NAT SPG/32

NORTH ATLANTIC SYSTEMS PLANNING GROUP

Summary of Discussions and Conclusions of the

Thirty-Second Meeting of the

North Atlantic Systems Planning Group

Paris, 16 - 20 September 1996

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INTRODUCTION

i.1 The Thirty-Second Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in Paris from 16 to 20 September 1996. Because of illness of the Chairman, **Mr. Myles Murphy** from Ireland, the Member for Iceland, **Mr. Ásgeir Pálsson**, had accepted the invitation by all the members of the NAT SPG to chair the meeting.

i.2 In addition to the International Aircraft Owners and Pilots Association (IAOPA), the International Air Transport Association (IATA), the International Air Carriers Association (IACA), 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 Organisation (Inmarsat), the Group had, as usual, invited Spain and the Russian Federation to attend the meeting as observers. A list of participants is at page ii-3.

i.3 The Mathematician's Working Group (MWG) had met four times since NAT SPG/31 and the latest meeting was held in Paris from 9 to 16 September 1996 to consider the mathematical and statistical aspects of separation minima safety in the NAT Region and to ensure that the Target Levels of Safety (TLS) were being met. **Mr. Andrew du Boulay**, the rapporteur of the MWG, presented information that had been developed by the MWG in support of current lateral performance and future reductions in vertical and horizontal separation minima.

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 and which met in London on 3 May 1996, provided the NAT SPG with their report.

i.5 The Aeronautical Communications Sub Group (ACSG), which met in Annapolis from 25 to 28 June 1996, had reviewed matters related to the NAT aeronautical telecommunications infrastructure. **Mr. Phonsie O'Connor** of Ireland, in his capacity of rapporteur, provided the Group with its report.

i.6 The North Atlantic Implementation Management Group (NAT IMG) had met three times since NAT SPG/31 in order to develop the plans for the implementation of Reduced Vertical Separation Minimum (RVSM) and for the implementation of the ICAO Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM) systems in the NAT Region. **Mr. Don MacKeigan**, the NAT IMG Member for Canada, acting on behalf of Mr Myles Murphy the Chairman of the NAT IMG, provided the NAT SPG with a progress report concerning the activities of the NAT IMG.

i.7 The NAT Operations Managers (OPS MGS) had met in New York from 13 to 17 November 1995 in order to address short term operational issues. **Mr. Michael Pumphrey** of the United States, acting as rapporteur in accordance with the new working methods of the OPS MGS, provided the NAT SPG with an update concerning their activities.

i.8 **Mr. Christian Eigl**, the ICAO Representative, European (EUR) and North Atlantic (NAT) Office, was the Secretary of the Meeting and was assisted by Messrs Jacques Vanier, Robert Kruger, Technical Officers (TO) for Air Traffic Management (ATM) and for Communications Navigation Surveillance (CNS) respectively from the European ant North Atlantic (EUR/NAT) Office of ICAO and by Mrs Olga Recasens, Chief of the Joint Financing Section from ICAO Headquarters.

i.9 In his opening remarks, the Chairman informed the Group that Mr. Lars-Peter Jensen had replaced Mr. Karsten Theil as the Member for Denmark and that Mr. John Nordbø had replaced Mr. Paul Wood as the Member for the United Kingdom. He also welcomed Mr. Howard Hess as the observer representing the interests of IBAC. Finally, in view of the illness of the Chairman, the Group was informed that Mr. Pat Ryan would act for the Member for Ireland.

LIST OF PARTICIPANTS/LISTE DES PARTICIPANTS

CANADA
Don MacKeigan*
Earle Snow
Bill Stilwell

DENMARK/DANEMARK
Lars Peter Jensen*
Svend B. Gravesen
Knud Rosing

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André Berman*
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Lindsay Norrish

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Christian Eigl
Robert Kruger
Olga Recasens
Angelika Schloemp
Jacques Vanier

* Member/Membre
\# Observer/Observateur
@ Representing the CMA/Représentant la CMA
\+ MWG Rapporteur/Rapporteur du MWG

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LIST OF CONCLUSIONS

LIST OF ABBREVIATIONS

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
AFTN	Aeronautical Fixed Telecommunications Network
AIC	Aeronautical Information Circular
AIS	Aeronautical Information Services
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
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
CAA	Civil Aviation Authority
CADAG	Communications, Automation and Data Link Applications Group
CARF	Central Altitude Reservation Facility
CMA	Central Monitoring Agency
CNS	Communications, Navigation and Surveillance
CNS/ATM	Communications, Navigation and Surveillance/Air Traffic Management
CPDLC	Controller Pilot Data Link Communications
ECAC	European Civil Aviation Conference
ELT	Emergency Locator Transmitter
EUR/NAT	European ant North Atlantic
FAA	Federal Aviation Administration
FASID	Facilities and Services Implementation Document
FDPS	Flight Data Processing System
GLONASS	Global Orbiting Navigation Satellite System
GMS	Global Positioning System (GPS) based Monitoring System
GMU	Global Positioning System Monitoring Unit
GNE	Gross Navigation Error
GNSS	Global Navigation Satellite Systems
GP	General Purpose
GP/VHF	General Purpose Very High Frequency
GPS	Global Positioning System
HF	High Frequency
HMU	Height Monitoring Unit
IACA	International Air Carriers Association
IATA	International Air Transport Association

IAOPA	International Aircraft Owners and Pilots Association
IBAC	International Business Aviation Council
IFALPA	Federation of Air Line Pilots Associations
IFATCA	International Federation of Air Traffic Controllers Associations
INMARSAT	International Maritime Satellite Organization
ISPACG	Informal South Pacific Air Traffic Services Co-ordinating Group
JAA	Joint Aviation Authorities
ICD	Interface Control Document
ID	Implementation Document
IGA	International General Aviation
IMG	Implementation Management Group
INS	Inertial Navigation System
IRS	Inertial Reference System
MASPS	Minimum Aircraft System Performance Specification
MNPS	Minimum Navigation Performance Specifications
MOPS	Minimum Operational Performance Standards
MWG	Mathematicians Working Group
NAT ID	North Atlantic (NAT) Implementation Document
NAT SPG	NAT Systems Planning Group
NAT TFG	NAT Traffic Forecasting Group
NICE	NAT Implementation Management Group Cost Effectiveness
NOCAR	North Atlantic Oceanic Concept and Requirements document
OAC	Oceanic Area Control Centre
OCA	Oceanic Control Area
OCD	Oceanic Clearance Delivery
OLDI	On Line Data Interchange
OPS/AIR	Operations and Airworthiness
OPS MGS	NAT Operations Managers
OTS	Organized Track System
PCO	Programme Co-ordination Office
R&D	Research and Development
RSSIG	Reduced Separation Standards Implementation Group
R/T	radiotelephony
RTCA	Radio Technical Commission for Aeronautics
RHSM	Reduced Horizontal Separation Minima
RVSM	Reduced Vertical Separation Minimum
SAR	Search and Rescue
SARPS	Standards and Recommended Practices (ICAO)
SATCOM	Satellite Communications
SOTA	Shannon Oceanic Transition Area
SPOM	South Pacific Operations Manual
SUPPS	Regional Supplementary Procedures
TCAS	Traffic Alert and Collision Avoidance System
TLS	Target Level of Safety
UIR	Upper Information Region
VHF	Very High Frequency
WATRS	Western Atlantic Route Structure

AGENDA ITEM 1: DEVELOPMENTS

1.1 Introduction

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

a) Adjacent Regions; and

b) Technology.

1.2 Adjacent Regions

Airborne Collision Avoidance Systems (ACAS)

1.2.1 The Group recalled that the United Kingdom had been collecting and analysing reports of ACAS events within the NAT Region and the proposed RVSM transition areas for several years. In this context, the Group noted the update which had shown that 235 ACAS events had been reported in United Kingdom airspace in 1995. Of these, 109 failed to report the position of the event hence may or may not have occurred in the United Kingdom transition areas. Of the remaining events, none occurred in the United Kingdom transition areas. It was noted with appreciation that the United Kingdom would continue to collect data and report to the NAT SPG.

1.2.2 The Group was informed that the European Civil Aviation Conference (ECAC) ACAS implementation schedule requires, with effect from 1 January 2000, the mandatory carriage and operation of ACAS II by all civil fixed-wing turbine-powered aircraft having a maximum take-off mass exceeding 15,000 kg or an approved passenger seating configuration of more than 30.

Other activities

1.2.3 The Group was provided information on activities related to the South Pacific and in particular those stemming from the work being carried out by the Informal South Pacific Air Traffic Services Co-ordinating Group (ISPACG). It was noted that ISPACG had to deal with issues similar to those encountered in the NAT Region. Of particular interest was the information that a document similar to the Minimum Navigation Performance Specifications (MNPS) Operations Manual called the South Pacific Operations Manual (SPOM) was being developed. The SPOM would be made available to the next meeting of the NAT Air Traffic Management Group (ATMG).

1.3 Technology

Air Traffic Control (ATC) automation

1.3.1 The Meeting was provided an update of on-going automation developments by States concerned. The Group noted that New York Oceanic Area Control Centre (OAC) had implemented an On Line Data Interchange (OLDI) link with Piarco OAC using as a basis the common co-ordination Interface Document (ICD) developed by the NAT SPG.

1.3.2 The Group also noted that Norway had initiated work to plan for the implementation of Automatic Dependent Surveillance (ADS) and Controller Pilot Data Link Communications (CPDLC) service in Bodø Oceanic Control Area (OCA).

The decommissioning of OMEGA

1.3.3 In follow-up to Conclusion 31/3, the Group was informed that the United States had committed to provide Omega coverage through 30 September 1997. After that date, the United States would cease to participate in the Omega Radionavigation System. On the basis of the above information, the Group agreed that it be recommended that no new MNPS approvals be issued to aircraft utilising Omega. Furthermore, effective from 1 October 1997, all aircraft that are currently MNPS approved on the basis of being equipped with Omega would no longer be approved. It was further agreed that ICAO should inform NAT user States concerned as soon as the United States formally informs ICAO.

CONCLUSION 32/1 - USE OF OMEGA IN MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) AIRSPACE

That:

a) as of 1 October 1997, no aircraft MNPS approved on the basis of Omega equipage meet MNPS requirements; and

b) upon formal notification from the United States, the ICAO European and North Atlantic Office inform all States concerned of the above.

1.3.4 The Group noted that, in the context of the discussions on the withdrawal of the OMEGA navigation system, some of the NAT provider States had embarked on an augmentation programme which included the establishment and operation of a Global Positioning System (GPS) correction station in Iceland.

The use of Global Navigation Satellite Systems (GNSS) in the NAT Region

1.3.5 The Group was informed that Canada and the United States have approved GPS as a primary means of navigation in the NAT Region in accordance with Federal Aviation Administration (FAA) Notice 8110.60, which provided certification policy in conjunction with FAA Handbook Bulletin for Air Transportation (HBAT 9509) which provided guidance for operational approval. In this context, it was noted that Canada and the United States issue MNPS approvals for aircraft that are GPS equipped in accordance with the afore mentioned documents. With this in mind, the Group agreed that it was important that a consensus regarding the use of GPS in MNPS airspace should exist.

1.3.6 The Group agreed that FAA Notice 8110.60 together with the provisions of HBAT 9509 provided an acceptable interim standard regarding airworthiness and operational approval for primary use of GPS in the NAT Region to meet MNPS requirements. It was also agreed that the overall system safety should be monitored during the progressive introduction of GPS to ensure that the overall system risk was not adversely affected. The Group agreed that the above referred material should be distributed to all concerned.

1.3.7 The Group was also informed that the Minister of Transport of the Russian Federation had informed ICAO, on 4 June 1996, that it had agreed to provide, free of charge, a standard accuracy Global Orbiting Navigation Satellite System (GLONASS) channel to the world aviation

community on a non-discriminatory basis for 15 years. The channel would be accessible to all civil aviation users and would provide position information with an accuracy of up to 60 metres in the horizontal plane (with a probability of 0.997) and up to 75 metres in the vertical plane (with a probability of 0.997).

1.3.8 As regards the use of GLONASS, the Group felt that it would be premature to decide whether it should be used as a primary navigation system that would meet MNPS requirements. It was however felt that, if additional information similar to that produced by the United States and the Joint Aviation Authorities (JAA) regarding the use of GPS were provided, consideration would be given to approving GLONASS equipped aircraft for MNPS operations. With this in mind, the Russian Federation was strongly urged to participate in the work of the Operations and Airworthiness (OPS/AIR) sub-group of the Reduced Separation Standard Implementation Group (RSSIG).

