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NAT SPG/30

NORTH ATLANTIC SYSTEMS PLANNING GROUP

Summary of Discussions and Conclusions of the Thirtieth Meeting of the North Atlantic Systems Planning Group

Paris, 6 - 17 June 1994

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LIST OF ABBREVIATIONS

ACAS	Airborne Collision Avoidance System
ACC	Area Control Centre
ADS	Automatic Dependent Surveillance
ADSDG	Automatic Dependent Surveillance Development Group
ADSP	Automatic Dependent Surveillance Panel
AFTN	Aeronautical Fixed Telecommunications Network
AIC	Aeronautical Information Circular
AIDC	Air Traffic Services (ATS) Inter-facility Data Communications
AIS	Aeronautical Information Services
AMSS	Aeronautical Mobile-Satellite Service
ANP	Air Navigation Plan
ASE	Altimetry System Error
ATMG	Air Traffic Management Group
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
CAA	Civil Aviation Authority
CDN	Co-ordination message
CMA	Central Monitoring Agency
CMT	Commit message
CNS/ATM	Communications, Navigation and Surveillance/Air Traffic Management
COMAG	Communications and Air Traffic Management Automation Group
CPDLC	Controller Pilot Data Link Communications
CPL	Current Flight Plan message
CRM	Collision Risk Model
CUR	Current message
DFDR	Digital Flight Data Recorder
DTSN	Data Transfer Serial Number
FASID	Facilities and Services Implementation Document
FDPS	Flight Data Processing System
FIR/CTA	Flight Information Region/Control Area
FMS	Flight Management System
FNM	Flight Notification message
GMU	GPS Monitoring Unit
GNE	Gross Navigation Error
GPS	Global Positioning System
HCI	Human/Computer Interface
HLM	High Level Managers

ICD	Interface Control Document
ID	Implementation Document
IGA	International General Aviation
IGM	Interim Guidance Material
IMG	Implementation Management Group
IPCT	Implementation Planning Co-ordination Team
IPD	Implementation Programme Document
IRS	Inertial Reference System
ITC	In Trail Climb
MASPS	Minimum Aircraft System Performance Specification
MNPS	Minimum Navigation Performance Specifications
MOPS	Minimum Operational Performance Standards
JAA	Joint Aviation Authorities
OAC	Oceanic Area Control Centre
OAG	Official Airline Guide
OCA	Oceanic Control Area
OCD	Oceanic Clearance Delivery
OCM	Oceanic Clearance Message
ODAPS	Oceanic Display and Planning System
OTM	Organized Track Message
OTS	Organized Track System
PMS	Performance Management System
R&D	Research and Development
RA	Resolution Advisory
RDY	Ready message
RSSIG	Reduced Separation Standards Implementation Group
RTA	Required Time of Arrival
RTCA	Radio Technical Commission for Aeronautics
RVSM	Reduced Vertical Separation Minimum
SARPS	Standards and Recommended Practices (ICAO)
SATCOM	Satellite Communications
SBY	Standby message
SUPPS	Regional Supplementary Procedures
TCAS	Traffic Alert and Collision Avoidance System
TFG	Traffic Forecasting Group
TLS	Target Level of Safety
TMI	Track Message Identification
TWDL	Two Way Data Link
VHF	Very High Frequency

INTRODUCTION

i.1 The Thirtieth Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in Paris from 6 to 17 June 1994. The meeting was chaired by **Mr. Karsten Theil**, the Member for Denmark.

i.2 In addition to IAOPA, IATA, IFALPA, IFATCA and Inmarsat, the Group had, as usual, invited Spain and the Russian Federation to attend this meeting as well as IACA whose status of observer has been approved by the President of the Council. A list of participants is at page i-10.

