]* (2)**
B	3 (2)
C1/C2/C3	9 (5)
D	0 (0)
E	0 (2)
F	0 (1)
UNCLASSIFIED	0 (1)
TOTAL	12 (11)

* Not the primary cause of observed error

** Figures in brackets refer to the previous 12 month period

3.2.9 As with the Table "Alpha" errors, the Group noted that there was a significant increase in the number of errors attributable to waypoint insertion errors and, that all but one occurred after a re-clearance and were considered to be avoidable. The Group also noted that one error involved a non-approved user and that two involved military aircraft.

3.2.10 The Group, while considering the Table 'Charlie' errors, was pleased to note that the number of errors reported occurring outside MNPS airspace had shown a significant decrease over the previous 12 month monitoring period. Table 3 shows a comparison of the Table 'Charlie' errors over the last 11 years.

Table 3. Table 'Charlie' errors for the last 11 monitoring years

MONITORING YEAR	NUMBER OF ERRORS
1987/88	63
1988/89	40
1989/90	31
1990/91	22
1991/92	17
1992/93	10
1993/94	15
1994	7
1995	14
1996	14
1997	9

3.2.11 In accordance with monitoring procedures, follow-up action was taken for any reported error in excess of 50 NM. The Group noted that this had to be done for 4 of the 9 reported occurrences. Of the Table Charlie errors, around 65% were attributable to waypoint insertion or equipment control errors. One error occurred when a crew failed to maintain situational awareness through poor dead reckoning procedures and was thought to have been up to 300 NM off track at one point. The Group noted that occurrences such as these are, fortunately very rare.

3.2.12 The Group was grateful to the representative for IAOPA for the compiled statistical information for the NAT Region under this agenda item. It was pleased to note an improvement in the number of flights per GNE from 7133 in 1996 to 8448 in 1997. Studying the breakdown of flights per GNE in the categories Public Transport (PT) Military (Mil) and IGA, the Group noted that the figure for PT for 1997 was an improvement on that of 1996 and stood at 17,255 flights per GNE. However, whilst the figure for military operations was better than the previous 12 month period at 1515 (1475) flights per GNE, it was still only of the same order as that which was being achieved in the late 1980s. For IGA, the Group noted a significant improvement in the number of flights per GNE - 848 - compared with the previous year's figure of 572.

3.2.13 As in previous years the Group considered the part played by OACs in containing the number of GNEs through timely intervention to prevent incorrect routing. During the monitoring period, Gander and Shanwick OACs advised the CMA of 70 (73) occasions when action was taken to prevent a GNE. The Group noted that this was around the same number reported during the previous 12 month period. The following statistics were extracted from the available data:

a) twenty seven confirmed cases of crew error;

b) twelve cases thought likely to be attributable to crew error;

c) eleven confirmed cases of ATC loop error;

d) thirteen cases thought likely to be attributable to ATC loop error;

e) one case caused by Radio/Telephony (R/T) misunderstanding; and

f) six from causes unknown.

3.2.14 The Group considered it worthwhile to have data on interventions from all NAT OACs for scrutiny as they provided information on the main problem areas and allowed remedial action to be taken, where necessary.

3.2.15 With respect to the continued application of the 10 minutes longitudinal separation, the Group noted that 17 reports of erosions of longitudinal separation in excess of 3 minutes had been received by the CMA during the monitoring year compared to 4 last year. The reason for the increase was thought to be because of increased reporting levels rather than a large increase in actual events. The erosion reports had been notified to the MIG for its consideration in the context of the reduced longitudinal separation study.

Methods of Improving the Observed Standard of Navigation Performance

3.2.16 In considering the methods by which the observed standard of navigation performance might be improved, account was taken of the lessons derived from the review of navigation performance.

3.2.17 During the period of the report, there was a significant increase - 19 versus 11 - in the combined number of Table "Alpha" and Table "Bravo" errors involving human error in the form of waypoint insertion and equipment control errors. Furthermore, with one exception, they all occurred following a re-clearance. The Group considered, therefore, that the pertinent remark on the twice-daily track message should be amended to reflect the high proportion of errors occurring after a re-clearance.

3.2.18 In the course of the scrutiny of errors, the Group identified the following as significant contributory factors in either the risk of a GNE being committed or to increasing the overall system risk:

a) failure of crews to cross-check clearances with information entered and stored in the navigation systems;

b) failure of crews to make position reports based on information available to them from onboard navigation systems but instead, reading reports directly from flight plans or Air Report (AIREP) forms;

c) failure of crews to carry out post waypoint checks effectively; and

d) occasional failure of operators/dispatchers to file the "Fish Points" associated with the filed 50W position, e.g. 54N050W – OYSTR – STEAM, thereby necessitating a reroute.

CONCLUSION 34/10 - METHODS TO IMPROVE NAVIGATION PERFORMANCE

That:

a) crews be reminded of the importance of following cross-check procedures by amending the remark on the twice-daily track signal to read: "80 percent of gross navigational errors occur after a reroute. Always carry out waypoint cross checks";

b) crews carry out both track and distance checks (not just distance checks) prior to or immediately after entering the active leg; and

c) in order to reduce reroutings, operators be made aware that for flight planning purposes, extreme care should be exercised when filing Westbound Organized Track System (OTS) flight plans so that the filed 50W position be matched up with its associated "Fish Point" or landfall fix.

Monitoring of Altitude Deviations in excess of 300 ft

3.2.19 The CMA received forty nine reports of risk bearing altitude deviations in the MNPS airspace which equated to around 60% of the total number of reports received. The Group noted that, with the odd exception, crews were carrying out the correct procedures in the event of an emergency. However, in spite of the range of measures implemented in an attempt to reduce the amount of time spent at incorrect levels, there were 7 occurrences of aircraft being at an incorrect level for 15 minutes or more. Two particular examples were noted: one where an aircraft was flown at the incorrect altitude for the whole NAT crossing while reporting the cleared level and one where the aircraft spent 43 minutes 700 ft higher than intended due to the an incorrect pressure setting being used. In the first case here, the Group was informed that company procedures had now been amended to help prevent a re-occurrence.

3.2.20 During the course of the scrutiny, it was noted that around 60% of the errors were caused by crews either climbing/descending without clearance or not climbing/descending as cleared; however, the Group did note that the introduction of RVSM did not appear to be a factor in the number or types of error occurring in the airspace.

3.2.21 It was also noted that, on two occasions, incidents occurred as a result of an ATC loop error between Shanwick and Reykjavik. Additionally, five incidents reported by New York involved aircraft failing to climb as cleared or climbing without clearance. It was considered that some of the clearances issued by New York may be worded such as to cause an element of confusion in the minds of the crew especially as in four of the five incidents, the first language of the crews was not English. It was agreed that procedures should be reviewed with the aim of assessing if changes could be implemented to make them less complex.

CONCLUSION 34/11 - REVIEW OF SOME AIR TRAFFIC MANAGEMENT PROCEDURES

That:

a) a review of the co-ordination procedures between Shanwick and Reykjavik be carried out; and

b) the climb/descent clearances/reclearances issued by NAT Oceanic Area Control Centres (OACs) be reviewed in accordance with the NAT Application of Separation Minima Document with the aim of assessing if changes could be implemented to make them less complex.

Methods of Improving the Current Monitoring Procedures

3.2.22 The Group concluded that the current monitoring methods were adequate to allow GNEs to be investigated effectively and were pleased that Santa Maria and New York were now also reporting GNEs to the NAT CMA. All reporting units were urged to continue to report incidents, including altitude deviation, using the formats set out in NAT Doc 001.