CONCLUSION 32/2 - THE USE OF GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) FOR MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) APPROVAL

That:

a) GNSS be considered an acceptable long range navigation system meeting MNPS approval requirements; and

b) the Central Monitoring Agency monitor:

i) the rate of GNSS equipage; and

ii) the effect of GNSS usage on the overall system risk.

CONCLUSION 32/3 - DISTRIBUTION OF MATERIAL TO BE USED TO APPROVE AIRCRAFT FOR OPERATIONS IN MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) AIRSPACE USING GLOBAL POSITIONING SYSTEM (GPS)

That the ICAO European and North Atlantic Office circulate to all States concerned material that has been agreed to by the NAT Systems Planning Group as being suitable for use to provide an MNPS approval to aircraft equipped with GPS.

1.3.9 Having agreed that GNSS be used for MNPS approvals, the Group then agreed that the MNPS Operations Manual and the NAT Guidance Material should be amended to reflect the above conclusion as well as the de-commissioning of Omega. It was further agreed that, until sufficient information concerning GLONASS was available, only GPS would be accepted as meeting the requirements of MNPS.

1.3.10 In concluding its discussion on the use of GNSS in the NAT Region, the Group agreed that, although NAT provider States need to consider institutional issues in the context of GNSS, resolution of such issues was not in the domain of the NAT SPG. In addition, the Group was cognizant that the responsibility to resolve, *inter alia*, legal, liability and regulatory issues rests with individual States.

CONCLUSION 32/4 - AMENDMENTS TO THE NAT MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) OPERATIONS MANUAL AND THE NAT GUIDANCE MATERIAL

That:

a) the NAT MNPS Operations Manual be amended in accordance with the material shown in **Appendix A** to the Report on Agenda Item 1; and

b) the material shown in **Appendix B** to the Report on Agenda Item 1 be considered as the basis for an amendment to the NAT Consolidated Guidance Material (Doc 001).

APPENDIX A - PROPOSED AMENDMENTS TO THE NORTH ATLANTIC MNPS AIRSPACE OPERATIONS MANUAL CONCERNING THE USE OF GLOBAL NAVIGATION SATELLITE SYSTEMS

(paragraph 1.3.10 refers)

Amend the seventh edition of the *North Atlantic MNPS Airspace Operations Manual* as follows:

Chapter 9 - Aircraft Minimum Navigation Capability

Page 29 - NAVIGATION EQUIPMENT FOR UNRESTRICTED MNPSA OPERATIONS

replace:

- One OMEGA Navigation System; or

with:

- One Global Navigation Satellite System (GNSS); or

add:

Note 1: Only two GNSS currently exist, the Global Positioning System (GPS) and the Global Orbiting Navigation Satellite System (GLONASS)

Note 2: A Navstar GPS installation must be approved as follows:

If the two required LRNSs are both GPS, they must be approved in accordance with FAA Notice 8110.60 or equivalent JAA or national documentation and their operation approved in accordance with FAA HBAT 95-09 or equivalent national or JAA documentation. If GPS serves as only one of the two required LRNSs, then it must be approved in accordance with FAA TSO-C129 as Class A1, A2, B1, B2, C1 or C2 or equivalent national or JAA documentation.

Note 3: Equivalent approval material for GLONASS is under development and must be available prior to approving any GLONASS equiped aircraft for MNPS operations.

Chapter 11 - MNPS Cross-Check Procedures

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replace the paragraph on:

OMEGA Synchronization

with:

GPS Pre-departure Procedures

Fault Detection and Exclusion (FDE) Availability Prediction Programme

- All operators conducting GPS primary means navigation in MNPSA must utilize an FDE prediction programme for the installed GPS equipment that is capable of predicting, prior to departure for flight on a specified route, the following:

- the maximum outage duration of the loss of fault exclusion;

- the loss of fault detection; and,

- the loss of navigation function.

The "specified route of flight" is defined by a series of waypoints (to include the route to any required alternate), with the time specified by a velocity or series of velocities. Since specific ground speeds may not be maintained, the pre-departure prediction must be performed for the range of expected ground speeds. This FDE programme must use the same FDE algorithm that is employed by the installed GPS equipment. In order to perform the prediction accurately, the FDE prediction programme must provide the capability to manually designate satellites that are scheduled to be unavailable.

Operational Control Restrictions

Any predicted satellite outages that affect the capability of GPS flight require that the flight be cancelled, delayed or re-routed. If the outage of the fault exclusion capability (i.e. exclusion of a malfunctioning satellite) exceeds the acceptable duration on the specified route of flight, the flight must be cancelled, delayed or re-routed.

Determination of the Capability to Navigate

Prior to departure, the operator must use the FDE prediction programme to demonstrate that there are no outages in the capability to navigate on the specified route of flight.

Determination of the Availability of Exclusion

Once the navigation function is assured (i.e. the equipment can navigate on the specified route of flight), the operator must use the FDE prediction programme to demonstrate that the maximum outage of the fault exclusion function for the specified route of flight does not exceed 51 minutes in MNPSA. Otherwise, the flight must be cancelled, delayed or re-routed.

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PROCEDURES IN THE EVENT OF SYSTEM DEGRADATION

add:

GPS En-route Procedures

Degraded GPS Navigation Capability

If the GPS displays a "loss of navigation function alert", the pilot should immediately begin using dead reckoning procedures until GPS navigation is regained. The pilot will report degraded navigation capability to ATC.

Satellite Fault Detection Outage

If the GPS receiver displays an indication of a fault detection function outage (i.e. RAIM is not available), navigation integrity must be provided by comparing the GPS position with a position computed by extrapolating the last verified position with airspeed, heading and estimated winds. If the positions do not agree within 10 NM, the pilot should immediately begin using dead reckoning procedures until the exclusion function or navigation integrity is regained and should report degraded navigation capability to ATC.

Fault Detection Alert

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

Chapter 12 - A Check List for Pilots Not Familiar With Operations in NAT MNPS Airspace

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replace Item 6 with:

"If using GPS, have you checked the latest NOTAMs regarding the serviceability of GPS satellites and have you performed an FDE prediction programme analysis?"

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APPENDIX B - PROPOSED AMENDMENTS TO THE NAT GUIDANCE MATERIAL - NAT DOC 001 T13.5N

(paragraph 1.3.10 refers)

The following changes to the NAT Doc 001 that take into account GNSS are proposed:

Page 18: Replace paragraphs 3.4.4 and 3.4.4.1 with the following:

3.4.4 Global Navigation Satellite System (GNSS)

3.4.4.1 The emergence of GNSS raises the following issues for users, air traffic service providers States of Registry and safety regulators.

3.4.4.2 System Safety A low level of GNSS-based navigation is not expected to affect overall system safety. However, the inherent horizontal accuracy of GNSS will eventually increase the probability of collision, following a loss of vertical separation. To mitigate such an effect, it is expected that appropriate operational procedures may need to be considered. This will only be necessary if a significant proportion of aircraft in the NAT use GNSS for navigation. Monitoring of the use of GNSS is therefore required in order to identify when appropriate operational procedures might be needed and to ensure that the system safety is not adversely affected. States of Registry are therefore required to provide details of GNSS approvals to the North Atlantic Central Monitoring Agency (CMA).

3.4.4.2 Institutional Considerations Whilst the NAT SPG should be cognisant of institutional considerations, it is the responsibility of individual States to resolve such concerns. States may wish to take account of the following institutional aspects.

3.4.4.2.1 Legal Issues As the use of GNSS increases, there will be a greater dependence by a large number of users on a small number of infrastructure providers. States concerned may wish to review the relevance of their national legislative requirements in the context of the provision of air traffic services to GNSS-equipped aircraft.

3.4.4.2.2 Liability Issues For safety-critical applications such as navigation, air traffic service providers should, on an individual basis, consider reviewing the extent of their liability towards GNSS users or third parties, in the event of a disrupted system or service.

3.4.4.2.3 Regulatory Issues State Regulation of the operational use of navigation satellite services is expected to take account of the ground and space domains, as well as the airborne domain. States should therefore satisfy themselves that their individual regulatory requirements are met in respect of each of these three domains.

Page 19 paragraph 3.4.7.1 a) ii

Replace "OMEGA" with "GNSS".

add the following notes:

Note 1: Only two GNSS currently exist, the Global Positioning System (GPS) and the Global Orbiting Navigation Satellite System (GLONASS)

Note 2: A Navstar Global Positioning System (GPS) installation must be approved as follows:

If the two required LRNSs are both GPS, they must be approved in accordance with FAA Notice 8110.60 or equivalent JAA or national documentation and their operation approved in accordance with FAA HBAT 95-09 or equivalent national or JAA documentation. If GPS serves as only one of the two required LRNSs, then it must be approved in accordance with FAA TSO-C129 as Class A1, A2, B1, B2, C1 or C2 or equivalent national or JAA documentation.

Note 3: Equivalent approval material for GLONASS is under development and must be available prior to approving any GLONASS equipped aircraft for MNPS operations.

AGENDA ITEM 2: PLANNING AND IMPLEMENTATION

2.1 Introduction

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

a) Report of the NAT Traffic Forecasting Group

b) Report of the NAT Implementation Management Group

c) Implementation planning

d) Other Issues

2.2 Report of the NAT Traffic Forecasting Group

2.2.1 The Group was informed that an interim meeting of the NAT Traffic Forecasting Group (NAT TFG) had been held from 14 to 17 May 1996. This meeting had not been able to update the forecasts because some of the key participants were not able to attend the meeting. The Group recalled that the participation in NAT TFG meetings by some States was problematic because they had to support several forecasting groups and that they did not have the necessary resources to support the NAT TFG on an annual basis. With this in mind, the Group agreed that its requirements could be met by a NAT TFG meeting every two years. In this context, it was stressed that the long range forecast had not been updated since 1991 and, since this information was very important in long term planning exercises, it was felt that this matter needed to be addressed as a priority by the NAT TFG and that they should be revised every four years beginning in 1997.

CONCLUSION 32/5 - MEETINGS OF THE NAT TRAFFIC FORECASTING GROUP (NAT TFG)

That:

a) the NAT TFG meet once every two years to update the short and medium term forecasts; and

b) long range forecasts be updated every four years as of 1997.

2.3 Report of the NAT Implementation Management Group

2.3.1 The Group noted that the NAT IMG had met three times since NAT SPG/31. The ATMG had also met three times whereas the Communications Automation and Data Link Applications Group (CADAG) and RSSIG met two times each. The thrust of all meetings was to develop programmes and documentation necessary to support the implementation of RVSM and the ICAO CNS/ATM systems in the NAT Region. Several meetings of the Airspace Monitoring Sub Group (AMSG) and Operations-Airworthiness (OPS/AIR) sub-group of the RSSIG and of the MWG also took place. The reports of all the above meetings were distributed to all concerned.

2.3.2 The NAT IMG had spent a significant amount of its time dealing with matters related to the implementation of RVSM in the NAT Region. The NAT IMG Cost Effectiveness (NICE) programme had also carried out a significant amount of work over the last year the results of which should provide the NAT IMG with a powerful tool to support systems planning. In addition to the foregoing, the NAT IMG kept itself abreast of developments in other ICAO planning regions as well as developments taking place at a world-wide level.

Organizational changes

2.3.3 The Group noted that as a result of Mr Myles Murphy being nominated Chairman of the NAT SPG and in accordance with the terms of reference and working structure of the NAT IMG, he also assumed the Chairmanship of the NAT IMG.

2.3.4 Two changes were made to the working structure of the NAT IMG and its working groups. Firstly, the United Kingdom has agreed to provide the necessary resources to support the establishment of a Programme Co-ordination Office (PCO) which was responsible to the NAT IMG for the co-ordination and tracking of the NAT implementation programme. The other change related to the structure of the CADAG. The NAT IMG agreed that the CADAG's two sub-groups be abolished and that the work be carried out by the CADAG as a whole. The ACSG, which reports directly to the NAT SPG, was detached from the CADAG. However, ACSG resources would be used when needed for planning purposes. The terms of reference of the PCO and of the CADAG will be incorporated in the next edition of the *NAT SPG Handbook*.

2.3.5 One of the main difficulties encountered in the organisation of work had been the problems associated with communications between the various groups. Hopefully, this has been resolved by ensuring a wider distribution of documentation, by encouraging the rapporteurs of the groups to participate in each others meetings and by the establishment of the PCO. This matter was being kept under review by the NAT IMG.

Documentation and programmes

2.3.6 The NAT IMG had concentrated on developing programmes and documentation to support the implementation of the ICAO CNS/ATM systems as well as RVSM. The Group finalised the development of the *NAT Oceanic Concept and Requirements* (NOCAR) document which is used as a high level planning document for all the working groups. The document, which is under strict configuration management, is updated after NAT IMG meetings. Distribution of the document and amendments thereto will be through States and international organizations directly involved in the work of the NAT SPG. It would then be the responsibility of the individual State or international organization to ensure that users of the document are kept up to date.