i.3 In order to progress its work efficiently, the Group established a number of sub-groups to deal with particular detailed aspects of some of the subjects considered during the meeting. These were:

a) a sub-group charged with the scrutiny of navigational performance questions, of which **Mr. Jim Benson** of the United Kingdom acted as Rapporteur;

b) a sub-group dealing with the review of matters related to NAT aeronautical telecommunications, of which **Mr. Svend Gravesen** of Denmark acted as Rapporteur; and

c) a sub-group to consider the mathematical and statistical aspects of separation minima in the NAT Region, of which **Mr. Ian Parker** of the United Kingdom acted as Rapporteur.

i.4 Mr. Christian Eigl, ICAO Representative, European and North Atlantic Office was Secretary of the Meeting and was assisted by Messrs Jacques Vanier, TO/RAC/SAR and Alfred Suban, TO/COM from the European and North Atlantic Office of ICAO and by Mrs Olga Recasens, Chief of the Joint Financing Section and Mr. George E. Bjerke, TO/RAC/SAR from ICAO Headquarters. The Secretary addressed the Group on specific ICAO matters at the opening of the meeting and in so doing, stressed particular issues directly related to the work of the Group.

i.5 In his opening remarks, the Chairman informed the Group that the Council had approved the International Air Carrier Association (IACA)'s request to become an observer of the NAT SPG and accordingly, he welcomed Mr. Patrick Webber. He also informed the Group that Mr. Ommund Mydland had replaced Mr. Rolph Grimsrud as the Member for Norway.

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LIST OF PARTICIPANTS/LISTE DES PARTICIPANTS

CANADA
Don MacKEIGAN*
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Bill STILWELL

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LIST OF CONCLUSIONS

AGENDA ITEM 1: DEVELOPMENTS

1.1 Introduction

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

a) ICAO Panels and Committees;

b) Developments in NAT provider States; and

c) Technology;

1.2 ICAO Panels and Committees

1.2.1 The Group was presented with information on data link application activities undertaken by the Automatic Dependent Surveillance Panel (ADSP). It noted that the ADSP, partly on the basis of existing industry standards, was developing data link applications for Automatic Dependent Surveillance (ADS), Controller Pilot Data Link Communications (CPDLC) and Air Traffic Services (ATS) Inter-facility Data Communications (AIDC) that would be compatible with the Aeronautical Telecommunications Network (ATN). The Group noted that the applications descriptions were expected to be published as ICAO guidance material. It was recognized that these applications would provide for most of the functionality envisioned for end-state systems and should, pending the development of ICAO Standards and Recommended Practices (SARPS), be considered for possible introduction in the NAT Region.

1.3 Developments in NAT provider States

1.3.1 The Group was informed by the Member for the United States of plans to conduct Satellite Communications (SATCOM) flight tests to evaluate the suitability of Aeronautical Mobile Satellite Service (AMSS) equipment to support Air Traffic Control (ATC) data link applications in oceanic airspace. With the early availability of equipment meeting ICAO SARPS for AMSS, it was expected that the trials would culminate in the operational use of AMSS, the ATN and ADS.

1.3.2 The Member for the United States also presented information on activities undertaken to expand the capabilities of the Oceanic Display and Planning System (ODAPS) installed and operating at the New York Oceanic Area Control Centre (OAC). These changes were expected to be implemented by the summer of 1994.

1.3.3 Information was presented to the Group by the Member for Norway concerning the development of ADS equipment suitable for installation on helicopters. It was noted that the equipment, which would adhere to ARINC 745-2 [Radio Technical Commission for Aeronautics (RTCA) DO-212] specification and the Inmarsat Data-3 specification, was planned to be available for flight tests in early 1996. Provided the results of the tests were successful, it was envisaged that carriage of ADS equipment would be mandatory for all helicopters operating in the Norwegian sector of the North Sea.