3.2.23 The introduction of RVSM had initially considerably increased the amount of work required to effectively tactically monitor the airspace but the efforts of the OACs in questioning operators over their approval status, if any doubt existed, and appropriate follow-up action by the CMA, had reduced the number of known non-approved operations to around 6 per month by January 1998 (paragraph 2.3.13 refers).

MATHEMATICAL MATTERS

3.2.24 To assist the NAT SPG in reviewing system safety performance, the NAT MWG had been convened with the principal objectives of:

a) providing to the NAT SPG with the estimates of lateral and vertical collision risk for the 1997 calendar year; and

b) reviewing:

i) the requirements for the ongoing monitoring beyond the verification phase of RVSM,

ii) the height keeping performance of aircraft approved to fly in RVSM airspace; and

iii) the requirements for future monitoring of large height deviations.

1997 Lateral and Vertical Collision Risk Estimates

3.2.25 It was agreed at NAT SPG/33 that the lateral risk for 1997 would be estimated in two parts: the risk prior to the introduction of RVSM (January to March) and the risk during the first 9 months of RVSM (April to December). It was also decided that occupancies for both the 12 months before the start of RVSM and for the first 9 months of RVSM would be required to enable the lateral risk to be estimated. The two sets of lateral occupancy estimates were determined for the above periods based on the traffic weighted average of the United Kingdom 20°W estimates, the Canadian 40*W estimates and the traffic weighted average of both 30°W estimates. The estimates were based on data for the 4th and 15th days of each month. The 1997 estimates together with the estimates for the previous four monitoring years are shown in Table 4.

Table 4: Lateral Occupancy Estimates for the years from 1993/4 to 1997

		Monitoring Year				1997	
Direction	Traffic	1993/4	1994/5	1995	1996	Pre-RVSM	Post-RVSM
Same	OTS	1.397	1.452	1.448	1.491	1.479	1.098
	Random	0.291	0.262	0.274	0.274	0.282	0.204
	Comb	1.002	1.056	1.026	1.043	1.032	0.752
Opposite	OTS	0.002	0.001	0.002	0.003	0.004	0.003
	Random	0.010	0.006	0.012	0.013	0.013	0.008
	Comb	0.005	0.003	0.006	0.007	0.007	0.005

3.2.26 For same direction traffic, it can be seen that, with the introduction of RVSM, the occupancy values have decreased compared to the previous years. This was in keeping with predictions produced when planning for the implementation of RVSM. For opposite direction traffic there had been very little change in occupancy throughout the five-year period and overall the trend remains static. The data on occupancies is portrayed graphically in Figure 1 (**Appendix A** to the report on Agenda Item 3). Note that the data extends back over a 10-year period and that occupancy is expressed in "standard units" that combine both same and opposite direction lateral estimates, weighted according to the kinematic factors of the Reich model. The future reporting of the occupancies will include historical values for reference, but a structural change such as RVSM introduction would not allow direct examination of trends until several years of history have been accumulated with that structure in place.

3.2.27 In the future, statistics would be compiled on the changes in occupancy through time, so that any trends could be recognised and so that tests could be developed to reveal significant differences from one year to the next. Such tests may be of value in warning of development of potentially increasing the risk in the system and could also be used to aid in the design of operational changes.

3.2.28 Before determining the 1997 lateral risk estimate, the NAT SPG noted that the MWG had reviewed the report of the Scrutiny Group and examined each of the MNPS GNEs reported in 1997 to ensure that they had been appropriately categorised for risk assessment purposes. Due to the different uses of the GNE results by the MWG and the Scrutiny Group the categorisation and weight of one GNE was changed and one GNE was reclassified as risk bearing to reflect the equivalent size of error which would have occurred at the monitoring, as opposed to radar, window. These changes were necessary to preserve the validity of the sample of GNEs.

3.2.29 The Group also noted that the issue of how to incorporate errors detected at the Reykjavik, New York and Santa Maria windows into the risk assessment process remained unresolved but should be maintained as an item for future consideration. Discussions also took place on the possibility of breaking down lateral risk into technical and operational components in an analogous fashion to that used for vertical risk in RVSM airspace. The NAT SPG considered it desirable to do this when planning for future reductions in lateral separation. It was felt that this approach would aid in the setting of performance requirements and the identification of factors that might affect the risk.

3.2.30 Having reviewed the Scrutiny Report and error weightings, the Group noted that the MWG had then determined the lateral risk estimate for 1997 both before and during RVSM. The 1997 estimates together with the estimates for the previous four monitoring years are shown in Table 5. Compared to previous years it can be seen that the overall collision risk for all MNPS traffic has decreased since the introduction of RVSM. The two major factors affecting the lateral risk are large lateral errors and lateral occupancy. Much of the change was due to a reduction in lateral occupancy. It was also noted that during

the calendar year of 1997 no GNEs were reported in the OTS. All the estimates were below the TLS of 2 x 10^{-8} fatal accidents per flight hour.

Table 5: Lateral Risk Estimates for the years from 1993/4 to 1997

All figures are in fatal accidents per flight hour and should be multiplied by 10^{-8}

	1993/4	1994/5	1995	1996	1997	
					Pre-RVSM	Post-RVSM
OTS	1.43	0.59	0.90	0.65	0.00	0.00
Random	0.34	0.56	0.45	0.52	1.25	0.87
All MNPS	0.98	0.58	0.69	0.59	0.62	0.43

Note: From 1995 onwards, updated values for the estimation of aircraft sizes were used for the kinematic factors

3.2.31 Based on the error classes used by the Scrutiny Group, the proportions of human error (Types B, C1 and C2), non-approved users (Type A) and equipment error (Types D, E, F) are examined graphically for the years 1988 to 1997 in Figure 2 (**Appendix B** to the report on Agenda Item 3 refers).

Vertical

3.2.32 As for lateral occupancies, the Group determined the vertical occupancy estimates for the first nine months of RVSM operations in 1997 based on the traffic weighted average of the United Kingdom 20°W estimates, the Canadian 40°W estimates and the traffic weighted average of both 30°W estimates. The estimates were based on data for the 4th and 15th days of each month. The vertical occupancies covering the period January to March 1997 were not examined at the meeting since they had already been determined for NAT SPG/33. The 1997 estimates for both RVSM and non-RVSM levels are shown in Table 6.

Table 6: Vertical Occupancy Estimates for 1997

Direction	Traffic	Post-RVSM	
		Non RVSM levels	RVSM levels
Same	**OTS**	0.609	1.297
	Random	0.109	0.188
	Comb	0.392	0.914
Opposite	**OTS**	0.006	0.001
	Random	0.024	0.018
	Comb	0.014	0.007

Note: Pre-RVSM values are available in previous NAT SPG reports

Technical Risk

3.2.33 It had been agreed that a full technical vertical risk assessment should be carried out in 1998 for two reasons:

a) a more precise method of accounting for variations of Altimetry System Error (ASE) performance, particularly in the way in which non-compliant RVSM-approved airframes are treated, has been developed. This would enable a more reliable technical risk assessment to be made; and

b) the occurrence of a 1200' height deviation caused by turbulence warranted a technical risk assessment to enable the risk associated with this event to be estimated.

3.2.34 New values of Pz(1000) were computed before the meeting, based on reports of large height deviations that occurred during 1997, the Canadian data on Assigned Altitude Deviation (AAD), and ASE data from the CMA database. The values computed enabled the components of risk associated with unapproved aircraft being in RVSM airspace as well as those due to non-compliant approved aircraft and the 1200' height deviation to be compared. A breakdown of technical risk is shown in Table 7 together with the corresponding values from the previous technical risk assessment.