2.3.7 An important adjunct to the NOCAR is the *Hybrid ATM Plan* being developed by the NAT IMG. This document strengthens the NOCAR and provides a blueprint to its achievement. Although not complete, it is expected that the document will incorporate ATM elements as well as some elements related to data link applications. This is one of the major tasks of the NAT IMG at this time and it is expected that the first edition should be available at the end of 1996 (NAT IMG/8).

2.3.8 As a consequence of developing the NOCAR and the *Hybrid ATM plan* by NAT IMG, the Group agreed that it was no longer necessary to maintain the Implementation Plan section of the NAT Implementation Document (NAT ID) which, in accordance with Conclusion 31/14, was managed by the NAT IMG.

CONCLUSION 32/6 - CHANGES TO NAT PLANNING DOCUMENTATION

That the:

a) NAT Implementation Plan section of the NAT Implementation Document be replaced by the *NAT Oceanic Concept and Requirements* document supported by a *Hybrid Air Traffic Management Plan*;

b) above documents serve as the basis for implementing the ICAO Communications Navigation Surveillance/Air Traffic Management systems in the NAT Region;

c) NAT Implementation Management Group be responsible for the maintenance of the above documents; and

d) NAT IMG terms of reference be updated to reflect the above.

The 4th Edition of the Application of Separation Minima document

2.3.9 The Group noted with appreciation that work had been completed on the 4th Edition of the *Application of Separation Minima* document. This new edition incorporates all the latest amendments to the NAT Regional Supplementary Procedures (SUPPS) as well as RVSM. It had also been completely re-structured to make it more user-friendly and to include a software engineer's version of the document. It was noted that once the NAT SPG had endorsed the document, Canada would publish it, on behalf of the NAT SPG, before the end of 1996.

2.3.10 In the discussions, the Group agreed that the issue of whether all aircraft in a formation flight or only one, as is the current practice for lateral separation, need to be approved before the formation flight could be cleared into RVSM airspace must to be addressed. The Group noted that the development of the safety constraint had not taken into account formation flights and the provisions of Annex 2 concerning formation flights may not apply in an RVSM environment. The NAT IMG had requested that the MWG address this matter but, as it was not considered to be a high priority issue, it was also agreed that an interim procedure was required. Accordingly, the Group agreed that until the necessary studies had been carried out concerning formation flights in RVSM airspace, such flights could only be cleared through RVSM airspace using an airspace reservation encompassing additional flight levels where required. With this in mind, it was agreed that Note 2 in paragraph 6.2.1.1 relating to formation flights in the draft *Application of Separation Minima* document should be deleted and it was further agreed that the NAT IMG should carry out the necessary studies concerning formation flights in RVSM airspace. With this in mind, the NAT SPG endorsed the 4th Edition of *Application of Separation Minima* document.

2.3.11 The Group noted that in follow up to NAT SPG/30 Conclusion 30/11, a common approach to airspace reservations which was the subject of an amendment proposal to the NAT SUPPS had been developed. This change would be incorporated in the *NAT Guidance Material* (NAT Doc 001) and had already been included in the 4th Edition of the *Application of Separation Minima* document.

CONCLUSION 32/7 - ENDORSEMENT OF THE 4TH EDITION OF THE NAT APPLICATION OF SEPARATION MINIMA DOCUMENT

That:

a) the NAT Systems Planning Group endorse the 4th Edition of the *Application of Separation Minima* document, minus the Note 2 referring to vertical separation in Chapter 6 concerning formation flights; and

b) Canada make arrangements within its Administration to publish, on behalf of the NAT SPG, the 4th Edition of the *Application of Separation Minima* document.

CONCLUSION 32/8 - FORMATION FLIGHTS IN REDUCED VERTICAL SEPARATION MINIMUM (RVSM) AIRSPACE

That:

a) the NAT Implementation Management Group, on behalf of the NAT SPG, develop a policy regarding the approval status of formation flights wishing to operate in RVSM airspace; and

b) until a definitive policy is developed, airspace reservations encompassing additional flight levels where required be used for all formation flights wishing to operate through RVSM airspace.

RVSM institutional arrangements

2.3.12 An important issue that arose from NAT SPG/31 as well as from Conclusion 6/7 of the LIM NAT RAN Meeting of 1992 was the requirement to establish some form of mechanism to assure the financing of the height monitoring facilities needed to support the implementation of RVSM. Although production models of the Height Monitoring Units (HMU) would not be available until the end of 1997, the prototype had been significantly upgraded and was being used in the data collection to support the implementation of RVSM. Furthermore a contract had been signed between ICAO and ARINC who will provide a GPS based Monitoring System (GMS) which makes up the second part of the monitoring facilities. ICAO has also agreed to collect an RVSM air navigation fee, using its existing mechanisms, and re-distribute the monies to States in accordance with the agreement that was signed by all concerned. The institutional arrangements mentioned above, which were negotiated in follow-up to LIM NAT RAN Conclusion 6/7, meets the requirements of all concerned.

2.3.13 The Group was provided an update on the RVSM cost that would be incurred by all aircraft that operate North of 45°N. The information presented gave an indication of the per crossing charge up to the year 2002. It was however noted that these charges could fluctuate depending on the actual levels of traffic.

2.3.14 The NAT SPG noted with appreciation that Eurocontrol, the owners of the prototype HMU installed at Strumble, had agreed that the HMU could be upgraded in such a way that it could be used during the verification phase. As can be seen from the initial safety assessment mentioned below, the prototype HMU has been an extremely useful tool in support of the implementation of RVSM.

RVSM information and implementation programmes

2.3.15 To assist States and operators to prepare for the implementation of RVSM, two seminars, in addition to the one held in Copenhagen in January 1995, were held. One was held in Reston, United States in August 1995 whereas the other was held in St Petersburg, Russian Federation in June 1996. As a result of the seminar in Reston, several implementation difficulties had been identified, particularly as regards international general aviation (IGA) and the military. In addition to the seminars, State letters explaining the approval process and the requirement to set up data bases of approved aircraft were sent by the ICAO EUR/NAT Office to all NAT user States and international organisations concerned. Finally, a draft Aeronautical Information Circular (AIC) was also sent to States concerned.

2.3.16 In order to address some of the issues that had been raised at the Reston seminar, the NAT IMG had agreed to develop an implementation strategy that would take into account the difficulties that had been identified. On the basis of a study that had been carried out by the NAT ATMG, the NAT IMG had agreed, at its 5th meeting, that a phased approach to implementation should be used. This would of course delay the full implementation of RVSM but would provide some benefits to operators that equip early and reduce the penalties to those that were unable to equip. With this in mind, the NAT SPG endorsed the phased approach and agreed that initial implementation would be limited to FL 330 to FL 370 provided that sufficient aircraft were approved so as to justify sterilising the airspace concerned and that a successful safety analysis had been carried out. It was noted that no additional changes to the original implementation plan had been agreed to and that no sunset date had been determined. These decisions had been reflected in an amendment proposal to the NAT SUPPS which has been submitted to ICAO by the United Kingdom.

2.3.17 The major outstanding difficulty to implementation was the lack of sufficient airworthiness approved aircraft needed to satisfactorily carry out the safety assessment needed to make a go/no go decision. This forced the NAT IMG, at its 6th meeting, to recommend postponement of implementation until 27 March 1997. In this context, it was pointed out that if the 27 March 1997 date could not be met, the next window of opportunity was January 1998. In addition, the NAT IMG was of the opinion that NAT SPG/32 would not be in a position to make a go/no go decision as had been anticipated at NAT SPG/31 for the same reason mentioned above. It was therefore agreed that a decision could not be made before December 1996 and that the NAT IMG should make the go/no go decision on behalf of the NAT SPG.

2.3.18 In arriving at the above decision, the Group was pleased to note that the Chairman of the NAT SPG stated that NAT SPG members that were not NAT IMG members would be consulted as regards the go/no go decision in December 1996 before any implementation action was initiated.

CONCLUSION 32/9 - IMPLEMENTATION OF REDUCED VERTICAL SEPARATION MINIMUM (RVSM) IN THE NAT REGION

That the NAT Implementation Management Group (NAT IMG), on behalf of the NAT SPG:

a) make the go/no go decision relating to the implementation of RVSM in the NAT Region on the basis of a satisfactory safety assessment and that sufficient number of aircraft are approved to justify the sterilisation of FL 330 to FL 370 for RVSM approved aircraft only:

b) decide the timing for the implementation of future phases taking due account of interfaces; and

c) monitor the implementation of RVSM operations.

2.3.19 Because of the problems associated with the aircraft approval process, the monitoring strategy has also had to be changed so as to limit the delay in implementation as much as possible. Although the strategy itself has changed, the goals have not. The result of these changes would affect the Central Monitoring Agency (CMA) resources needed to set up the data base and carry out the safety analysis. The Group noted that the NAT IMG had agreed that the arrangement signed by all concerned provided sufficient lee-way to temporarily increase resources as required.

2.3.20 The Group was informed that the NAT IMG had agreed that a methodology to forecast RVSM aircraft populations and their impact on flight level usage was necessary in order to support making a go/no go decision for the implementation of RVSM. With this in mind, the Group examined the methodology prepared by the United Kingdom which it found to be entirely satisfactory. The analysis was based on 24 days of Shanwick data and information on predicted RVSM approvals taken from a recent IATA/IACA survey of airlines. Based on the data, it was shown that flight level usage between FL 330 and FL 370 inclusive accounts for about 75% of all NAT flights between FL 290 and FL 410 (81% Eastbound and 67% Westbound). The analysis also estimated that between 15% and 20% of flights might need to be excluded from phase 1 RVSM airspace. This would equate to approximately 50 Westbound and 70 Eastbound flights daily that normally operate in the FL 330 FL 370 band being cleared outside RVSM airspace.

2.3.21 The representative from IBAC expressed some concern that the methodology did not appear to take into account IGA and in particular business aircraft and that the methodology alone, in their opinion, does not explain the full process to be used to make a go/no go decision. Whilst it was believed by the MWG that the methodology took into account all airspace users, the particular concerns of IBAC would be sought and addressed in future work. Because of the lack of information about IGA plans for RVSM approvals, it was recognised that it was difficult to make assumptions on the effect that the phase 1 implementation of RVSM could have on the IGA population. With this in mind, the Group accepted with appreciation IBAC's offer to try and provide the MWG with data on IGA's RVSM approval plans so that this information could be taken into account in the analysis.

2.3.22 The Group noted that the NAT IMG had agreed that a more in-depth analysis should be carried out using the methodology. The Group noted that a data sample for July, August and September 1996 limited to information provided by Gander and Shanwick and that used cleared flight levels only would be collected and used as the basis for further analysis. The United Kingdom would co-ordinate the collection and analysis of the data. It was further noted that IACA and IATA would continue to collect information concerning their members plans for RVSM approval. The Group was also informed that results of the work being carried out by the United States in the context of the NICE programme could provide information on the minimum percentage of RVSM approved aircraft necessary to support implementation. This data would also be used to make the go/no-go decision.

Preliminary safety assessment for RVSM

2.3.23 The Group noted a preliminary safety assessment concerning the implementation of RVSM which had been based on a collision risk analysis of height monitoring data collected from December 1995 to July 1996 and on large height deviations between January 1995 and June 1996

that had been reported to the NAT CMA. It was noted that the next update to the analysis would include an examination of all height monitoring data accumulated up to the end of October 1996.

2.3.24 The estimates of risk based on airworthiness approved aircraft seen so far were very encouraging but given the small amount of data seen (210 airframes), they remained inconclusive. However it was anticipated that when a representative sample of monitoring results of airworthiness approved aircraft from the Phase 1 (FL 330 to FL 370) RVSM population became available, it would result in a technical risk value well within its safety constraint.

2.3.25 It was stressed that the go/no go decision in December 1996 needed to be based not only on whether the risk estimate, at the time, was below the TLS but also on whether sufficient and representative data had been amassed to give confidence in that estimate. To this end, data used for the analysis would be collected up to 31 October 1996. Monitoring would continue after 31 October during the operational trial and beyond to ensure that system safety requirements continued to be met.

2.3.26 Work on the analysis of future phases and traffic increases had also been completed. This analysis did not indicate any early concerns in terms of the safety assessment but highlighted the need for on-going monitoring and review. This initial work had had to be based on assumed information with respect to traffic increases, aircraft RVSM approvals and lateral navigation performance. As this information is validated, the assumptions may need to be re-visited. The NAT IMG will ensure the on-going assessment of all the relevant aspects.