1.4 Technology

IN TRAIL CLIMB PROCEDURE

1.4.1 The Group was presented with information on the development of an In Trail Climb (ITC) procedure for use in oceanic airspace. The procedure, based on the use of Traffic Alert and Collision Avoidance Systems (TCAS) to determine the distance between two aircraft subject to specific conditions, would enable ATC to apply distance-based longitudinal separation between two succeeding aircraft to achieve a change of flight level. It was noted that two airlines had agreed to participate in controlled operational trials which were scheduled to begin in the Pacific Region in July 1994 for at least a three month period. The Group recalled that the purpose of Airborne Collision Avoidance System (ACAS)/TCAS was to provide a collision avoidance system; also, it noted that data collections and analyses in respect of TCAS performance were being undertaken. In view of this the Group was of the opinion that it would be premature, at this stage, to consider the procedure for possible application in the NAT region. The Member for the United States was requested to provide results of the Pacific operational trials with the ITC procedure in due course. The representative from IFALPA expressed concern with the proposed use of TCAS as a tool to provide separation between aircraft.

1.4.2 In the ensuing discussions, the Group noted that the use of the ITC procedure might entail the transfer of some of the responsibility for ensuring separation from the ground to the air; this matter would need to be clarified. In addition, it was pointed out that the intent of paragraph 9.1 a) in Part III of *The procedures for Air Navigation Services - Rules of the Air and Air Traffic Services (PANS-RAC)* Doc 4444 concerning the use of special electronic means or other aids for reductions in separation minima would also require clarification. Accordingly, the Group agreed that, before the use of ITC procedures could be considered for use in the NAT Region, it would be necessary to resolve the above issues.

TRACK DEFINITION MESSAGE

1.4.3 Information was presented to the Group on a track definition message which had been developed on the basis of the NAT track message in order to meet the needs of the Pacific Region. Recognizing the desirability of standardization, the Group agreed on the structure of a track definition message which would permit the publication of one or more tracks and which could be initially used in other regions in the short term. It was agreed that completion and publication of the detailed specifications for inclusion in Baseline 3 of the Common Coordination Interface Control Document (ICD) (paragraph 2.8.7 refers) would be undertaken, as directed by the NAT Implementation Management Group (IMG), on the basis of the contents of **Appendix A** to this part of the report after which it could be introduced in the NAT Region.

USE OF SATELLITE VOICE COMMUNICATIONS FOR ATC PURPOSES

1.4.4 The Group was presented information that Inmarsat had indicated to the United Kingdom that designated telephone numbers would be used for any and/or all pilot/controller communications via satellite for which they were certified. In this context, the Group recalled that the Air Navigation Plan (ANP) for the NAT Region, in respect of SATCOM, stated that voice communications should be available for emergency and safety-related non-routine messages. Furthermore, the discrete telephone numbers which had been provided to Inmarsat were intended to permit service providers to route distress messages to the appropriate facility. The use of satellite voice communications for other than such messages was considered by the Group not to be in accordance with the ANP.

TCAS ALERTS REPORTED IN AND AROUND MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS AIRSPACE

1.4.5 The Group was provided information on TCAS II alerts in or near NAT Minimum Navigation Performance Specifications (MNPS) airspace which had been reported during the United Kingdom's TCAS operational evaluation. It was seen that the majority of events to date had been due to altitude station keeping problems which had been attributed to either weather conditions or out-of-tolerance Performance Management Systems (PMS). Other events had been classified as phantom alerts, excessive altitude deviation and altitude corruption. The Group noted that there had been only one coordinated TCAS encounter within NAT MNPS airspace. It was further noted that the 19 reported events generating Resolution Advisories (RA) did not provide sufficient data to form a representative sample. The Group considered it unlikely that all RAs which had occurred within the NAT Region had been reported to the Central Monitoring Agency (CMA). It was recognized that maintaining an accurate data base of TCAS events in the NAT Region was vital to be able to assess the operational implications of TCAS in this airspace. The Group consequently agreed that States receiving reports on TCAS events should provide a report to the CMA and should also encourage flight crews to report TCAS RAs which have occurred in the NAT region.