Table 7 : Breakdown of Technical Risk in NAT RVSM airspace (and comparison with previous estimates made in April 1997)

(Estimates are in fatal accidents per flight hour x 10^{-9})

Risk due to:	**April 1997 Estimate**	**June 1998 estimate**
Approved flights	0.03	0.02
Unapproved flights	0.15	0.07
Non-compliant approved airframes	0.44	0.03
6 minute 1200' deviation	N/A	0.08
Total	**0.62**	**0.20**

3.2.35 The reduction in risk due to unapproved flights reflects a reduction in the number of unapproved flights in RVSM airspace, resulting from ATC diligence in tactical monitoring of aircraft approvals and through air carriers co-operation. Because of the more precise estimation method used, the computed risk due to the 3 non-compliant airframes has been reduced. It was noted that the risk due to non-compliant airframes, after they were examined and if necessary modified, had now been shown to be small and it would no longer be computed separately. Instead, compliant and non-compliant approved airframes would be considered as a single group for risk estimation purposes, as long as non-compliant airframes continued to be identified and corrected. It was emphasised that there was a significant risk associated with non-compliant airframes circulating in the system. Technical vertical collision risk in a non-RVSM environment was deemed not to contribute to the measurable risk.

Risk Due to Operational Errors

3.2.36 The operational element of vertical collision risk, in both RVSM and non-RVSM environments, is determined primarily from the estimate of time spent by aircraft at uncleared levels during the monitoring year. Table 8 shows the total number (not necessarily risk bearing) of large height deviations reported to the CMA and the estimate of time spent at uncleared levels for 1997 and the previous five monitoring years (paragraph 2.3.7 refers).

Table 8: Large Height Deviations and Time Spent at Wrong Levels for the Years 1992 - 1997

	1992/3	**1993/4**	**1994/5**	**1995**	**1996**	**1997 (3 months pre RVSM)**	**1997 (9 months post-RVSM)**
Number of Deviations	35	43	39	29*	49*	24*	55*
Time Wrong Level (mins)	320	187	153	60	182	83	266

* includes turbulence and TCAS reports

3.2.37 Table 8 shows that the number of reports has been increasing since 1995. This may indicate a greater awareness of the need for reporting all occurrences of deviations. The Group expressed its appreciation for the large height (as well as GNE) reports now being received from New York and Santa Maria, and stressed the importance of this source of data. The large increase in time spent at wrong level during 1997 was largely due to a single event where a complete NAT crossing was made at the wrong level (duration 170 minutes).

3.2.38 During a review of reports of erosions of longitudinal separation, it was determined that two of the incidents should be classified for risk calculation purposes as large height deviations. These incidents have been included in Table 8. The Group stressed the importance of these large height deviation reports to the ongoing monitoring programme. For risk calculation purposes it was also decided to re-classify three of the height deviations reported by New York as non-risk bearing, on the basis that during the time between when a clearance is issued and when the pilot reports at altitude the aircraft could be deemed to have been provided separation at two levels by ATC (i.e. that another aircraft would not be cleared to the level vacated by an aircraft until a positive indication was received that the first aircraft was established at its new level). However, the Group was unable to establish whether this ATC procedure was common practise throughout NAT MNPS Airspace.

3.2.39 It was noted that pilots have been recommended to limit rates of climb or descent in RVSM airspace to 500 - 1000 ft/min. The reason for this limitation was to minimise TCAS TAs and to reduce the incidents of under or overshooting assigned flight levels. 2000ft/min had been used to date in calculating the risk of crossing a level. The new climb rate was used in risk calculations, although the effect on the overall risk estimate is minimal due to the infrequency of this type of situation. It was noted that the rate of 1000 ft/min would be used in future calculations.

3.2.40 Based on the revised set of large height deviations reported in 1997 and the new value of the climb rate parameter, the Group then determined the operational vertical collision risk estimates which are shown in Table 9.

Table 9: Vertical Collision Risk Estimates for 1997 (Large Height Deviations Only)

All Figures are in Fatal Accidents Per Flight Hour and should be Multiplied by 10^{-9}

	(First 3 months)	**(Final 9 months)**	
	FL290 - FL410	**RVSM Levels**	**Non-RVSM Levels**
OTS	8.34	3.20	0.05
Random	8.17	19.08	4.24
Combined	**8.26**	**10.27**	**2.29**
TLS	**20.00**	**5.00**	**20.00**

3.2.41 Table 9 shows that all the 1997 risk estimates for non-RVSM levels are within the non-RVSM TLS of 2 x 10-8 fatal accidents per flight hour. Risk estimates for random and combined RVSM levels are higher than the RVSM TLS of 5 x 10-9 fatal accidents per flight hour. The large combined RVSM level risk is due to the incident involving a NAT crossing at incorrect level, adding 170 minutes to the time spent at wrong level. Flight deck procedures have been changed to minimise the chance of reoccurrence of this type of incident. A report from Santa Maria also contributed an event with up to 48 minutes spent at the

wrong level. New reports from New York have also increased the number of events in 1997, and, the changes in operational procedures made by New York controllers to mitigate these events were discussed.

3.2.42 The combined operational risk estimated for the RVSM levels is further analysed in Table 10, in which the major contributing events are shown.

Table 10: Operational Combined Vertical Collision Risk Estimate (Final 9 months of 1997 at RVSM levels)

All Figures are in Fatal Accidents Per Flight Hour and should be multiplied by 10^{-9}

Risk due to	Risk estimate
700ft altimetry setting error	0.08
48 minutes at wrong level	1.33
170 minutes at wrong level	4.71
Other height deviations	4.15
Total Operational Risk:	**10.27**

3.2.43 It can be seen by comparing Tables 7 and 10 that technical vertical collision risk is small by comparison to operational risks. This suggests that the Minimum Aircraft System Performance Specification (MASPS) is working successfully in limiting the technical risk in RVSM airspace. Clearly, operational risk is the major contributing component. As was noted previously, risk due to operational errors where aircraft are at incorrect flight levels is not directly related to the implementation of RVSM. Rather it is the increased reporting of errors from all sources brought about by RVSM monitoring that has stimulated this awareness. It was also noted that the ATC phraseology used during the clearance - issuing a clearance before a restriction - may have been a contributing factor in at least one of these events.

Collision Risk Model and Navigation Performance Studies

3.2.44 Suggestions for possible refinements to the collision risk model were considered, particularly in the way time spent at incorrect flight levels is treated in risk calculations. However, the Group concluded that the current methodology was completely sound. It was explained that even though an aircraft could spend a long duration at an incorrect but previously unoccupied level, in any time interval the probability of another aircraft being cleared to that level was constant. Hence, the risk was a linear function of the time spent at wrong level. In addition, the kinematic factor within the existing model accounted for the constant lateral and vertical fluctuation of aircraft about the route centreline. Therefore, although a collision may not occur at the time a flight reaches an uncleared flight level, the risk of colliding continues at a constant level, proportionate to the time spent at an incorrect flight level.

3.2.45 Discussion of the issuing of random offsets with flight clearances led to the Group to agree that another core navigation study should be planned, subject to resource availability (almost 5 years has elapsed since the last one). The reason for a new study was that navigation equipment had evolved over this period (particularly in the case of GPS) and there was also some suggestion that crews may regularly fly offsets. Both of these factors effect the distribution of lateral errors and hence Py(0), which in turn effects vertical collision risk. If evidence emerged from such a study that the core navigation distribution had changed, then the collision risk estimates would also be revised.

CONCLUSION 34/12 - THE NEED TO CARRY OUT A NAT CORE NAVIGATION STUDY

That the NAT Mathematicians Working Group, subject to available resources, carry out a NAT core navigation study and present their recommendations to the NAT SPG.