2.3.27 The need to collect information on large height deviations in order to carry out the above analysis was stressed. Accordingly, the NAT IMG agreed to recommend that all providers and users report all height deviations greater than 300 ft resulting from operational errors, contingencies, reports of moderate or greater turbulence and ACAS resolution advisories.

CONCLUSION 32/10 - INFORMATION ON HEIGHT DEVIATIONS GREATER THAN 300 FT

That providers and users report all height deviations greater than 300 feet, including operational errors, contingency events, reports of moderate or greater turbulence and Airborne Collision Avoidance Systems resolution advisories using existing procedures to the NAT Central Monitoring Agency.

NAT Implementation Management Group Cost Effectiveness programme

2.3.28 NAT SPG/31 had been informed that the NAT IMG had set up the NICE programme that would be managed by Iceland on behalf of the Group. The programme was well under way at this stage. The scenarios that were being simulated were the Current Scenario, RVSM; RVSM and reduced Longitudinal (RVLSM) 1000 feet-60 NM-7 min; RVSM and reduced horizontal (RVHSM) 1000 feet-30 NM-5 min and the Free Flight scenario. An additional scenario has been added simulating a reduction from 15 min separation minimum for crossing aircraft to 10 min. Some initial results were available from the Free Flight scenario but since they were not based on a representative sample of the whole NAT Region, their publication was considered premature. It was envisaged that the models being developed by the three NICE simulation groups (Iceland, the United Kingdom and the United States) would provide a useful tool that would permit the NAT IMG to be significantly more confident in making future planning decisions.

Future plans

2.3.29 The Group noted that, in addition to finalising and updating the planning documentation, the NAT IMG would address safety management issues. As regards further reductions in separation minima, the NAT IMG had agreed, in accordance with NAT SPG directive, that priority should be given to reducing the longitudinal separation minimum from 10 to 7 minutes and crossing track separation from 15 to 10 minutes. This, of course, would not preclude that work continues in respect of further reductions in horizontal separation minima.

2.4 Implementation Planning

Change of the vertical dimensions of MNPS airspace

2.4.1 The Group noted that the amendment proposal to the NAT SUPPS concerning the changes to the vertical extent of MNPS airspace would become effective on 1 January 1997. Recognising that the changes to the vertical dimensions had been agreed as a consequence of the implementation of RVSM, the Group agreed that the changes to the airspace should be made at the same time as the implementation of RVSM Phase 1. States concerned would promulgate this information using the AIRAC system.

CONCLUSION 32/11 - PROMULGATION OF THE NEW DIMENSIONS OF MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) AIRSPACE

That all States concerned promulgate the new dimensions to MNPS airspace, as agreed to by the Limited NAT Regional Air Navigation (1992) Meeting, simultaneously with the implementation Reduced Vertical Separation Minimum - Phase 1.

AGENDA ITEM 3: AIR NAVIGATION SYSTEM REVIEW

3.1 Introduction

3.1.1 Under this Agenda Item, the Group considered the following 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 navigation performance accuracy achieved in the NAT Region during the period 1 January 1995 to 31 December 1995;

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

c) consideration of improving the current monitoring process.

Navigation performance accuracy achieved in the NAT Region during the period 1 January 1995 to 31 December 1995

3.2.2 The Group completed a scrutiny of observed gross navigation errors (GNEs) in the NAT Region and found that a total of 42 (32)* errors were reported during the period under review. Of these errors, 14 (7)* occurred outside MNPS airspace and were classified as Table 'Charlie' errors. From the remaining 28 (25)*, 10 (7)* 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. The remaining 18 (18)* errors, which form the basis of the scrutiny, were classified as Table 'Alpha' errors.

3.2.3 The Group noted no change in the number of Table 'Alpha' errors compared with the previous 12 month period but was disappointed to note that there had been an increase of 3 in the combined Tables 'Alpha' & 'Bravo' errors. Taking into account the 5 % increase in the level of traffic using MNPS airspace, and the fact that there had been a reduction in the risk bearing effect of the errors over the previous 12 month period, the Group considered that the number of

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* *A change to the monitoring year has occurred since the last report: therefore, the comparative figures in brackets refer to the previous 12 month period.*

GNEs in MNPS airspace did not give cause for major concern.

3.2.4 The breakdown of the 18 Table 'Alpha' errors is shown in Table 1 below.

CLASSIFICATION **	ETA ERRORS	RISK BEARING ERROR WEIGHTING		
		TOTAL MNPS TRAFFIC	OTS TRAFFIC	RANDOM TRAFFIC
A	1 (3)	0	0	0
B	0 (1)	0	0	0
C1/C2	10 (7)	2.81	1.32	1.49
D	1 (0)	0	0	0
E	0 (1)	0	0	0
F	5 (6)	1.1	0.4	0.7
UNCLASSIFIED	1 (0)	0	0	0
TOTAL	18	3.91	1.72	2.19
TOTAL IN LAST PERIOD	18	4.08	1.64	2.44
OBSERVED TRAFFIC '95		226,113	135,316	90,767
OBSERVED TRAFFIC '94		215,794	136,091	79,703

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

3.2.5 The breakdown of the 18 Table 'Alpha' errors points to 3 areas of particular note namely:

a) an increase in the number of waypoint insertion and equipment control errors [10(7)] accounting for around 55% of the reported Table 'Alpha' errors compared with around 40% in the previous 12 month period:

b) a small decrease in the number of classification D/E/F errors (other navigation errors including equipment failure) accounting for around 30% of the total errors;

c) a reduction from 3 to 1 of those errors occurring to a non-approved user;

** A. Aircraft not certified for MNPS Operations.
B. ATC Insertion/Equipment Control/ System Loop error.
C1/C2. Equipment Control/Waypoint Insertion.
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.

d) four errors attributable to glass cockpit aircraft and of which 3 were risk bearing; and

e) five errors attributable to military aircraft of which 2 were risk bearing.

3.2.6 The Group was disappointed to note the increase in Table 'Alpha' errors attributed to waypoint insertion/equipment control errors but was pleased to see that only one of these errors occurred following a reclearance. It was clear that recommended cross-checking procedures were often still ignored as a large number of errors still occurred even where the aircrafts' flight planned route and cleared route were the same.

3.2.7 It was noted that there was a reduction in the number of errors attributed to equipment failures. The Group was particularly pleased to note that the number of OMEGA failures fell to only two.

3.2.8 The Group was pleased to note a reduction in the number of classification A errors whilst recognising that this was still one too many. It was disappointed to note that no response had been received from 2 States following repeated requests from the CMA for the approval status of aircraft registered to them.

3.2.9 In reviewing the 10 (7) Table 'Bravo' errors the Group noted an increase in the number of these errors from the previous year. Table 2 shows a breakdown of the Table 'Bravo' errors into the established error classifications.

ERROR CLASSIFICATION (See **)	NUMBER OF ERRORS
A	2 (0)
B	3 (2)
C1/C2	3(5)
D	1(0)
E	0 (0)
F	0 (0)
UNCLASSIFIED	1 (0)
TOTAL	10 (7)

Table 2. Breakdown of Table 'Bravo' Errors

3.2.10 Whilst the Group was disappointed to note the increase in the total number of errors, it was pleased that the percentage of waypoint insertion errors fell significantly. The other area of change to disappoint was the increase in the number of non-approved users from zero to two.

3.2.11 The Group, while considering the Table 'Charlie' errors, was disappointed to note that the number of errors reported occurring outside MNPS airspace showed a 100% increase over the previous 12 month monitoring period. Table 3 shows a comparison of the Table 'Charlie' errors over the last 9 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

Table 3. Table 'Charlie' errors for the last 9 monitoring years

3.2.12 The Group noted that of the 14 errors, 2 occurred above MNPS airspace whilst 12 occurred below, thus continuing the trend of previous years.

3.2.13 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 10 of the 14 reported occurrences. Of the causes, 50% were attributable to equipment failure with the failure of OMEGA being a major contributory factor.

3.2.14 The Group was grateful to the representative of IAOPA for the compiled statistical information for the NAT Region under this agenda item. It was however disappointed to note that the number of flights per GNE had shown a decrease (worsened) over the previous 12 month period. Whilst that change for flights outside MNPS airspace was small enough to be considered insignificant, the number of flights per GNE for military aircraft had decreased from 2940 to 1057, the worst figure for 8 years. Furthermore, for public transport, the number of flights per GNE was also down (worse) from 12,588 to 10,806. Nevertheless, this ratio was still significantly higher than the one quoted for military flights and whilst disappointing was not considered to be a sufficient reason for undue concern.

3.2.15 As in previous years the Group considered the part played by Area Control Centers (ACC/OACs) in containing the number of GNEs through timely intervention to prevent incorrect routing. Within the monitoring period, Gander and Shanwick OAC advised the CMA of 62 occasions when mistakes occurred and action was taken to prevent a GNE. The Group noted that this was nearly twice the number reported during the previous 12 month period. It was not possible to determine the reason for this but it was likely that this was due to the encouragement given to ACCs/OACs by NAT SPG/31 to report more efficiently. Whilst it did not cause undue concern to the Group, the statistics in the following list of probable causes were considered to be worthy of note:

a) at least eleven instances where the crew were following a flight planned route instead of an issued cleared route;

b) six confirmed instances of ATC loop error with a possible 8 others; and

c) the remainder can be broadly categorised as either misunderstandings between the clearing agency and the crew or poor flight deck co-ordination.

3.2.16 With respect to the continued application of the 10 minute longitudinal separation minimum, the Group noted that only 4 reports of erosions of 10 minute longitudinal separation minimum had been received by the CMA during the monitoring year.

Methods of Improving the Observed Standard of Navigation Performance

3.2.17 Overall, during the period of the report, there was not a significant increase - 13 versus 12 - in the number of Table "Alpha and Table "Bravo" errors involving human error in the form of waypoint insertion and equipment control errors. There was, however, a very significant reduction in the number of errors occurring after a reclearance and it was considered that the change in wording on the track message as a result of NAT SPG/31 Conclusion 31/2 may have had some effect. To that end the Group agreed that the message should be retained (Conclusion 31/2 refers).

3.2.18 In the course of the scrutiny of errors, the Group noted that the following were major 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) the offer of MNPS levels by controllers to known non-approved aircraft (2 occurrences);

c) confusion surrounding the use of reporting point "ENTRY" (3 occurrences); and

d) the use of "Sixty North" on the radiotelephony (R/T) instead of "Six Zero North" had been received as "Six Three North" (2 occurrences)

3.2.19 The Group was satisfied that all that could be done had been done with regards to reminding crews about cross-checking procedures. As for controllers offering MNPS levels to non-approved traffic, the Group recommended that ACC/OAC managers brief their controlling staff on this issue. Furthermore, the Group noted that "ENTRY" no longer existed as a waypoint.

3.2.20 The Group concurred that the GNEs which came about as a result of poor R/T phraseology would probably have been avoided had the clearances been given in the single digit format e.g. "Six Three North" as opposed to "Sixty Three North".

CONCLUSION 32/12 - USE OF CORRECT PHRASEOLOGY FOR AIR TRAFFIC CONTROL CLEARANCES AND READ-BACKS

That:

a) NAT States ensure that all Air Traffic Services operational personnel and radio operators use approved single digit phonetics for geographical co-ordinates in air traffic clearances or advisories including read backs: and

b) operators ensure that flight crews use single digits for air traffic control clearances and/or re-backs.

Monitoring of Height Deviations

3.2.21 The Group noted details of height deviations received by the CMA and further noted that more ACCs/OACs were now passing information on height deviations to the CMA. Because of the shortfalls in information required for a satisfactory safety assessment. Oceanic Managers were requested to adopt a new format for reporting height deviations which is shown in **Appendix A** to the report on Agenda Item 3. The CMA had received a good response from the ACCs/OACs and the new format would be included in the NAT Guidance Material (NAT Doc 001) at the next amendment.

3.2.22 Twenty one reports of height deviations in MNPS airspace were received as opposed to 28 in the previous 12 month period, and of these, only around one-third were considered to be risk bearing with the vast majority of crews executing the correct contingency procedures when required.

Methods of Improving the Current Monitoring Procedures

3.2.23 The Group concluded that the current monitoring methods were adequate to allow GNEs to be investigated effectively. Furthermore, the Group noted that continued publicity and tactical monitoring had reaped benefits in that only a very small number of non-MNPS approved aircraft had attempted to enter MNPS airspace. However, the Group was disappointed to note that 3 GNEs had been attributed to aircraft that did not have MNPS approval and that a number of States of registry failed to provide the CMA with information on approval status of aircraft registered to them.