APPROVAL OF THE GLOBAL POSITIONING SYSTEM AS A LONG RANGE NAVIGATION AID

1.4.6 Information was provided to the Group on the following:

a) approval by the United States for the use the Global Positioning System (GPS) as one of the two long range navigation systems required for MNPS operation;

b) GPS system status;

c) documents associated with GPS; and

d) proposals to maximize the use of GPS in the NAT region.

The Group was also informed that Canada had also approved the use of GPS as one of the two long range navigation systems required for MNPS operations. In addition, the Group was informed of the envisaged shutdown of OMEGA; in this context, the Member for the United States agreed to further study this matter and report to NAT SPG/31. It was recognized that there was a need for harmonization of documents issued by respectively the Federal Aviation Administration (FAA) and the Joint Airworthiness Authorities (JAA). The Member for the United Kingdom undertook to raise this matter with the JAA and to initiate discussions on technical issues regarding GPS between the FAA and the JAA. The Group agreed that it would not be appropriate at this stage to amend the *Consolidated Guidance Material NAT Region* nor the *NAT MNPS Airspace Operations Manual* to reflect the use of GPS.

THE USE OF HIGH FREQUENCY AS A DATA LINK MEDIUM

1.4.7 The Group was presented with information on the status of the High Frequency (HF) data link and related avionics which were being developed to possibly complement SATCOM in oceanic and remote continental airspace. The Group noted that preliminary trials with HF data link were in progress in the NAT Region using stations in Canada, Iceland and Sweden and that trials had also recently commenced in the Pacific Region.

TCAS/ACAS RESEARCH ACTIVITIES

1.4.8 Information was provided to the Group on separate TCAS research activities being carried out by the United Kingdom and the United States. These activities had been undertaken in part in response to the Limited NAT Regional Air Navigation (1992) Meeting (LIM NAT RAN) Conclusion 2/19. The intent of the United Kingdom and the United States to perform joint work in areas where the activities overlapped was noted. The Group was informed that the NAT Reduced Separation Standards Implementation Group (RSSIG), as part of its Reduced Vertical Separation Minimum (RVSM) implementation activities, had analyzed extensive samples of NAT MNPS traffic from the years 1988 to 1993. From the source data, it was noted that about seventy-three per cent of NAT MNPS flights originated from or terminated in the United States and that, of these, about ninety per-cent were aircraft to which mandatory carriage of TCAS applied. The remaining flights were conducted by military, cargo and general aviation aircraft, which were not mandated to carry TCAS. However, the source data seemed to indicate that approximately seventy per cent of the 118 general aviation airframes observed were registered in the United States and that there was reason to presume that a number of these aircraft were TCAS equipped. Roughly twenty per cent of the MNPS flights originated from or terminated in Canada. It was not possible to determine from the present data how many of these aircraft would also operate in United States airspace and thus be subject to mandatory carriage of TCAS.

APPENDIX A - TRACK DEFINITION MESSAGE

(Paragraph 1.4.3 refers)

PURPOSE: To define one or more organized tracks

FORMAT: (Message type)
Track System ID
Active Time Interval
Part definition (optional)
Track Identifier (2 alphanumerics)
Route elements
Level Information (Optional)
Link Routes (using RTS/subfield)
Remarks (Optional)
Hyphen (if further definitions follow) or)

EXAMPLE: PACIFIC REGION

(TDM-PAC YYMMDDHHMM YYMMDDHHMM-
08 CALMA COLIC.... 40N105W BPR
RTS/RJAA...DFW)

ATLANTIC REGION

(TDM-NAT PART 1/2 YYMMDDHHMM YYMMDDHHMM-
01 56N010W....SCROD YYR
WEST 310 330 350
EAST 370
RTS/NAR109 EAST VIA MAC-

B .....
.....
.....
RTS/NAR108
RMK/.....
.....
.....)