3.2.46 Another possible refinement considered was the incorporation of the effects of Automatic Dependent Surveillance (ADS) into the collision model. Although the Group felt it was too early to consider modelling ADS, it was noted that an ADS trial would be commencing in the near future and its possible effect on the system should be closely tracked.

3.2.47 One area in which more information could be provided was in examining the frequency of different types of errors revealed by the large height deviation reports. For example, the majority of risk bearing errors appear to be associated with failures to climb or descend when cleared, or climbing or descending without a clearance. In addition, the risk of large height deviations caused by aircraft at incorrect flight levels should be presented separately from the risk of other large height deviations with major events highlighted. The Group agreed that attention should be focused on this area in future with the aim of providing more information to interested parties (paragraph 2.3.8 also refers).

Review of On-Going Monitoring Procedures

Lateral

3.2.48 The three key parameters which affect the lateral collision risk estimate are:

a) lateral occupancies;

b) the accuracy with which aircraft on adjacent tracks at the same flight level maintain their assigned flight levels; and

c) the rate of reported Gross Navigation Errors.

Risk estimates are made on an annual basis with monthly updates being provided by the CMA.

Occupancies

3.2.49 As agreed previously and since the introduction of RVSM was a significant change in airspace structure, lateral occupancies were affected by such changes. Hence, occupancy sample periods should continue to be constrained by the time at which RVSM was introduced, and the implementation of Phase 2 RVSM. That is, monthly lateral risk estimates would be based on a 12-month moving average from now until the introduction of Phase 2 RVSM (October 1998) and from then on would be based on cumulative average occupancies starting October 1997 until a 12 month moving average could be achieved.

3.2.50 The Group noted that for the 1998 annual risk assessment, prior to RVSM Phase 2, the lateral risk estimate was based on the average 12 months of occupancies between 15th October 1997 and 4th October 1998. For the post-RVSM Phase 2 estimate, the average occupancy in MNPS airspace for the seven month period 15th October 1998 to 15 April 1999 would be used.

Longitudinal

3.2.51 The Group welcomed the new reports on erosions of longitudinal separation now being received from Santa Maria as well as from Gander, in the format specified by NAT SPG Conclusion 33/11. The reports were being added to a store of such events which will be used in the upcoming longitudinal risk assessment.

Vertical

Occupancies

3.2.52 The occupancy periods that will be sampled for the 1998 vertical risk assessment will be as for the lateral assessment, except that the occupancy will be broken down into RVSM and non-RVSM levels.

Requirements for Monitoring Beyond the Verification Phase

3.2.53 Although the RVSM trial period is now over, monitoring of ASE and large height deviations is continuing. Up to February 1997 for the GMS and up to March 1997 for the HMU, a total of 2155 approved airframes had been monitored by these systems. This constituted 75% of the total estimated NAT fleet which at that time consisted of 2863 airframes.

3.2.54 Before discussing future monitoring requirements, the Group considered two items of work that have a bearing on the matter:

a) a preliminary analysis of the traffic sample likely to be obtained by the Gander HMU site when becoming operational. It was concluded that of the approximately 650 approved airframes not yet monitored, at least one third would be captured by this HMU. Furthermore, 38 of the 39 operator/aircraft pairs not yet monitored are not expected to be captured at Gander. Discussions revealed that more data could be reduced and analysed to highlight more effectively candidates for GMS sampling; and

b) an analysis of individual airframe ASE stability was carried out on 101 airframes for which more than a years' worth of HMU measurements existed (the majority of airframes had been measured for approximately 400 days, with some up to 2 years). The conclusion was that mean ASE was largely stable on the majority of airframes, only one out of the 101 exhibiting an apparent clear drift of 60 ft over 2 years, with two others showing possible signs of variation. Although further work was required on this study to examine the stability of ASE variation, it was noted that the airframe mean ASE appeared to be largely stable over approximately a year and a quarter.

3.2.55 After taking into account the above two studies the Group arrived at the following draft for monitoring requirements for beyond the verification stage:

Technical Risk

I. Achieve as near complete a census as possible of NAT approved airframes (no time limit is specified)

II. ASE stability results should be analysed each year by the MWG and reviewed. Because of the initial analysis regarding the stability of mean ASE, a minimum re-monitoring period for individual aircraft has not been specified.

III. Monitoring is to be focused on problem areas

Operational Risk

I. The importance of complete reporting should be re-emphasised

II. The Large Height Deviation sampling period should remain at one year for the time being. (Although a larger sample period would give a better risk estimate, reporting is not yet stable enough to warrant this.)

3.2.56 In order to initiate Item I under Technical Risk and complete the minimum monitoring requirements for approved aircraft, the Group agreed that:

a) the most current monitored data be carefully examined to confirm which of the 38 aircraft operator/type pairs have not met minimum sampling requirements and that they be scheduled for monitoring.

b) aircraft operator/type pairs not planning to operate in the vicinity of the Gander HMU be identified as candidates to be monitored by the GMS; and

c) the initial analysis discussed by the Group be expanded to more days to confirm those aircraft operator/type pairs that are not expected to be monitored by the HMU at Gander and that these aircraft operator/type pairs be identified as candidates to be monitored by the GMS.

3.2.57 It was noted that the MWG would give consideration to the development of new indicators (similar to the 180 minute at wrong flight level test) for use by the CMA as an on-going monitoring tool. The aim would be to use the indicators to flag possible problems as early as possible. It was also suggested to the Group that similar performance indicators be developed for technical risk assessments to eliminate the need for a full risk assessment each year.

3.2.58 It was noted that the investigation of HMU/GMU differences remained on the long term work programme and that typical Flight Technical Error (FTE) performance would need to be reviewed (in approximately a year's time).

3.2.59 In order to improve the efficiency of the review process, it was agreed that at least one member of the MWG should attend future Scrutiny Group meetings to allow discussions that result in error classifications suitable for both Groups. In addition, the information to be reviewed by the Scrutiny Group should be circulated sufficiently in advance for the MWG to review and make inputs to the scrutiny report (paragraph 2.3.8 refers).

CONCLUSION 34/13 - IMPROVEMENTS TO THE EFFICIENCY OF THE NAT MATHEMATICIANS AND SCRUTINY WORKING GROUPS

That:

a) annual data collected by the Central Monitoring Agency for review by the Scrutiny Group be circulated to the Mathematicians Working Group (MWG) by the end of March of each year; and

b) a member of the MWG attend Scrutiny Group meetings.

Mathematicians' Working Group Work Programme

3.2.60 The MWG will continue to provide inputs to the CMA on a monthly basis and its next annual risk assessment will be performed in May 1999 for which a meeting will be required before NAT SPG/35.

3.3 Review of systems operations

AIR TRAFFIC MANAGEMENT

North Atlantic Operations Managers' Meeting

3.3.1 The Group expressed disappointment that the NAT Operations Managers had not submitted their report, which should have been done in accordance with their terms of reference. In order to ensure maximum efficiency, it was agreed that the NAT OPS MNGs submit their report to the European and North Atlantic Office of ICAO within one month after the end of their meeting. The Secretary would then ensure that the necessary co-ordination is carried with the NAT SPG for short term issues and would further present the report to the NAT SPG.

CONCLUSION 34/14 - REPORTS OF THE NAT OPERATIONS MANAGERS MEETINGS

That:

a) the rapporteur of the NAT Operations Managers Meeting submit a report of their meeting to the Secretary of the NAT SPG within one month of the end of their meeting; and

b) the Secretary of the NAT SPG ensure that the necessary co-ordination amongst the NAT SPG be subsequently carried out.