3.2.24 With the planned commencement of RVSM in March 1997, it was considered necessary to extend the concept of tactical monitoring of MNPS approval to the new environment. It was intended that ACCs/OACs would be provided with a list, in hard copy or electronic format as requested, of RVSM approved aircraft to help facilitate the task of tactical monitoring. Furthermore, ACC/OACs are to report to the maximum extent possible unauthorised use of MNPS/RVSM airspace by signal or fax in the revised format as shown in **Appendix B** to the report on Agenda Item 3.

CONCLUSION 32/13 - TACTICAL MONITORING IN A REDUCED VERTICAL SEPARATION MINIMUM RVSM ENVIRONMENT

That:

a) tactical monitoring be extended to include RVSM approved aircraft: and

b) States use the form shown in Appendix B to the Report on Agenda Item 3 to report anomalies to the central monitoring agency.

CONCLUSION 32/14 - AVOIDANCE OF NON MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) APPROVED AIRCRAFT OPERATING IN MNPS AIRSPACE

That States concerned take all reasonable actions to ensure that non MNPS approved aircraft are prohibited from operating within MNPS airspace.

MATHEMATICAL MATTERS

1995 LATERAL COLLISION RISK ESTIMATE AND RELATED TOPICS

3.2.25 The annual lateral risk assessment for the 1995 calendar year was performed in June 1996 and was presented to the Group. The risk estimate was 0.69 x 10^{-8} fatal accidents per flight hour compared to the TLS of 2 x 10^{-8} fatal accidents per flight hour. The estimate for the previous 1994/95 monitoring year had been 0.58 x 10^{-8} fatal accidents per flight hour. Comparisons of occupancy and error rates with those from previous monitoring years are shown in figures one to three of **Appendix C** to the report on agenda item 3.

3.2.26 The Group was presented an analysis of the location of potential GNEs which had been eliminated by controller intervention and reported to the CMA. At NAT SPG/31, a study appeared to show that interventions were occurring more frequently at the oceanic boundary rather than in the middle of the ocean. If this were the case, the risk estimate that assumes an even spread of actual GNEs across the ocean could be flawed. The latest analysis used intervention data from both Prestwick and Gander whereas the previous study had concentrated on interventions by Gander which until recently was the only OAC that provided the information. When considering both OACs, it was found that the interventions were evenly spread across the ocean thereby supporting the assumption in the lateral collision risk model that GNEs seen at the monitoring windows were representative of errors occurring elsewhere in the ocean. The effect seen previously had been due to a concentration (in the analysis) of Westbound interventions by Gander to aircraft coming off the ocean. In the latest analysis, a similar effect was noticed for the Prestwick eastbound data. When combined together these two effects resulted in an even spread of interventions across the ocean. The salient results are presented in Table 4. It was concluded that the no further analysis on this matter was required.

	Inside Coastal Fix	Coastal Fix or 60W	50W	40W	30W	20W	15/10W	Landfall	TOTAL
Eastbound	0 (0%)	0 (0%)	1 (3%)	1 (3%)	6 (16%)	10 (27%)	16 (43%)	3 (8%)	37
Westbound	11 (22%)	13 (27%)	9 (18%)	5 (10%)	3 (6%)	8 (16%)	0 (0%)	0 (0%)	49
TOTAL	11 (13%)	13 (15%)	10 (12%)	6 (7%)	9 (10%)	18 (21%)	16 (19%)	3 (3%)	86

Table 4 - Frequency of interventions to prevent a GNE (September 1994 to March 1996)

3.2.27 The Group was presented some preliminary information which compared Inertial Navigation System (INS) and Inertial Reference System (IRS) lateral navigation accuracy. The data had been obtained from the United Kingdom 1995 core navigation study and a survey of North Atlantic operators which had determined typical navigation equipment fits for oceanic fleets. These show for aircraft exiting the ocean on the United Kingdom boundary a standard deviation of cross track errors of 2.33 NM for aircraft with IRS systems and 3.44 NM for aircraft with INS systems. The data would be further analyzed to verify that similar times since initialisation were used for both navigation system samples. The overall result for all aircraft from the core navigation study exiting the ocean on the United Kingdom side had been a standard deviation of 2.79 NM.

3.2.28 Further useful results from the comparison of the survey data with that obtained from the core navigation study would become available over the next year although it was noted that a number of major NAT operators had still not responded to the survey.

LONGITUDINAL COLLISION RISK TOPICS

3.2.29 The Group was presented information by IAOPA detailing their concerns about the effects of proposed reductions in longitudinal separation standards on the availability of tracks and levels for slower moving aircraft. The Group acknowledged that the problem existed today and might be exacerbated by the introduction of Phase 1 RVSM when fewer 2000 ft levels would be available to non-RVSM approved aircraft. However, the Group concluded that reducing longitudinal separation would not, in itself, have any further detrimental effects on the situation.

3.2.30 In follow up to the discussions held at NAT SPG/31 concerning reductions in longitudinal separation minimum, the Group noted that the MWG had reviewed several papers relating to the development of the longitudinal collision risk model. The results of their review indicated that:

a) the model should only be applied to adjacent pairs of aircraft since the possibility of an undetected overtake occurring in the crossing time available was remote;

b) the appropriate distribution for the initial separation of aircraft pairs, $E_x(t)$, should be used based on adjacent pairs of aircraft;

c) the collision risk model parameter values within the model should be reviewed; and

d) the methodology should be advanced to the state where a preliminary set of aircraft performance criteria necessary to support the TLS could be determined (by for example making use of existing collision risk model parameter values) and also to determine what longitudinal separation standard could be achieved for aircraft under current technology.

3.2.31 The Group also considered the advantages and disadvantages of basing the collision risk estimate on a sum of "between waypoint" risks and a single whole ocean crossing risk multiplied by an assumed "unsuccessful" ATC intervention factor. The "between waypoint" method would have the advantages that it would take account of the reduced risk that could be afforded by an increased number of reporting points (for example, using ADS) and also the fact that it does not rely on the determination of an ATC intervention factor which is difficult to evaluate and also tends to dominate the overall result. The difficulty with the "between waypoint" method lay in the determination of how the uncertainties in an aircraft's position should be "re-set" as a result of passing through a waypoint and giving a position report. For example, a controller would normally warn an aircraft if, on reporting, it was perceived that separation with the preceding aircraft had degraded to below 10 minutes. The Group tasked the MWG to find out more information on what manual and automatic checks were performed at waypoints, as well as what the standard procedures were, and to make a decision at their next meeting as to which methodology to adopt.

3.2.32 The Group was presented with a study that looked at clock accuracy for NAT aircraft within Gander airspace. Controllers involved for this study contacted aircraft and asked the pilots to note their clock time which was then compared with Universal Coordinated Time (UTC). The results showed that a mean difference between actual time and clock time used by aircraft for position reporting of +3.6 seconds (positive = aircraft clock slow compared to actual time) and a standard deviation of 18.2 seconds. Seven out of the 426 measurements made showed differences greater than a minute with the largest being one of 181 seconds. The results are illustrated in Figure 1 as shown in **Appendix D** to the report on Agenda Item 3.

3.2.33 These results confirm previous studies on clock accuracy and highlight the need for the determination of standard procedures for aircraft clock setting. Other studies looking at time reporting at waypoints and time gain/losses between successive aircraft have also indicated a need to tighten procedures. The Group was of the opinion, as had been made at NAT SPG/30 (Conclusion 30/20 refers) that the current performance would not support the safe introduction of a reduction in longitudinal separation minimum. The Group therefore agreed that suitable time keeping procedures be developed at the earliest opportunity. The Group also agreed that further data collection and analysis on these aspects should wait until they could be used to demonstrate that the procedures put in place were in fact working.

CONCLUSION 32/15 - ESTABLISHMENT OF CLOCK SETTING PROCEDURES

That the NAT Implementation Management Group make arrangements to develop accurate time-keeping procedures.

Review of actions and mathematicians' work programme

3.2.34 The Group noted the MWG's work programme for 1996/97 which is given in **Appendix E** to the report on Agenda Item 3. The date of the next meeting had been planned from 18 to 22 November inclusive in London when the update to the RVSM safety assessment would be produced. Following that meeting, no other meetings were planned prior to June 1997.

3.3 Review of systems operations

AIR TRAFFIC MANAGEMENT

North Atlantic Operations Managers' Meeting

3.3.1 The Group was presented with a brief summary of NAT OPS MGS meeting which had been held in New York from 13 to 17 November 1995. Since the result of the work of the NAT OPS MGS, including eight conclusions which had been highlighted in the report of their meeting, had been taken up by the NAT IMG and the NAT ATMG, no working paper was presented. However, the NAT OPS MGS wished to highlight the fact that the Central Altitude Reservation Facility (CARF) resources, primarily personnel, had been reduced commensurate with the end of the cold war. However, there had not been a notable reduction in military missions (710 during the year of Desert Storm, 630 in 1995). CARF representatives had pointed out, and the NAT OPS MGS agreed, that the unit was hard pressed to accomplish mission planning and coordination in a timely manner.

3.3.2 Recalling that the format and working methods of the OPS MGS meetings had been changed at NAT SPG/31 (Conclusion 31/9 refers), the Group was pleased to note that the new procedures were starting to bear fruit. However, it was reported that additional secretariat assistance was required to support the new format. The Group was also pleased to note that work had been completed on the NAT contingency plans. Finally, the Group agreed that it would require a working paper from future NAT OPS MSG meetings highlighting progress and identifying items that would require action by the NAT SPG.

Manned balloon flights

3.3.3 The Group was informed that during the 1995/1996 balloon season (November through March), three known separate requests were made for around the world balloon flights which would involve transitting the NAT Region. In consideration of NAT SPG Conclusion 31/8,

Canada had placed an altitude restriction of FL 270 on the approval in the Gander Oceanic Control Area (OCA). The United Kingdom had also placed a similar restriction on flights within Shanwick OCA.

3.3.4 It was pointed out that in some cases, approval for balloon flights were obtained through diplomatic channels with the associated political overtones without any input from Air Traffic Services (ATS). This had lead to difficulties. No formal ICAO documentation was in place which offered guidance on the processing or restrictions for manned balloons and thus ensuring that a united, common approach was taken by all NAT provider States concerned.

3.3.5 As a balloon cannot predict a flight path, it cannot meet the specifications required for operations in MNPS airspace and could therefore cause considerable disruptions to air traffic at a cost to the operators. Accordingly, in the interest of flight safety, the need to segregate a balloon from high density air traffic of the oceanic track structure was considered to be necessary.

3.3.6 With the above in mind, the Group agreed that the NAT Regional Supplementary Procedures and NAT Doc 001, T13.5N, "*Consolidated Guidance Material North Atlantic Region*", be amended to reflect that manned balloon flights be restricted to operate outside NAT MNPS airspace and that the flights possess communications capability in accordance with Annex 2.

CONCLUSION 32/16 - MANNED BALLOON FLIGHTS

That:

a) manned balloon flights be excluded from NAT Minimum Navigation Performance Specifications (MNPS) airspace;

b) Canada make arrangements within its Administration to amend the NAT Regional Supplementary Procedures in accordance with **Appendix F** to the report on Agenda Item 3; and

c) the NAT Consolidated Guidance Material be amended in accordance with **Appendix G** to the report on Agenda Item 3.

Implementation of Reduced Vertical Separation Minimum

3.3.7 The Group was provided an outline of the plans that Norway had put in place for the implementation of an RVSM transition area. The Group noted with appreciation that all necessary planning had been completed and that Norway was prepared for the implementation of RVSM. Aeronautical Information Services (AIS) action was dependent on the results of the go/no-go decision to be made in December 1996.

3.3.8 The Group was informed of the potential economic penalties that could accrue to operators of ferry flights and/or delivery flights wishing to operate across the NAT knowing that they did not need an RVSM approval for their expected normal operations. It was proposed that temporary RVSM approvals should be considered. The Group felt that this matter was within the remit of the NAT IMG and therefore agreed that they were the appropriate group to deal with this matter. In this context, the Group recalled that airspace reservations could be used for this purpose but that no procedures existed.

CONCLUSION 32/17 - PROCEDURES TO ACCOMMODATE FERRY FLIGHTS THROUGH REDUCED VERTICAL SEPARATION MINIMUM (RVSM) AIRSPACE

That the NAT Implementation Management Group make arrangements to develop procedures to accommodate ferry flights when RVSM is implemented.

COMMUNICATIONS

High Frequency (HF) VOLMET Update

3.3.9 Canada informed the Group that an automated VOLMET system had been installed at Gander in June 1995 which incorporated changes that had been agreed to in October 1995. Ireland indicated that due to delays in software upgrade, it had not yet been possible to implement the required changes to the Shannon VOLMET broadcast plan. Furthermore, it could not confidently expect to progress the requirement with the original software developer and was actively considering replacement of the existing system. The United States informed the Group that the changes to the New York VOLMET broadcast plan had not been implemented to date. It was indicated that once the plan had been validated, an effort would be made to implement the changes as soon as practicable.