Notes:

1) There is no requirement for message numbering or time of issue as part of the message as they are included in the communications header.

2) LAT and LONG should be capable of expressing minutes of arc.

3) There is no need for the F or the A/B when expressing flight levels.

4) The new subfield RTS/ should be used to define link routes; the RMK subfield/ should be used for general remarks.

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 High Level Managers Meeting;

b) Report of the exploratory meeting of the NAT Implementation Management Group;

c) Report of the Nat Traffic Forecasting Group;

d) Report of the Reduced Separation Standards Implementation Group;

e) Report of the Automatic Dependent Surveillance Development Group;

f) Report of the NAT Air Traffic Management Group;

g) Report of the Communications and Air Traffic Management Automation Group;

h) Implementation planning process;

i) Contingency planning in the NAT Region; and

j) Provision of radar services in Southern Greenland.

2.2 Report of the High Level Managers Meeting

2.2.1 The Meeting of High Level Managers (HLM) from NAT SPG Member States was held in Paris (20 - 21 January 1994) in follow up to NAT SPG Conclusion 29/36. The main focus of the meeting was to discuss issues related to the institutional, financial and policy aspects of implementing the new ICAO ANP and in particular those aspects relating to the implementation of the ICAO Communications Navigation Surveillance/Air Traffic Management (CNS/ATM) systems in the NAT Region.

Management structure for the development and implementation of the ICAO CNS/ATM systems

2.2.2 On the basis that the tasks facing the NAT SPG required increasingly harmonious and integrated implementation action, the NAT HLM felt that a tool, that would secure the commitment of States and airspace users to apply the required resources towards concrete implementation action (ranging from Research and Development (R&D), to standardization, to procurement, to installation and to operation) in a harmonized manner and in accordance with a critically timed agreed schedule, was required. This schedule must be met by all concerned in order to ensure rapid progress and to avoid waste of time and resources.

2.2.3 With the foregoing in mind, the NAT HLM agreed that a mechanism should be established within the NAT SPG in order to satisfy the above. This mechanism would consist of a specialised management group called: the NAT Implementation Management Group (NAT IMG) composed of officials from Canada, Iceland, Portugal, the United Kingdom/Ireland, the United States

of America and of users. The individuals from the States and organizations should be at a level whereby they could make commitments on behalf of their State or organization. The Chairman of the IMG would be the Chairman of the NAT SPG itself (paragraph 2.3.5 also refers).

2.2.4 In this context, the NAT SPG would continue to be responsible for monitoring the health of the system and for the overall policy concerning planning for the implementation of the CNS/ATM systems. The NAT IMG would oversee, on behalf of the NAT SPG, the activities of the various implementation working groups as well as the day to day management of the agreed implementation plan.

Harmonisation of States' individual NAT implementation programmes, commitments and requirements

2.2.5 The NAT HLM meeting also examined a proposal concerning the need to harmonize State's individual NAT implementation programmes, commitments and requirements as well as the need to ensure that a cooperative approach to developing CNS/ATM systems for the NAT Region was taken by all concerned. In this context, it had been pointed out that incremental benefits to the users may be necessary in order to encourage them to equip their aircraft at an early date and that co-operation between States was a prerequisite to such action.

2.2.6 Furthermore, with the intent of keeping costs down, it was noted that where spare simulation capacity was available, such availability should be made known to other States; additionally, administrations should publish and distribute results of their trials and simulations so that work already carried out was not duplicated unnecessarily.

2.2.7 With the foregoing in mind, the Group noted that the NAT HLM had agreed that NAT provider States should:

a) establish common processes to evaluate priorities for the implementation of major changes and the future integration of systems;

b) identify and agree on those operational and functional requirements which were considered to be essential for their OAC to have in common and agree on the required level of commonality;

c) participate in joint procurement on those occasions when they perceive this to be beneficial;

d) establish common technical interface protocols for ATM equipment to meet common operational and functional requirements;

e) where possible, introduce all changes in separation standards in the NAT Region on a common date following coordination amongst the administrations concerned; and

Note: Where this would not be possible, partial introduction could be undertaken based on agreements by the administrations concerned and with common introduction dates in adjoining Oceanic Control Areas (OCA).

f) take a co-operative approach to developing CNS/ATM issues in the NAT Region.