Five-letter name-code designators for oceanic reporting points

3.3.2 The Group was presented with a proposal to name latitude/longitude waypoints within the Gander and Shanwick OCAs using five-letter name-codes. The Group could not agree to the proposal because of the operational and systems implications.

Uniform Methodology for the identification, assessment and reporting of air navigation shortcomings and deficiencies

3.3.3 The Group was presented with a proposal to establish a uniform methodology for the identification, assessment and reporting of air navigation shortcomings and deficiencies for the NAT Region. In this context, it was noted that the proposal had stemmed from the Council which had agreed that the current practice of identifying shortcomings and deficiencies needed improvement. The Group examined the proposal and felt that the definitions for shortcomings and deficiencies required further refinement before any uniform methodology could be implemented in the NAT Region.

3.3.4 The Group also felt that it already met the spirit of the proposal in that it regularly reviewed the health of the NAT air navigation system. In this context, the NAT SPG has several working groups (communications, OPS Managers, mathematicians and scrutiny) to identify and propose solutions to "shortcomings and deficiencies". Nevertheless, the Group felt that it would be useful to review this matter once the Air Navigation Commission had completed its work on this issue.

COMMUNICATIONS

3.3.5 The Group was informed that the meeting of the ACSG planned for Iceland in advance of NAT SPG/34 was deferred due to the non-availability of some of the group members. The meeting was tentatively re-scheduled for September/October 1998.

Installing additional Very High Frequency (VHF) stations in Greenland

3.3.6 It was recalled that NAT SPG Conclusion 33/15 required Denmark and Iceland to study the possibility of installing additional VHF stations in Greenland, remotely controlled from Iceland, so as to reduce high frequency congestion and subsequently to report their findings to NAT SPG/34. This had not been possible because of the deferred ACSG meeting and it was now expected to be discussed at the re-scheduled ACSG meeting in September/October 1998.

Discontinuation of High Frequency (HF) Intercept Procedures

3.3.7 Some communications provider States had expressed concern at the discontinuation of the HF intercept procedures as required by NAT SPG 33/16; therefore, it had not been possible to agree on an implementation date by correspondence. The subject will be dealt with at the next meeting of the ACSG.

HF and General Purpose (GP)/VHF Data collection 1997

3.3.8 States concerned had prepared detailed statistical reports for 1997 based on the results of HF and GP/VHF data collection exercises conducted in accordance with NAT SPG Conclusion 30/26. The results, consolidated in a single report compiled by Portugal, provided an analysis of individual station performance and a global overview of network stations.

3.3.9 The network produced 3.32 million messages in 1997, up from 3.28 million in 1996. Distribution was approximately 78 percent on HF, with the remainder on GP/VHF. These statistics included both readback (RB) and intercept messages. The data indicated that some HF frequencies were exceeding capacity limits during peak traffic periods. The Group agreed to continue reporting HF and GP/VHF surveys and to compile a separate report for the busiest day, confined to RB messages only.

Effects of RVSM on HF Communications

3.3.10 A recent survey indicated that the effects of the implementation of RVSM had not been as significant as earlier predicted. Traffic peaks were sharper, leading to greater pressure on HF frequencies at those times. The overall picture had shown an increase of approximately 4% in communications exchanges. The impact of the introduction of Phase 2 in October 1998 would be monitored by the ACSG and reported on at NAT SPG/35. In 1997, the Shanwick HF station reported an increase of 5.6% in aircraft movements (273,000) while communications exchanges (900,000) were up by 9%.

Network Management

3.3.11 Uneven distribution of traffic on HF frequencies was again a cause of concern. The main area of contention relates to use of NAT – family A, which was assigned to traffic on Southerly routes, being used inappropriately as an off-load frequency for traffic on other routes.

Data Link.

3.3.12 Canada had indicated that it would commence trials for data link transmission of Waypoint Position Reports (WPR) in the Gander Oceanic Control Area (OCA) later in 1998. Furthermore, development of the ARINC GlobaLink HF Data Link continued and some NAT provider States were considering participating in the system.

3.3.13 HF datalink (HFDL) was being explored not only as a low-cost back-up to satellite systems but as a viable alternative. In the short term, the implementation of NAT HFDL would help to alleviate the problem of congestion on HF voice channels which could occur at peak hours. The development of SARPs

for HFDL is expected to be complete by the end of 1998. It is estimated that by 2003, the take-up of NAT HF datalink will amount to 30% of the overall HF load.

3.3.14 As regards the implementation of data links, the Group recalled that it was necessary to resolve institutional issues, and it noted that the United Kingdom National Air Traffic Services and the Irish Aviation Authority are engaged in ongoing bilateral discussions on provision of service issues.

Provision of NAT HF Services during the Transition to Aeronautical Mobile Satellite Systems

3.3.15 The slow pace of transition to new communications systems, allied to ongoing growth in aircraft movements, had prompted some HF provider States to conduct a review of their operational facilities. The Shanwick communications station in Ireland had embarked on a programme of replacement of all its HF equipment and Portugal planned to replace all HF equipment as part of the new Oceanic Centre project.

3.3.16 The Group recalled that the NAT SPG had been tasked by the Limited North Atlantic Regional Air Navigation (LIM NAT RAN) Meeting, 1992, to take account of important transitional issues when planning the implementation of satellite-aided CNS/ATM systems. In seeking to ensure that arrangements were adequately flexible to accommodate presently defined services and a range of future services, the following factors were to be considered:

a) the projected increase in aircraft traffic in the short term before satellite communications were generally available, and the impact of this on the level of HF services required;

b) the need for some providers to re-equip HF installations prior to and perhaps during the transition to satellite communications;

c) a clear indication of the rate of equipage of satellite facilities by users in order to plan future HF capacity;

d) the possible rationalisation or change in the configuration of the NAT HF network when satellite communications significantly impact on HF services;

e) cost recovery of HF services in a declining HF environment; and

f) the need to provide for staff re-training and possible redundancy arrangements for communications staff.

3.3.17 The NAT TFG had predicted that between 1997 and 2015, aircraft movements on the North Atlantic would increase by between 61% (baseline) and 84% (optimistic). Currently the average daily total of movements is 813. This could rise to 1,495 by 2015.

3.3.18 In 1997, almost all air-ground-air exchanges continued to be conducted on HF or VHF. The progression towards replacement systems has only just commenced. In this context, Canada was initiating operational trials for WPR using the ADS functionality of the FANS 1/A avionics. Other methods of data linking WPR, including the Controller Pilot Data Link Communications (CPDLC) functionality of FANS 1/A, are not being considered by NAT SPG at this initial stage.

3.3.19 Predictions - including those agreed to at the LIM NAT RAN Meeting (1992) - regarding implementation time-scales for aeronautical mobile satellite systems for the NAT Region have proven to be inaccurate. The Group agreed that it was necessary to review the institutional and transitional issues identified in the LIM NAT RAN report in relation to the requirements for HF services.

CONCLUSION 34/15 - TRANSITION FROM HIGH FREQUENCY VOICE TO NEW SYSTEMS

That the NAT Implementation Management Group (IMG) investigate the issues and time scales related to the transition from HF voice communications to the new systems and report to NAT SPG/35.

SYSTEM EFFICIENCY

Determination of the performance of the NAT air navigation system and the services provided to airspace users by ATC

3.3.20 As at previous meetings, the Group was presented with information on the efficiency of NAT air navigation services in the format agreed to at NAT SPG/24 (Conclusion 24/11 refers). It was noted that nothing untoward was reported.