3.3.10 Portugal reported that it was considering the possibility of implementing a VOLMET broadcast aimed at meeting the requirements of the traffic transitting the Santa Maria OCA between Europe and destinations in the Caribbean and South America. Portugal cited the need for frequencies to support the effort. The Group noted that the users had indicated that they had no requirement for an extra HF VOLMET. They also indicated that it might be possible to include the information in the Shannon broadcasts. To this effect, the Group agreed that the matter be further studied by Ireland and users and that, if necessary, an amendment to the NAT Facilities and Services Implementation Document (FASID) be developed.

CONCLUSION 32/18 - AMENDMENT TO THE SHANNON HIGH FREQUENCY (HF) VOLMET PLAN

That:

a) NAT users determine their requirements for the Shannon HF VOLMET; and

b) Ireland make arrangements within its Administration to amend the NAT FASID.

HF & General Purpose Very High Frequency (GP/VHF) Data Collection 1995

3.3.11 States concerned had prepared detailed statistical reports for 1995 based on the results of HF and GP/VHF data collection exercises conducted in accordance with NAT SPG Conclusion 30/26. The results were consolidated into single report compiled by Portugal which provided an analysis of individual station performance as well as a global overview of network operations.

3.3.12 The network produced 3.04 million messages in 1995 up from 2.83 million the year before. The traffic was distributed 79.4 % HF and 20.6 percent VHF. These statistics included both read back and intercept messages. The data indicated that some HF frequencies were exceeding capacity limits during peak traffic periods. The Group was concerned that the effects of increased communications requirements resulting from the implementation of RVSM might push HF capacity

to critical limits. As regards the format of future surveys, it was agreed to continue as before except that busiest day traffic reporting would be confined to read-back only.

3.3.13 The Group expressed its appreciation to Portugal for the quality and scope of the consolidated report and acknowledged its usefulness to the various administrations involved. It was agreed that there should be a similar exercise, with the agreed changes mentioned above, conducted in 1996, and that Portugal would again coordinate the details with the States concerned.

CONCLUSION 32/19 - HIGH FREQUENCY (HF) & GENERAL PURPOSE VERY HIGH FREQUENCY (GP/VHF) DATA COLLECTION 1996

That States concerned:

a) continue to conduct an annual HF and GP/VHF data collection exercise and present the information in the format outlined at Appendix C to the Report on Agenda Item 2 of NAT SPG/29 with the exception of reporting the busiest day by individual aeronautical communications stations, and

b) confine busiest day reporting to read back only traffic.

HF Network Management

Assignment of Frequencies

3.3.14 During the discussions pertaining to the assignment of HF frequencies, the Group referred to overloading on some frequencies during certain traffic periods and discussed the matter of acquiring additional frequencies. It was felt that acquisition of new frequencies was necessary and that perhaps consideration should be given to sharing frequencies with other areas.

3.3.15 The Group noted that the use of the new GP/VHF facility in Greenland, remotely controlled from Iceland, as well as an increased use of GP/VHF in the northern part of Canada had considerably reduced traffic on HF Family D and consequently had added capacity for additional traffic for the NAT Region. Canada intends to add HF Family NAT-D frequencies to the Gander Aeronautical Station for use on a tactical basis, when required. Such an approach would supplement Gander's overall communications capacity such that additional HF frequency capacity would be available whenever traffic demand would justify or propagation on other NAT HF families was not satisfactory. The Group felt that the additional frequencies were needed outside of considerations related to RVSM.

3.3.16 The Group noted that Denmark had undertaken to review the possibility of optimizing VHF coverage from Greenland facilities in Frederiksdal and Prins Christian Sund. In this context, Iceland and Denmark would review the possibility of further alleviating HF congestion by implementing additional VHF frequencies in Greenland remotely controlled from Iceland. A result of this study would be presented to NAT SPG.

Distribution of Traffic

3.3.17 The Group discussed suggested recommendations pertaining to the elimination of the read-back of weather information received in conjunction with position reports and disseminating such information instead through the Aeronautical Fixed Telecommunication Network (AFTN) to the agreed destination. The Group agreed that it was unnecessary to read back weather information and that it could be transmitted to other network stations over the AFTN.

3.3.18 The Group also discussed the proposal that members take appropriate action within their respective Administrations to address the relay of company messages and other messages having a lower priority than Flight Safety Messages, when appropriate, on a separate, "less busy" frequency than the primary or secondary. The Group felt such frequencies were not always available and that this was a matter that should be left up to the individual Administrations.

3.3.19 Because NAT-A Family was the most used HF family in the NAT, it was agreed that Canada should review its current use of NAT-A Family as an off-load HF family in light of the future capacity offered by NAT-D Family and that Portugal and the United States do a similar exercise with regards to NAT-A Family considering their use of NAT-E Family and its capacity.

CONCLUSION 32/20 - READ BACK OF WEATHER DATA

That:

a) the practice of reading back weather data should be dispensed with and should be relayed by the appropriate means; and

b) this information be published by national administrations.

CONCLUSION 32/21 - REVIEW OF NAT HIGH FREQUENCY (HF) LOADING

That:

a) Canada review its current use of NAT-A Family as an off-load HF family in light of family saturation and the future capacity with NAT-D Family; and

b) Portugal and the United States do a similar exercise with regards to NAT-A Family considering their use of NAT-E Family and its capacity.

CONCLUSION 32/22 - ADDITIONAL HIGH FREQUENCY (HF) FREQUENCIES

That Canada:

a) take action to investigate the possibility of acquiring additional frequencies particularly in the 2, 5, and 8 MHz bands; and

b) report to NAT SPG/33.

Harmful Interference on HF

3.3.20 As agreed at NAT SPG/30, the Group was presented with reports on harmful interference on HF encountered during 1995 at the various network stations. The general conclusion derived from these reports was that, while there was some increase in the number of reports of harmful interference, operations were not adversely affected. It was noted that the monitoring exercise would be continued.

RVSM Impact on HF Operations

3.3.21 The Group noted that HF capacity could be challenged by the increase in communications traffic resulting from RVSM. For example, it had been observed that a single flight level change request can result in as many as four exchanges from the request through the level report. It was noted that the 5-MHz and 8-MHz bands were the most severely limited during peak periods, but even if additional frequencies were acquired, in some instances additional resources would also be needed. The Group then discussed whether there were other means of becoming more efficient in communicating on HF. In this context, it was suggested that suspending the reading back of the next forward reporting point in position reports could reduce usage of air time. The Group recalled that discontinuing the read-back of weather data that had been agreed upon and would therefore be of benefit in reducing air time. Bearing in mind the safety implications of eliminating the read-back of next position reports, the Group could not agree to discontinuing these read-backs. It also felt that the effects of the elimination of the weather read-backs would have to be evaluated before any further steps could be taken. With this in mind, it was also agreed that the OPS MGS should review this proposal before any action be taken.

CPDLC

3.3.22 The Group discussed the introduction of CPDLC in the NAT Region and how it might affect HF voice communications for emergency purposes only. It was reported by the United States that the FAA planned to implement CPDLC at the New York OCA in late 1997. It was reported that CPDLC had been implemented on a limited basis in the South Pacific which imposed a new role for aeronautical communication stations of backing up CPDLC with voice communications. The United States also reported that SATCOM Voice was being used as an alternative means of voice communications, but that trials had shown that it was not without some difficulties. As an example, ground to air calling required that the caller have the octal phone number assigned to the aircraft. Additionally, one has to know which communications satellite the aircraft is logged on to make the call. Finally, SATCOM Voice calls on average can take longer to communicate with a flight crew than via SELCAL and GP/VHF or HF voice communications. During one test period involving 228 calls, it took an average of 57 seconds on SATCOM Voice to speak with a member of the flight crew, 59 seconds if using the "TRANSIT" feature.

SYSTEM EFFICIENCY

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

3.3.23 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. The Group did note with appreciation the data presented by the representative from IAOPA on the distribution of traffic in Shanwick OCA.

APPENDIX A - MESSAGE FORMAT FOR A REPORT TO THE CENTRAL MONITORING AGENCY OF AN ALTITUDE DEVIATION OF 300 FT OR MORE, INCLUDING THOSE DUE TO TCAS, TURBULENCE AND CONTINGENCY EVENTS

(paragraph 3.2.21 refers)

1. REPORT OF AN ALTITUDE DEVIATION OF 300 FT OR MORE
2. REPORTING AGENCY
3. DATE AND TIME
4. POSITION
5. RANDOM/OTS [1]
6. FLIGHT IDENTIFICATION AND TYPE
7. FLIGHT LEVEL ASSIGNED
8. OBSERVED/REPORTED[1] FINAL FLIGHT LEVEL[2] MODE "C"/PILOT REPORT [1]
9. DURATION AT UNCLEARED FLIGHT LEVEL
10. CAUSE OF DEVIATION
11. CREW COMMENTS, IF ANY, WHEN NOTIFIED
12. REMARKS [3]

1. State one of the two choices.
2. In the case of turbulence, state extent of deviation from cleared flight level.
3. In the event of contingency action, indicate whether prior clearance was given and if contingency procedures were followed.

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APPENDIX B - MESSAGE FORMAT FOR A REPORT TO THE CENTRAL MONITORING AGENCY AS A RESULT OF THE TACTICAL MONITORING OF MNPS/RVSM APPROVAL STATUS

(paragraph 3.2.24 refers)

TO: NAT CMA

FROM:

SUBJECT: *TACTICAL MONITORING OF MNPS/RVSM[1] APPROVAL*

DATE/TIME:

FLIGHT IDENT. & OPERATOR:

AIRCRAFT TYPE:

PLANNED/REQUESTED LEVEL:

CLEARED LEVEL:

DEPARTURE AIRFIELD:

DESTINATION AIRFIELD:

LETTER 'X' FILED IN FIELD 10?:

LETTERS 'X' & 'W'[2] FILED IN FIELD 10?

CREW COMMENT:

REMARKS:

1. RVSM approval encompasses the requirements for MNPS approval.

2. Post RVSM implementation, aircraft crew will be required to file 'W' in field 10 to signify RVSM approval, **in addition** to 'X'.

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APPENDIX C

FIGURE 1 : NORTH ATLANTIC MNPS AIRSPACE OCCUPANCY EXPRESSED IN STANDARDS UNITS

(paragraph 3.2.25 refers)