Cost/benefit estimations and cost sharing/recovery

2.2.8 The Group noted that the NAT HLM meeting had been presented with information on cost benefit estimations for the implementation of RVSM and ADS in the NAT Region. As regards the cost/benefit information on ADS, it was noted that the NAT HLM had agreed that it was necessary to carry out another study before proceeding with detailed implementation planning.

2.2.9 As regards cost sharing and recovery, the NAT HLM meeting had noted that the need for co-operation in the form of cost sharing may increase in the future. Increased difficulties in raising capital to finance new projects and the growing emphasis on cost-effectiveness, may be expected to encourage States to consider the possibility of introducing cost sharing arrangements. In this context, it was noted that ICAO was willing to provide assistance in developing such arrangements and, if requested, to administer them.

Global Navigation Satellite Systems

2.2.10 The Group was informed that the NAT HLM meeting had been presented with information on the potential benefits of using Global Navigation Satellite Systems (GNSS) in the NAT Region and, in particular, GPS. It had decided that the NAT SPG should develop a work programme aimed at deriving benefits from GPS in its present form, as well as looking into augmentation, as necessary, to maximize user benefits regionally. This matter would be brought to the attention of the NAT IMG.

2.3 Report of the exploratory meeting of the NAT Implementation Management Group

Terms of reference of the NAT Implementation Management Group

2.3.1 As mentioned in paragraph 2.2.3 above, NAT IMG had been established to ensure that the implementation of the future NAT System was executed in a cost effective manner. In follow-up to the above, an exploratory meeting of the NAT IMG was held in Copenhagen from 12-14 April 1994 where it was recognized that the complexities of the NAT issues, and the inter-dependencies of plans of NAT States concerned, required a "business plan" approach which took into account the needs and abilities of the users of the System.

2.3.2 One of the main objectives of the above meeting was to develop a proposal for terms of reference for the NAT IMG. In this context, the role of the Implementation Programme Coordination Team (IPCT), which had been established pursuant to NAT SPG Conclusion 29/37, vis-à-vis the various implementation working groups had been considered. The NAT IMG had felt that, in the interest of centralizing the management of the implementation process and of eliminating duplication of efforts, the functions of the IPCT should be subsumed by the NAT IMG and that the IPCT should be disbanded.

2.3.3 In addition, the Group recalled the role of all NAT planning documentation namely: the Regional Supplementary Procedures (SUPPs), the NAT ANP, the new Facilities and Services Implementation Document (FASID) and the NAT Implementation Programme Document (NAT IPD). From this examination, it was possible to determine what tasks should be performed by the NAT IMG and which ones should remain entirely under the direction of the NAT SPG itself keeping in mind that, in accordance with the NAT HLM decision, monitoring and overall planning was a function of the NAT SPG itself.

2.3.4 On the basis of the above, the Group agreed to the following terms of reference for the NAT IMG:

1. To develop and manage the NAT Implementation Plan[1] which identifies priorities and sets out the timetables with associated milestones.

2. To identify, detail and recommend allocation of tasks and resources required to fulfil the NAT Implementation Plan.

3. To assess the cost effectiveness of the elements of the NAT Implementation Plan.

4. To approve or amend the terms of reference of NAT implementation working groups and to direct their work programmes.

5. To ensure the necessary coordination and/or consultation with NAT provider States, other States, NAT users and appropriate international organizations.