APPENDIX A

FIGURE 1 - North Atlantic MNPS Airspace Occupancy Expressed in Standard Units

(Paragraph 3.2.26 refers)

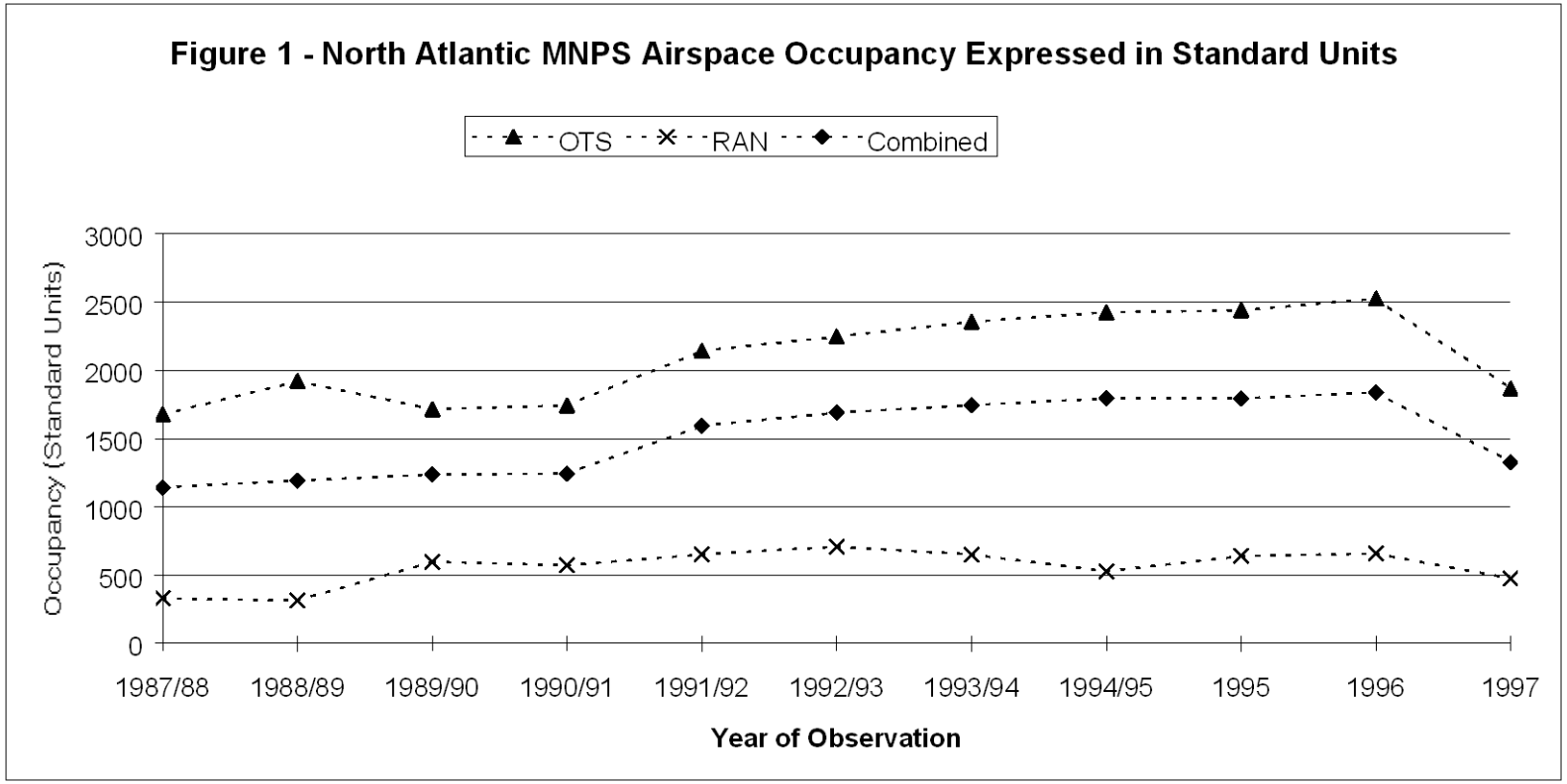
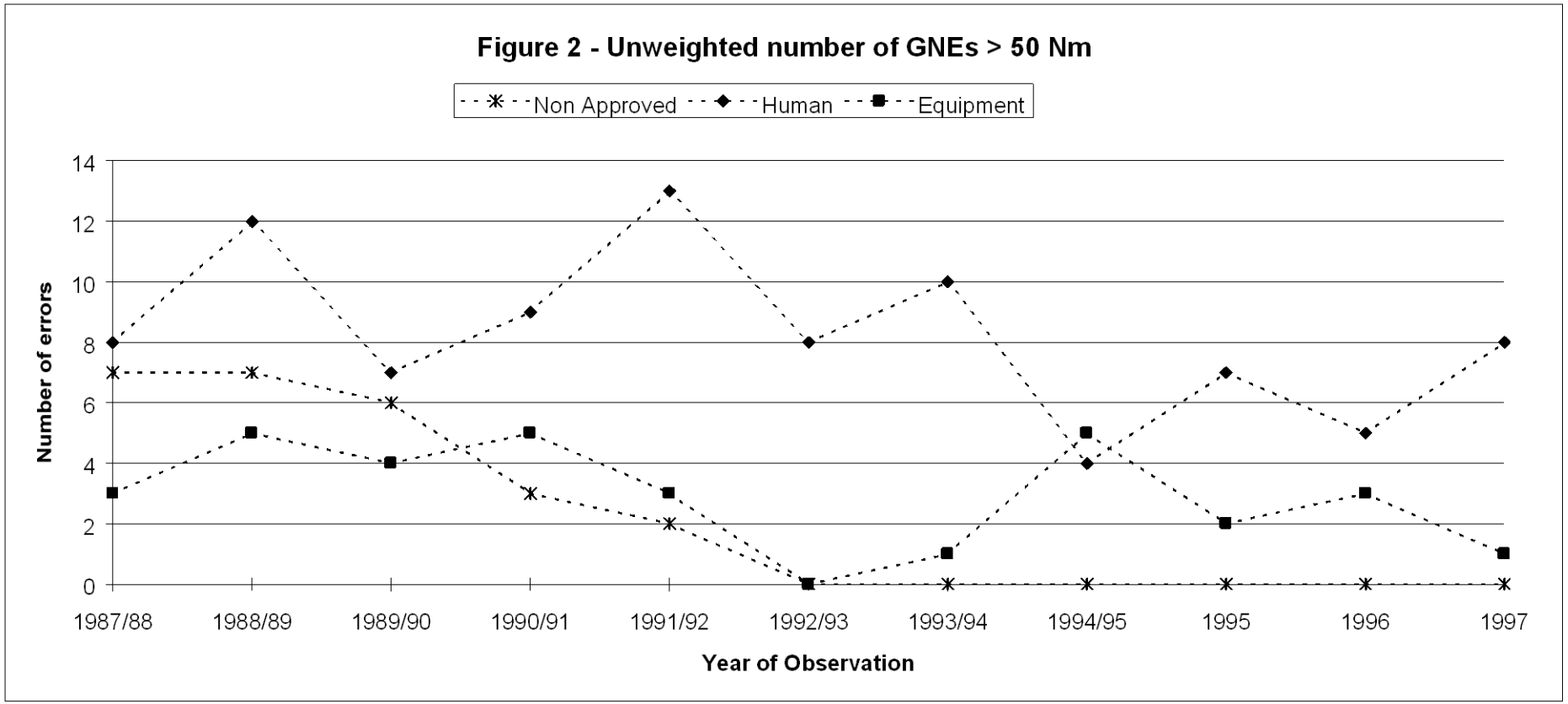


FIGURE 2 - Unweighted number of GNES > 50 NM

(Paragraph 3.2.31 refers)



4. AGENDA ITEM 4 - DOCUMENTATION UPDATE

4.1 Introduction

4.1.1 Under this Agenda Item, the Group considered the following specific subjects:

a) NAT MNPS Operations (MNPS OPS) manual

b) NAT Consolidated Guidance Material

c) NAT IGA Manual

4.2 MNPS OPS manual

4.2.1 The Group was informed that the Seventh edition of the MNPS OPS Manual has been published. This edition takes into account the implementation of RVSM Phase I as well as the use of GPS as a long range navigation system. However, since the publication of the document, several enquiries were received requesting clarifications. In addition, RVSM Phase II is now planned for 8 October 1998 and, as indicated below, the NAT RVSM Guidance Material (Doc 002) will be incorporated into the NAT Consolidated Guidance Material (Doc 001). Furthermore, there is a need to indicate the pre-departure procedures for GPS equipped aircraft.