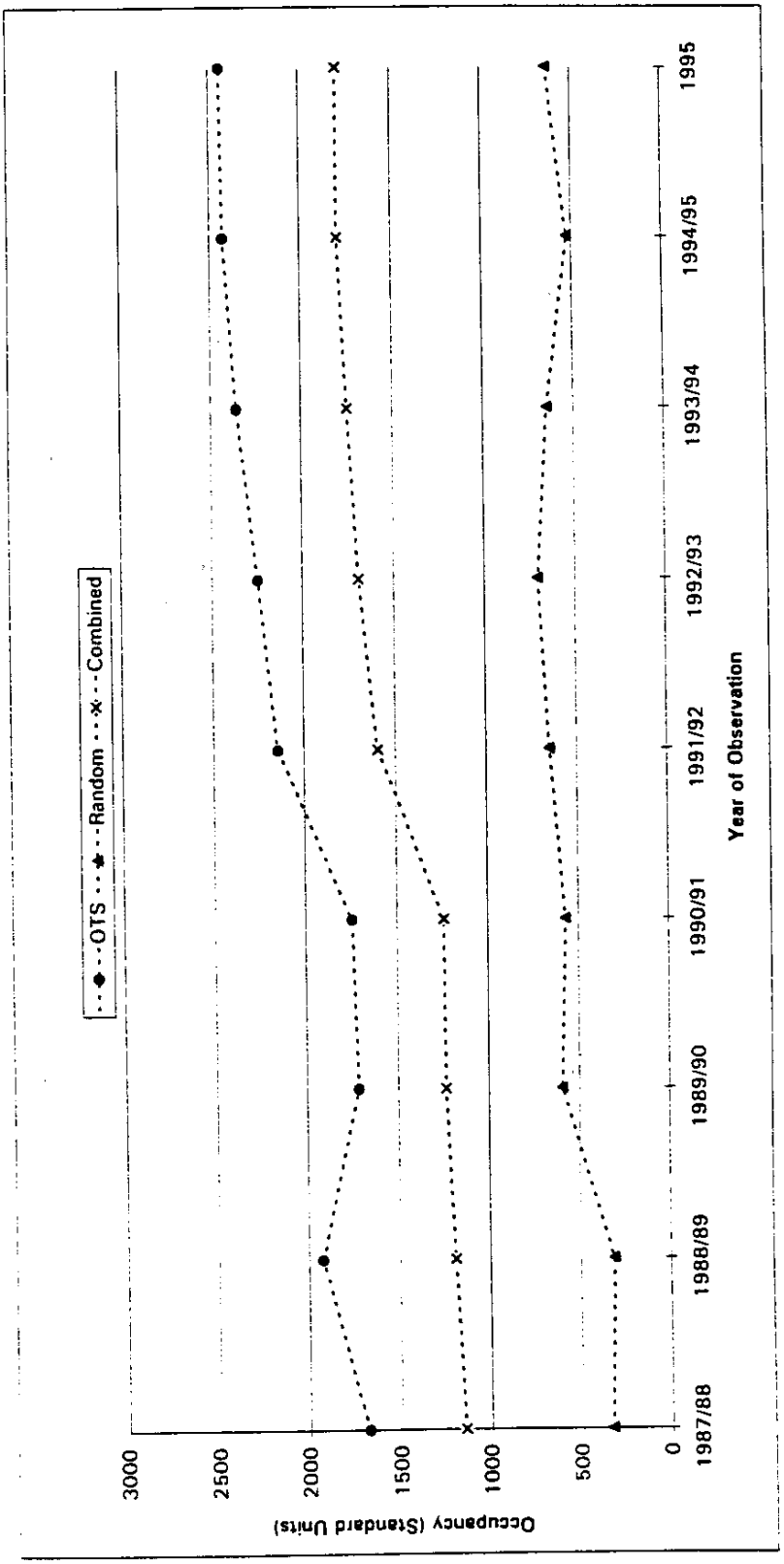


FIGURE 2 : NORTH ATLANTIC MNPS AIRSPACE
RISK-BEARING ERROR RATES

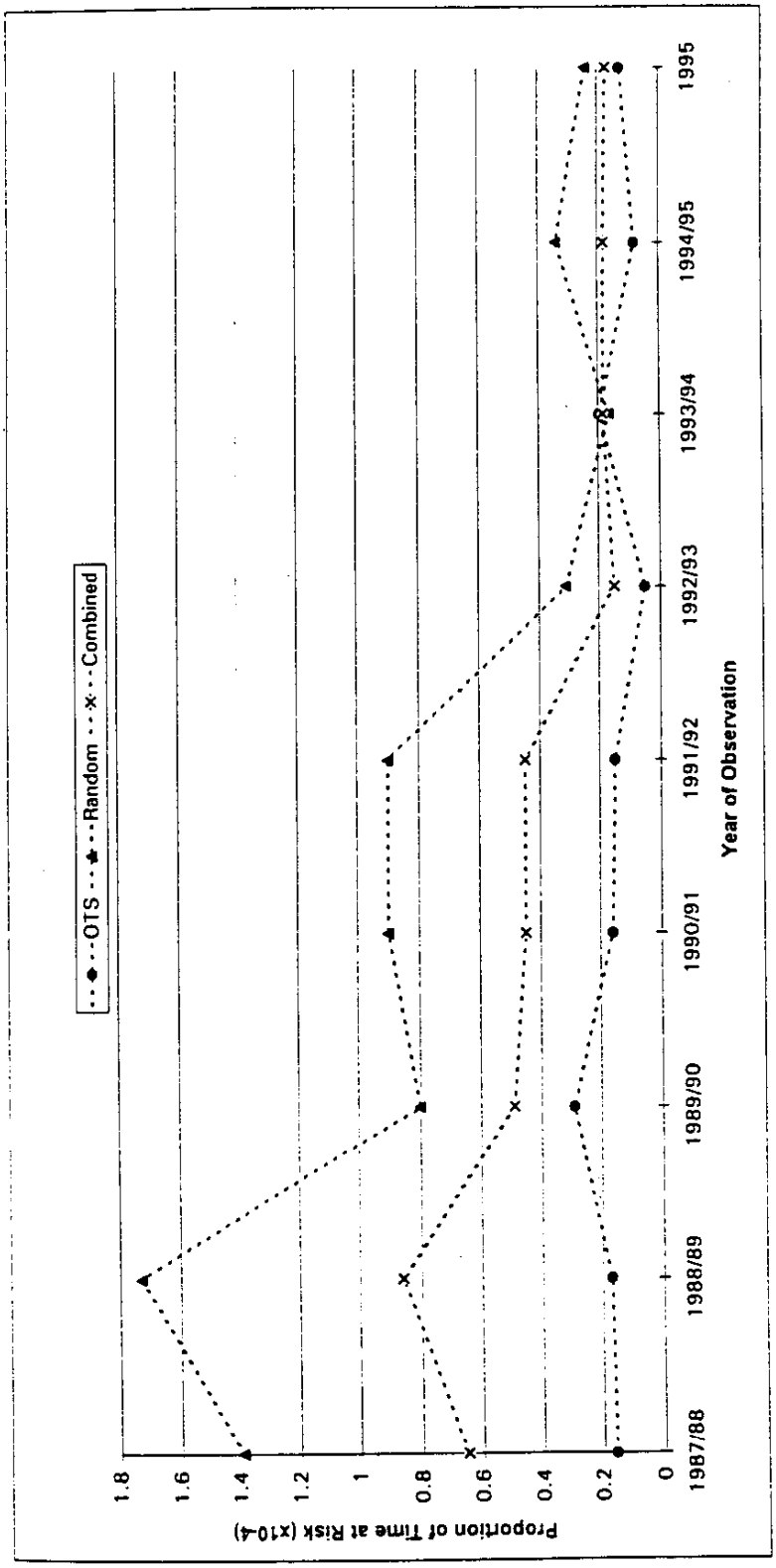
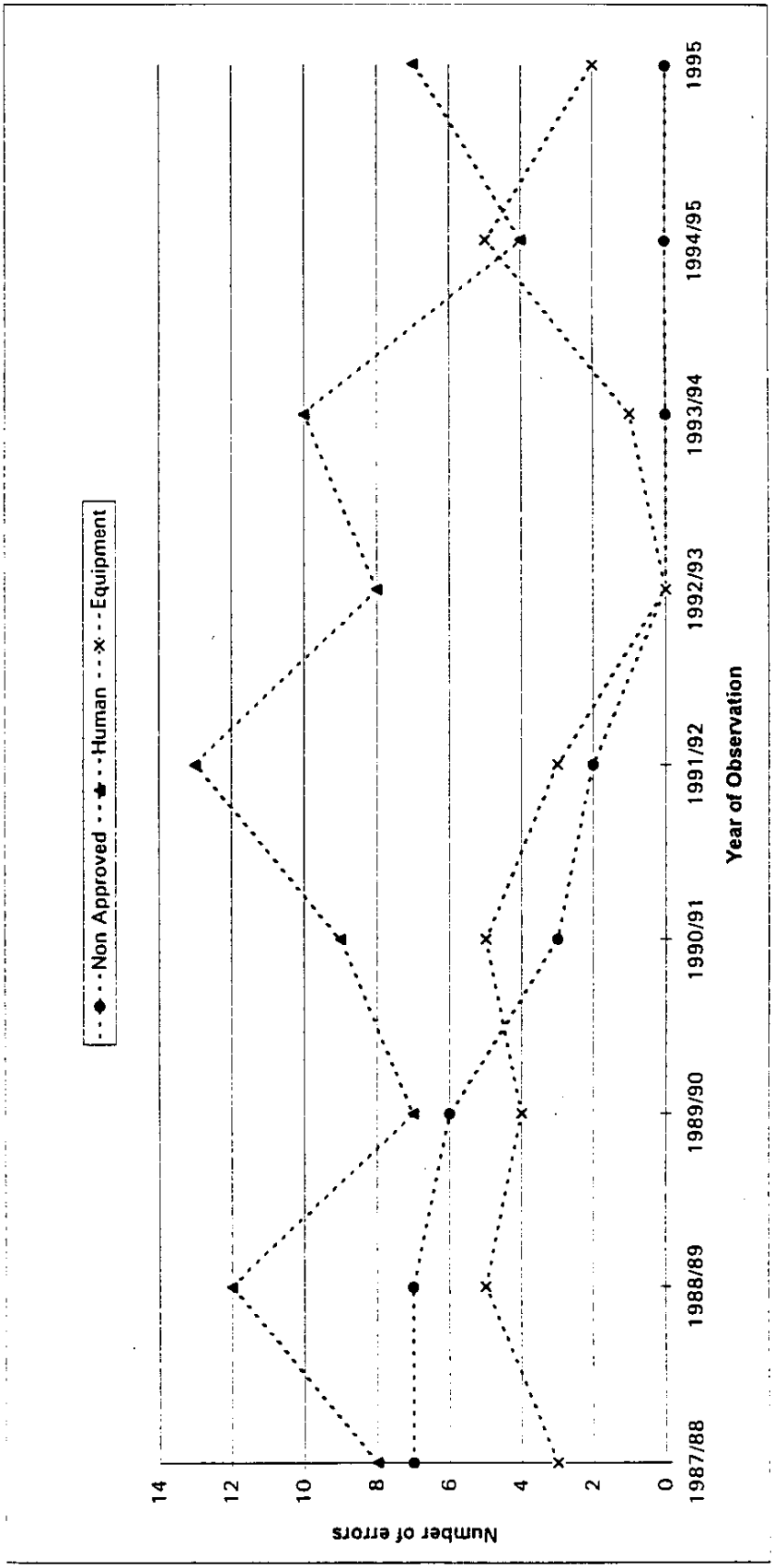


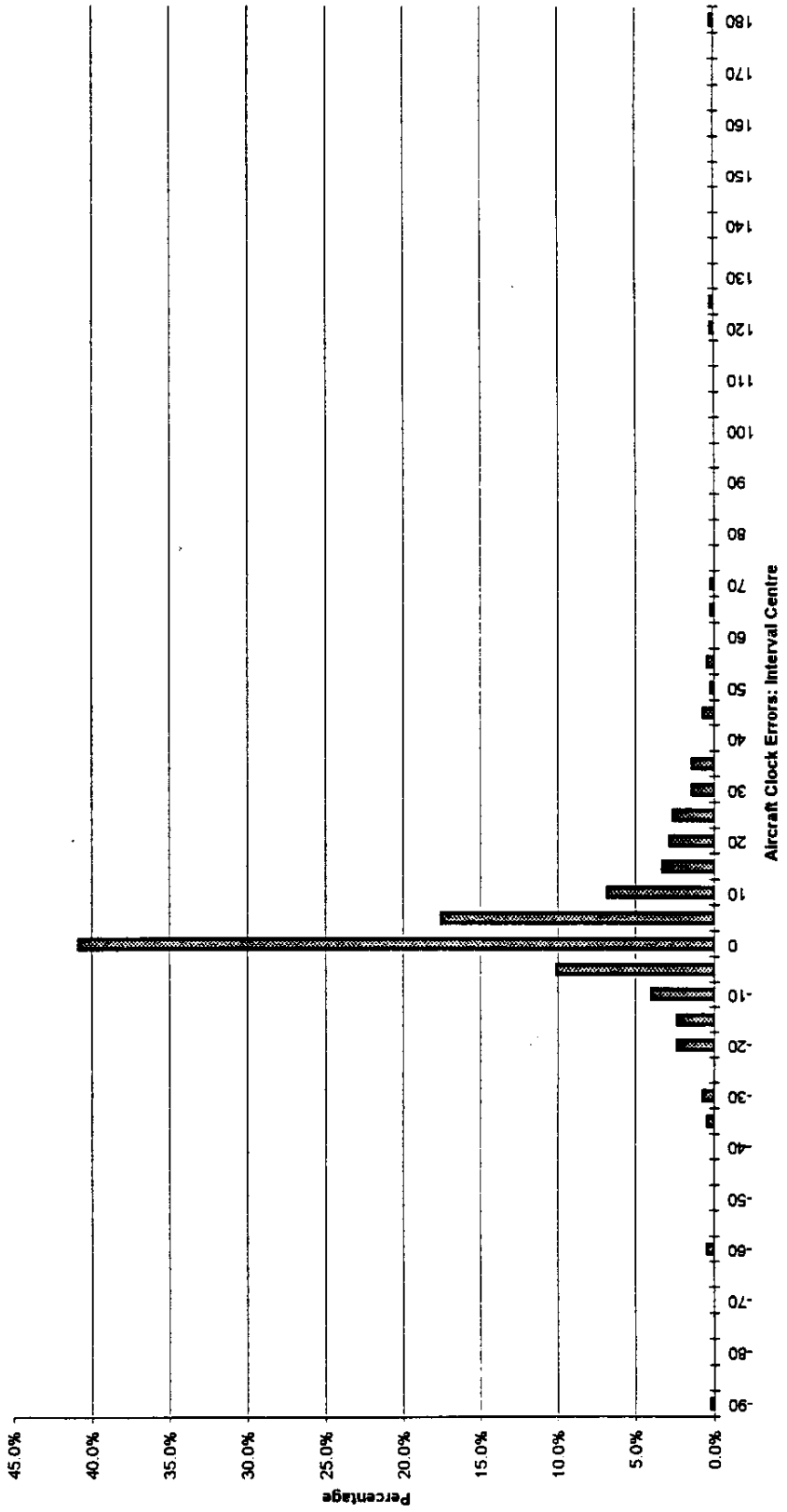
FIGURE 3 : UNWEIGHED NUMBER OF GNES > 50 NM