6. To propose to the NAT SPG amendments to the ANP, the FASID and to the Implementation Strategy.

7. To seek guidance from the NAT SPG on issues that the group cannot resolve.

8. To report to the NAT SPG.

Composition of the NAT IMG

2.3.5 The Group recalled that the NAT IMG was composed of one designated official from Canada, Iceland, Ireland, Portugal, the United Kingdom, the United States and suitable user representation. With this in mind, it was agreed that user participation should be as full members and that they should be required to provide commitment to the programme on behalf of users. Bearing in mind the need to keep the NAT IMG as small as practicable and that States' participation was normally limited to one individual, it was agreed that the users should also keep the level of their participation as small as possible. Accordingly, it was agreed that the user community should be offered three seats on the NAT IMG and it was felt that suitable representation might be two seats for IATA and one for IACA. Finally, the Group also agreed that the NAT IMG could invite other participants as and when required in order to ensure that the correct expertize was available when addressing specific tasks.

CONCLUSION 30/1 - TERMS OF REFERENCE AND COMPOSITION OF THE NAT IMPLEMENTATION MANAGEMENT GROUP (NAT IMG)

That the:

a) terms of reference of the NAT IMG be as follows:

1. To develop and manage the NAT Implementation Plan[1] which identifies priorities and sets out the timetables with associated milestones.

[1] Reference should be made to Conclusion 30/14 when considering the NAT Implementation Plan and Strategy

2. **To identify, detail and recommend allocation of tasks and resources required to fulfil the NAT Implementation Plan.**

3. **To assess the cost effectiveness of the elements of the NAT Implementation Plan.**

4. **To approve or amend the terms of reference of NAT implementation working groups and to direct their work programmes.**

5. **To ensure the necessary coordination and/or consultation with NAT provider states, other states, NAT users and appropriate international organizations.**

6. **To propose to the NAT SPG amendments to the Air Navigation Plan, the Facilities and Services Implementation Document and the Implementation Strategy.**

7. **To seek guidance from the NAT SPG on issues that the group cannot resolve.**

8. **To report to the NAT SPG.**

b) **composition of the NAT IMG include the following: one member from Canada, Iceland, Ireland, Portugal, the United Kingdom, the United States of America and three members from the user community; and**

c) **NAT Implementation Programme Coordination Team be disbanded.**

Rationalization of the implementation working groups

2.3.6 The Group noted that the NAT IMG, in the context of trying to rationalize its working structure, had agreed that the Automatic Dependent Surveillance Development Group (ADSDG) and the Communications and ATM Automation Group (COMAG) should be combined into one implementation working group. This decision was based on the fact that the ADSDG had only two Lines of Action assigned to it and because of the similarities of the tasks allocated to the ADSDG and the COMAG. In addition, the NAT IMG felt that only one implementation working group should address the full range of data link issues. It was noted that the rapporteurship of the new group would remain with the United Kingdom.

2.3.7 On the basis of the decision of the NAT IMG to create a data link implementation working group which would address other communications matters, the Group reviewed the role of its COM sub-group within the overall structure of the NAT SPG. It was recalled that the NAT SPG had two fundamental tasks - namely implementation planning and monitoring the health of the system. The COM sub-group was responsible for monitoring the health of the communications infrastructure and for proposing changes or improvements to rectify any shortcomings identified in the infrastructure. With the creation of a data link implementation group by the NAT IMG, it was felt that the work of the COM sub-group should be incorporated into that of the NAT IMG's work for the sake of consistency. However, in agreeing to the foregoing, it was noted that the NAT IMG was not responsible for the monitoring function; therefore, it was agreed that the NAT IMG data link applications working group should report directly to the NAT SPG on matters relating to monitoring the health of the system.

2.3.8 The Group also agreed that, whenever difficulties arose because of a conflict between the implementation planning function and the monitoring function within any other NAT IMG implementation working group, the same procedure outlined above should be used.

2.3.9 Finally, it was noted that the terms of reference for the NAT IMG's data link application implementation working group, which would report to the NAT SPG for the monitoring aspect and to the NAT IMG for implementation planning function, would be developed by the NAT IMG.