4.2.2 On the basis of the above information, the Group examined options to update the MNPS OPS Manual. It was finally agreed that an Eighth Edition should be prepared and that some form of Aeronautical Information Services (AIS) action, preferably an AIC, would be required to alert the user community. Initially, the new edition would be posted on the NAT Web site and the hard copy would be produced as soon as possible thereafter. In agreeing to the foregoing, it was recognised that the MNPS OPS Manual would no longer have the same edition number as the NAT Consolidated Guidance Material.

4.2.3 The Group then turned its attention to some specific issues that had been raised and for which clarification had been sought. The Group provided the editor of the MNPS OPS Manual with specific answers to the questions that had been raised. In the discussions, it was noted that the NAT Facilities and Services Implementation Document (FASID) contained some erroneous information concerning the route structure in the NAT Region. It was agreed that in the process of moving the ATS route network from the FASID to the NAT ANP (Council Decision 150/3 of 28/02/97 refers), the opportunity should be taken to correct the errors. In concluding its discussions on this matter, the Group expressed its appreciation to the United Kingdom and IATA for all the efforts that they have put into producing the Seventh Edition of the MNPS Operations Manual.

CONCLUSION 34/16 - PUBLICATION OF THE EIGHTH EDITION OF THE MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS OPERATIONS (MNPS OPS) MANUAL

That:

a) the editors of the MNPS OPS Manual make arrangements for the publication of the Eighth Edition; and

b) the ICAO European and North Atlantic Office make arrangements to amend the NAT Air Navigation Plan to reflect the current status of fixed ATS routes in the NAT Region.

4.3 NAT Consolidated Guidance Material

4.3.1 The Group was informed that the preparations for the publication of the Seventh edition of the NAT Consolidated Guidance Material (NAT Doc 001) were well underway. However, because of the complexity of incorporating the RVSM Guidance Material (NAT Doc 002) into NAT Doc 001, delays had been encountered. However, it was expected that the document would be completed and distributed to all concerned by the last quarter of 1998.

4.3.2 With this in mind, the Group examined some specific proposals for inclusion in Doc 001. In particular, the Climb/Descend procedures shown in **Appendix A** to the report of Agenda Item 4 were reviewed and endorsed. It was also agreed that they be incorporated in the Seventh Edition. The Group was also informed that the RVSM approval requirements were changing and that monitoring would no longer be part of the approval process for certain types of aircraft. In this connection, it was recalled that monitoring was never supposed to be part of the approval process but that it had been necessary to do so in order to meet the implementation time-table. The Group agreed that the CMA should draft appropriate wording for inclusion in the Guidance Material.

4.3.3 Recalling that in-flight contingency procedures (paragraph 2.3.5 refers) had to be developed to mitigate the effects of wake turbulence at RVSM levels, the Group felt that the procedures should also be included in Doc 001.

CONCLUSION 34/17 - AMENDMENTS TO THE NAT CONSOLIDATED GUIDANCE MATERIAL

That:

a) the procedures concerning climb/descent through Minimum Navigation Performance Specifications (MNPS) airspace as shown in Appendix A to the Report on Agenda Item 4 be incorporated into the seventh Edition of the NAT Consolidated Guidance Material; and

b) the Central Monitoring Agency develop an amendment to the reduced vertical separation minimum (RVSM) approval process so as to gradually remove the requirement for monitoring in order to obtain an RVSM approval.

4.4 NAT IGA Manual

4.4.1 As in previous years, information had been sought from the Search and Rescue (SAR) authorities of NAT provider States in order to compile the summary of SAR incidents which is at **Appendix B** to the Report on Agenda Item 4. Only incidents which generated a launch of SAR assets have been included.

4.4.2 It is worth noting once more that in October 1996 Canada introduced modified regulations for the inspection of single engined and twin engined aircraft flying over their territory and thence over the North Atlantic. They reduced inspections from the previous 2-flight inspections per pilot, to spot checks only.

4.4.3 This relaxation was due to a number of factors i.e. aircraft were more reliable, better equipped and were flown by better trained pilots. The introduction of GPS as a very precise navigation aid was in itself significant and the availability of an 'IGA Operations Manual' for pilots flying in the NAT had helped considerably with educating crews to fly safely.

4.4.4 Civil aviation SAR Incidents have been reduced dramatically in recent years, since the peak of 28 in 1989, and even more so during the past year. The only 2 incidents (with nobody killed) that have occurred in airspace underlying MNPS airspace in 1997 were over Greenland and consisted of:

a) a light aircraft crash caused by controlled flight into terrain on the Greenland icecap; and

b) a Catalina aircraft which experienced engine problems en route to Goose Bay and needed to be escorted through the fjords to Narsarsuaq

4.4.5 There have however been 6 SAR incidents, mainly ditchings, which have occurred a little outside NAT MNPS airspace: 2 helicopters between Norway and the MNPS boundary (with at least 12 Persons On Board [POB] killed); 2 light aircraft about 1 NM off the coast of United States (with 5 persons dead); and 2 light aircraft several NMs south west of Gander, Canada (with 3 POB slightly hurt).

4.4.6 The Group noted that Canada, the United Kingdom and the United States have almost completed their tripartite talks to formulate a SAR agreement for areas of mutual interest including the NAT. It should be signed by civil and military aeronautical and maritime authorities this year. It is hoped to have a SAR exercise in the NAT sometime next year.

APPENDIX A

CLIMBS AND DESCENTS THROUGH MNPS AIRSPACE

(Paragraph 4.3.2 refers)

The Group noted that, in order to improve the Air Traffic Services (ATS) provided to aircraft operating into/out of those airports where no established Very High Frequency Omni Directional Range/Distance Measuring Equipment (VOR/DME), Radar or Direct Controller Pilot Communications (DCPC) existed and to prevent the development of a critical fuel situation, the ATMG had developed the following procedure:

Non-Minimum Navigation Performance Specifications (MNPS) approved aircraft can be cleared to climb or descend through MNPS airspace for the sole purpose of landing or departing at an airport which underlies MNPS airspace provided that:

i) the aircraft is equipped with a suitable long range navigation aid to enable it to maintain a random track established by Air Traffic Control (ATC);

ii) descent (or climb) through MNPS airspace will not be initiated until the aircraft is established on the track established by ATC;

iii) the established track will be maintained by the aircraft until it has exited the MNPS airspace and is clear of other known traffic;

iv) descent (or climb) will be expedited in so far as is safely practicable; and

v) all other traffic at each respective flight level is protected either laterally by 120 NM, or the applicable minimum longitudinal separation standard.

Note: - DCPC is not required for the application of this procedure and MNPS/RVSM approved flights operating in MNPS airspace during such climbs or descents shall not be penalized by the application of this procedure.