NS52RA3.W51

APPENDIX D - AIRCRAFT CLOCK ERRORS: PERCENTAGE

(paragraph 3.2.33 refers)



APPENDIX E - ACTIONS AND PROPOSED MATHEMATICIANS' WORK PROGRAMME FOR 1996/97

(paragraph 3.2.35 refers)

ACTION	Target Completion Date	Participants
VERTICAL COLLISION RISK		
Update IATA/IACA table on possible approved operator/aircraft type pairings	1st Week October 1996	IATA
Produce updated paper for full RVSM occupancy predictions	3rd week October 1996	Canada
Using new predictions concerning approvals, repeat simulations to determine phase 1 RVSM lateral and vertical occupancies and document flight level allocation rules	3rd week October 1996	Canada
Modify procedures to take out unidentified airframes from weighted ASE method and confidence interval data	MWG/10	UK/USA
Modify aircraft type graphs to make keys consistent.	MWG/10	USA
Modify programmes to allow versions of operator and airframe graphs to be prepared either with or without operators identified	MWG/10	USA/UK
Perform AAD study	MWG/10	USA
Examine Canadian core navigation data to see if AAD data can be used	MWG/10	Canada
Confirm new trigger levels	RSSIG/7	UK/USA
Investigate aberrant/non-compliant measurements	RSSIG/7	UK/CMA
Determine rules for whether ASE sample is representative	RSSIG/7	All
Confirm effects of crossing traffic under full RVSM	RSSIG/7	UK
Perform flight level analysis based on summer 1996 data from Prestwick and Gander	NAT IMG/8	UK
Determine Pz(1000) on additional data set that includes all results (approved/unapproved) from revised IATA/IACA survey table	MWG/10	USA/UK

ACTION	Target Completion Date	Participants
VERTICAL COLLISION RISK (continued)		
Analyze and prepare height monitoring and large height deviation data for risk assessment	On-going	UK/USA
Preliminary attempt to examine height monitoring data on repeat airframes for ASE stability	MWG/10	USA/UK
Determine requirements for monthly monitoring/risk assessment during RVSM operational trial	MWG/10	All
Prepare RVSM safety assessment	NAT IMG/8	All
Investigate risk of RVSM formation flights	NAT IMG/8	UK/USA
Update NAT Census	On-going	UK
Produce monthly lateral and vertical occupancy results for phase 1 RVSM and non-RVSM levels	Start Jan 1997	Canada/UK
Examine height monitoring data on repeat airframes for east and westbound differences	NAT SPG/33	UK
Produce version of operator graph that compares SD ASE	NAT SPG/33	USA
Produce next version of Supplement to NAT Doc 002	NAT SPG/33	All
Investigate ways of determining ydot and zdot	NAT SPG/33	UK
Update NAT Flights Paper based on 1996 TFG Data	NAT SPG/33	UK
Modify simulation model to reflect actual re-allocation rules used and input of "All" operator/aircraft type pairings into RVSM airspace.	NAT SPG/33	Canada

ACTION	Target Completion Date	Participants
LATERAL COLLISION RISK		
Produce paper documenting the investigation of lateral and vertical occupancy differences	MWG/10	Canada/UK
Process westbound data for aircraft exiting the ocean from 1995 Core Navigation Study	MWG/10	Canada
Investigate current ground navigation aids and improvements over last 15 years that might affect lateral navigation accuracy of aircraft entering the ocean	MWG/10	UK/Canada
Investigate proprietary curve fitting packages. Try out on Canadian eastbound data	MWG/10	IATA(BA)/ Canada
Produce paper describing the process whereby it is verified that the correct weighting has been applied during the scrutiny of GNEs	NAT SPG/33	USA/Canada
Compile and analyze common UK/Canada data set from core navigation study	NAT SPG/33	UK/Canada
Complete questionnaire on aircraft equipment fit and tie up with core navigation study results	NAT SPG/33	USA/IATA/ UK
Consider how Reykjavik data can be incorporated into the collision risk estimate	NAT SPG/33	Canada/UK
Progress work on risk assessments of 30 NM lateral separations with ADS.	NAT SPG/33	UK
Produce annual lateral risk assessment	NAT SPG/33	UK/Canada

ACTION	Target Completion Date	Participants
LONGITUDINAL COLLISION RISK		
Produce a preliminary safety assessment of reducing cross track separation from 15 minutes to 10 minutes	Spring 1997	UK
Analyze existing data on Gain/Loss studies	NAT SPG/33	Canada
Review parameter values within longitudinal collision risk model	NAT SPG/33	USA/UK
Advance longitudinal work to produce a preliminary set of performance criteria required to support a reduction in along track separation standard.	NAT SPG/33	USA/UK
Determine what separation standard can be achieved with current technology.	NAT SPG/33	USA/UK

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APPENDIX F - PROPOSAL FOR AMENDMENT OF THE ICAO SUPPLEMENTARY PROCEDURES (DOC 7030) - NORTH ATLANTIC REGION

(paragraph 3.3.6 refers)

PROPOSAL FOR AMENDMENT OF THE ICAO SUPPLEMENTARY PROCEDURES (Doc 7030) - NORTH ATLANTIC REGION

(Serial No.: -------)

a) **Regional Supplementary Procedures:**

Doc 7030/4 - NAT Part 1, Rules of the Air, Air Traffic Services and Search and Rescue, as modified by amendment 183 dated 1 February 1996.

b) **Proposed Amendment:**

Add new paragraph 9.3 - Manned Balloon Flights

9.4 Special procedures for manned balloon flights

9.4.1 Manned balloon flights authorized to operate in the NAT Region must operate outside NAT MNPS airspace.

9.4.2 Within the NAT Region, manned balloons shall have a communication capability in accordance with Annex 2, Rules of the Air.

c) **Originated by:**

Canada

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

The North Atlantic Systems Planning Group (NAT SPG) has agreed that procedures with respect to manned balloon flights operating in the NAT Region were necessary and that the Regional SUPPs provide procedures to allow for guidance to all concerned. The Regional procedure is necessary as:

a) a balloon cannot predict a flight path and therefore cannot meet the specifications required for operation in MNPS airspace:

b) operation of a balloon within MNPS airspace would cause considerable disruption to air traffic incurring a cost to the operators: and

c) a need exists to segregate a balloon from the high density air traffic of the oceanic track structure in the interest of flight safety.

e) **Intended date of implementation**:

As soon as possible, after approval by the Council.

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

g) **Secretariat's comments:**

APPENDIX G - PROPOSAL FOR AMENDMENT OF NAT DOC 001, T13.5N

(paragraph 3.3.6 refers)

Add new PART 9:

PART 9

MANNED BALLOON FLIGHT IN THE NAT REGION

9.1 *Coordination Requirements*

9.1.1 Balloon operators are responsible for coordinating flights within the NAT Region with the civil aviation authority of the States concerned.

9.1.2 As considerable coordination is required within air traffic services authorities of the States concerned, balloon operators are encouraged to coordinate any balloon operations as soon as possible. As a guideline, such coordination should commence at least four months prior to any proposed flight or launch window.

9.2 *Communications Requirement*

9.2.1 Within the NAT Region, manned balloons shall have a communication capability in accordance with ICAO, Annex 2, Rules of the Air.

9.3 *Operating Altitudes*

9.3.1 Manned balloon flights authorized to operate in the NAT Region must operate outside NAT MNPS airspace.

Amend PART 9 to read PART 10 (renumber paragraphs) and TABLE OF CONTENTS accordingly.

AGENDA ITEM 4: DOCUMENTATION UPDATE

4.1 Introduction

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

a) MNPS OPS Manual;

b) IGA Manual;

c) the NAT SPG handbook; and

d) NAT Facilities and Implementation Document

4.2 International General Aviation Manual

4.2.1 As in the past, the Group received, with appreciation, an update on the number of Search and Rescue (SAR) incidents that had occurred in the NAT Region since 1987. From the information, it appeared that the IGA Manual was bearing fruit in that SAR incidents had decreased since 1987. Although no further measures were though to be required at the time, the Group did feel that the United Kingdom should continue to monitor the situation and to report to the NAT SPG if anything untoward was identified. The results of this exercise are at **Appendix A** to the report on Agenda Item 4.

4.3 MNPS OPS Manual

4.3.1 The Group noted that the seventh edition of the NAT MNPS OPS Manual, which would take into account RVSM, was being prepared by the United Kingdom and IATA and that publication was expected in the spring of 1997.

4.4 NAT SPG Handbook

4.4.1 The Group noted with appreciation that the second edition of the NAT SPG handbook, which had been produced by the Chairman, had been very well received. Accordingly, it was agreed that the document should, as originally planned, be updated by the Chairman after NAT SPG meetings. With this in mind, all participants had been invited to provide their inputs in order to update the manual.

4.5 Consolidated Guidance Material (NAT Doc 001)

4.5.1 The Group noted that several issues agreed to in the context of the implementation of RVSM as well as the de-commissioning of Omega needed to be reflected in Doc 001. The Group agreed that this task was an important one and that it should be completed by NAT SPG/33 so that the Doc 001 and the MNPS OPS Manual remained "in step". With this in mind, it was agreed that the ICAO European and North atlantic Office, in co-operation with the NAT provider States and users should prepare a draft 7th edition of Doc 001 for review at NAT SPG/33.

CONCLUSION 32/23 - SEVENTH EDITION OF THE NAT CONSOLIDATED GUIDANCE MATERIAL (NAT DOC 001)

That:

a) the European and North Atlantic Office of ICAO co-ordinate the preparation of the 7th edition of the NAT Consolidated Guidance Material; and

b) the draft 7th edition be presented to NAT SPG/33 for endorsement.

4.6 NAT Facilities and Services Implementation Document

4.6.1 The Group was informed that the study concerning the NAT FASID had been carried out and that the results had been submitted to the Air Navigation Commission. It was expected that a final decision on this matter would be made by the ICAO Council before the end of 1996. The Group would be kept informed of developments.

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APPENDIX A - SAR INCIDENTS IN THE NAT REGION

(Paragraph 4.2.1 refers)

	1987	1988	1989	1990	1991	1992	1993	1994	1995
Denmark	1	4	10	5	3	1	1	0	3
Ireland/UK	5	4	7	4	3	4	3	1	0
USA	2	2	4	2	0	0	0	2	0
Portugal	2	0	2	2	0	4	3	3	1
Iceland	N/A	12	5	10	2	0	2	3	0
Norway	N/A	N/A	N/A	1	0	0	0	0	1
Canada	N/A	N/A	N/A	N/A	0	2	0	0	4
Totals *(for data received)*	10	22	28	24	8	11	9	9	9
Average (for RCCs reporting)	2.5	4.4	5.6	4.0	1.1	1.6	1.3	1.3	1.3

Note: Denmark includes Faroe Islands and Greenland

AGENDA ITEM 5: ANY OTHER BUSINESS

5.1 Introduction

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

a) election of a Vice-Chairman; and

b) next meeting of the NAT SPG.

5.2 Election of a Vice-Chairman

5.2.1 In view of the difficulties that had been generated as a result of the sudden illness of the Chairman, the Group agreed that it would be opportune to elect a vice-chairman. With this in mind, Canada nominated Mr Asgeir Pálsson from Iceland to be Vice-Chairman. The nomination was seconded by the United Kingdom and was unanimously agreed to by NAT SPG Members.

5.3 Next Meeting

5.3.1 The Group agreed that its annual meeting should revert to the June time frame. Accordingly, it was agreed that NAT SPG/33 be held in Paris from the 9 to the 13 June 1997.

5.3.2 When agreeing to the above dates, the Group also considered its new working arrangements, in particular the length of the meetings. It was felt that because of the implementation of RVSM in early 1997, it would be wise to schedule a five day meeting in 1997. From the experience gained after NAT SPG/33, it may very well be possible to reduce the duration of the meeting to four days. The secretary pointed out however that documentation for the meeting would have to be controlled in a stricter manner in order to meet the four day goal. In particular, the number of papers would have to be either reduced or their handling changed. Furthermore, papers would have to be submitted in advance so that they could be disposed of in a timely manner and the report material drafted.

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