APPENDIX B

SAR INCIDENTS IN THE NAT REGION

(Paragraph 4.4.1)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	4	10	5	3	1	1	0	3	1	2
Ireland/UK	4	7	4	3	4	3	1	0	1	0
USA	2	4	2	0	0	0	2	0	2	0
Portugal	0	2	2	0	4	3	3	1	1	0
Iceland	12	5	10	2	0	2	3	0	0	0
Norway	N/A	N/A	1	0	0	0	0	1	0	0
Canada	N/A	N/A	N/A	0	2	0	0	4	4	0
Totals ***(for data received)***	22	28	24	8	11	9	9	9	9	2
Average (for RCCs reporting)	4.4	5.6	4.0	1.1	1.6	1.3	1.3	1.3	1.3	0.2

Note: Denmark includes Faroe Islands and Greenland

5. AGENDA ITEM 5 - ANY OTHER BUSINESS

5.1 Introduction

5.1.1 Under this Agenda Item, the Group considered the following specific subjects:

a) next meeting of the NAT SPG

b) North Atlantic Oceanic Conference

5.2 Next meeting of the NAT SPG

5.2.1 The Group agreed that the next meeting will be held in the newly renovated premises of the ICAO EUR/NAT Office in Paris from 14 to 17 June 1999. It was also agreed that the MWG would meet from 7 to 12 June 1999, also at the ICAO EUR/NAT Office in Paris. It has been demonstrated again that when documentation is provided in advance of the meeting, it is possible to complete the work in a minimum of time; however, it was pointed out that papers had not been distributed in advance of the meeting due to their late arrival at the Secretariat. This can reduce the efficiency of the meeting because it is not possible to co-ordinate a State or organisation position in advance of the meeting. Participants were therefore once again urged to endeavour to make sure that papers are sent early, especially if they contain controversial matter that requires prior co-ordination.

5.3 North Atlantic Oceanic Conference

5.3.1 In follow-up to NAT SPG Conclusion 33/7, the group was informed that the Oceanic Conference would be held in Edinburgh in October 1999. The Conference, which will be under the auspices of ICAO, will be hosted by the United Kingdom.

LIST OF ACRONYMS

AAD	Assigned Altitude Deviation
ACAS	Airborne Collision Avoidance System
ACARS	Aircraft Communication Addressing and Reporting System
ACC	Area Control Centre
ACSG	Aeronautical Communications Sub-Group
ADS	Automatic Dependent Surveillance
ADSP	Automatic Dependent Surveillance Panel
AFTN	Aeronautical Fixed Telecommunications Network
AIC	Aeronautical Information Circular
AIDC	Air Traffic Services (ATS) Inter-facility Data Communications
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Services
AFI	African
ALLPIRG	All Planning and Implementation Regional Groups
AMSG	Airspace Monitoring Sub-Group
AMSS	Aeronautical Mobile-Satellite Service
ANP	Air Navigation Plan
ASE	Altimetry System Error
ATC	Air Traffic Control
ATCC	Area and Terminal Control Centre
ATM	Air Traffic Management
ATMG	Air Traffic Management Group
ATMIP	Air Traffic Management Implementation Plan
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
BOTA	Brest Oceanic Transition Area
CAA	Civil Aviation Authority
CADAG	Communications, Automation and Data Link Applications Group
DFDR	Digital Flight Data Recorder
CMA	Central Monitoring Agency
CNS	Communications
CNS/ATM	Communications, Navigation and Surveillance/Air Traffic Management
CPDLC	Controller Pilot Data Link Communications
CRM	Collision Risk Model
CTA	Control Area
DPP	Development Programme Plan
DR	Dead Reckoning
ECAC	European Civil Aviation Conference
EATCHIP	European Air Traffic Control Harmonization and Integration Programme
EGNOS	European Geostationary Navigation Overlay Service
ELT	Emergency Locator Transmitter
EUR/NAT	European and North Atlantic
FAA	Federal Aviation Administration
FANS	Special Committee on Future Air Navigation Systems
FASID	Facilities and Services Implementation Document
FDE	Fault Detection and Exclusion
FDPS	Flight Data Processing System
FIR	Flight Information Region
FMS	Flight Management System
FTE	Flight Technical Error
GAATS	Gander Automated Air Traffic System
GAT	General Air Traffic
GLONASS	Global Orbiting Navigation Satellite System
GMS	Global Positioning System Monitoring System

GMU	Global Positioning System Monitoring Unit
GNE	Gross Navigation Error
GNSS	Global Navigation Satellite System
GP	General Purpose
GPS	Global Positioning System
HF	High Frequency
HFDL	HF Data Link
HMU	Height Monitoring Unit
IACA	International Air Carrier Association
IAOPA	International Council of Aircraft Owner and Pilot Associations
IATA	International Air Transport Association
IBAC	International Business Aviation Council
ICD	Interface Control Document
ID	Implementation Document
IFALPA	International Federation of Air Line Pilots' Associations
IFATCA	International Federation of Air Traffic Controllers' Associations
IGA	International General Aviation
IMG	Implementation Management Group
Inmarsat	International Maritime Satellite Organization
INS	Inertial Navigation System
IRS	Inertial Reference System
JAA	Joint Aviation Authorities
LIM NAT RAN	Limited North Atlantic Regional Air Navigation
MASPS	Minimum Aircraft System Performance Specification
MEL	Minimum Equipment List
MIG	Mathematicians Implementation Group
Mil	Military
MNPS	Minimum Navigation Performance Specifications
MNPS OPS	Minimum Navigation Performance Specifications Operations
MOPS	Minimum Operational Performance Standards
MSSR	Monopulse Secondary Surveillance Radar
MWG	Mathematicians Working Group
NAM	North American
NAT	North Atlantic
NAT IMG	North Atlantic Implementation Management Group
NAT SPG	North Atlantic Systems Planning Group
NAT TFG	North Atlantic Traffic Forecasting Group
NICE	NAT Implementation Management Group Cost Effectiveness
NOCAR	North Atlantic Oceanic Concept and Requirements document
OAC	Oceanic Area Control Centre
OAG	Official Airline Guide
OCA	Oceanic Control Area
OCD	Oceanic Clearance Delivery
ODAPS	Oceanic Display and Planning System
OLDI	On Line Data Interchange
OPS/AIR	Operations/Airworthiness
OPS MNG	NAT Operations Managers
OTS	Organized Track System
PCO	Programme Coordination Office
POB	Persons On Board
PT	Public Transport
RAIM	Receiver Autonomous Integrity Monitoring
RB	Readback
R&D	Research and Development
RHSM	Reduced Horizontal Separation Minima
RNAV	Area Navigation
RNP	Required Navigation Performance
RSSIG	Reduced Separation Standards Implementation Group

R/T	Radio Telecommunication
RTCA	Radio Technical Commission for Aeronautics
RVSM	Reduced Vertical Separation Minimum
SAR	Search and Rescue
SARPS	Standards and Recommended Practices (ICAO)
SATCOM	Satellite Communications
SOTA	Shannon Oceanic Transition Area
SST	Supersonic Transport
SUPPS	Regional Supplementary Procedures
TCAS	Traffic Alert and Collision Avoidance System
NAT TFG	NAT Traffic Forecasting Group
TA	Traffic Advisors
TLS	Target Level of Safety
TVE	Total Vertical Error
UIR	Upper Information Region
VHF	Very High Frequency
WAAS	Wide Area Augmentation System (WAAS)
WATRS	West Atlantic Route Structure
WGS-84	World Geodetic System – 1984 Standards
WPR	Waypoint Position Report
WWW	World Wide Web
Y2K	Year 2000

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