CONCLUSION 30/2 - MONITORING OF THE HEALTH OF THE COMMUNICATIONS INFRASTRUCTURE

That:

a) the NAT Implementation Management Group take into account the requirement to monitor the health of the communications infrastructure when agreeing on terms of reference for a data link application working group; and

b) the above referred implementation working group report directly to the NAT SPG on the monitoring aspects of its work.

Mechanism to address short term operational issues

2.3.10 The Group noted that the work of the NAT IMG did not include short term operational issues. Additionally, the NAT SPG would no longer have a mechanism to carry out this function. In this context, it agreed that operational issues that fall within a 12-month time frame should be addressed outside the NAT IMG.

2.3.11 It was agreed that, although the NAT Air Traffic Management Group (ATMG) had been used to address short term issues in the past, it was no longer considered to be the best vehicle to do so. Therefore, the Group agreed that the annual NAT Operations Managers Meeting (formally the NAT Chief's meeting) should be expanded to include user participation (civil and military) and that the traditional timing of the meeting be moved to the Spring, with provision for an additional fall meeting if extenuating circumstances require one. Recalling the effectiveness of small groups, the Group noted that the inclusion of the military users would eliminate the need for the NAT ALTRV as it was constituted. In this context, the Member for the United States agreed to apprise the United States Air Force of the decision and of the rationale behind it.

CONCLUSION 30/3 - THE NEED TO ADDRESS SHORT TERM OPERATIONAL ISSUES

That:

a) on the basis of the terms of reference shown at Appendix A to the Report on Agenda Item 2, the annual NAT Operations Managers meeting be tasked to address operational issues that fall within a 12-month timeframe;

b) the above meeting be expanded to include civil and military users;

c) the meeting shall be chaired by the NAT Implementation Management Group Member of the host State who shall provide the secretariat;

d) the NAT SPG Member of the host State shall report the outcome of the above meetings to the NAT SPG; and

e) the above meeting may invite participation by representatives of other air traffic control and flow management units as required by the agenda.

2.3.12 The Group also recognized that many of the operational issues of consequence to the users concerned problems at the oceanic/domestic interface. Provider States agreed to make arrangements for provider/user meetings to address these issues in both the European and North American Regions.

2.3.13 In order to ensure that all concerns were taken into account when dealing with oceanic/domestic interfaces, the Group also agreed that the operations managers from adjacent facilities be invited to provider/user meetings as required.

CONCLUSION 30/4 - THE NEED TO ADDRESS OCEANIC/DOMESTIC INTERFACE MATTERS

That:

a) States concerned in the EUR and NAM Regions make provision with the users to address problems associated with the oceanic/domestic interface; and

b) other States concerned be invited to participate in the above meetings as required.

2.4 Report of the NAT Traffic Forecasting Group

2.4.1 The 28th Meeting of the NAT Traffic Forecasting Group (TFG) was held in Paris from 5 to 13 May 1994. Their major task was to update the NAT annual and peak period forecasts for the 1994 to 1999 period. To this end, the NAT TFG had prepared estimates of annual 1993 passengers and flights to use as the base period in preparing the annual forecasts. In addition, they revised the previous estimate of 1992 passengers, from 39.0 to 39.4 million. The July and November 1993 sample data supplied by the oceanic centres served as the base period for the peak period forecasts. They also forecasted the traffic flow between North America and the Caribbean.

2.4.2 All six of the OAC or Area Control Centres (ACC) submitted their sample data on computer diskette which greatly reduced the time required to enter the data in the data analysis programme. The NAT TFG acknowledged the co-operation and timely support received from all OAC/ACCs. However, New York was unable to provide the data required for the November collection. While the problems associated with scarce resources were appreciated, it was hoped that New York would be able to fully participate next year.

2.4.3 From the forecasts, the Group noted a dramatic increase in traffic on the EUR-MIDWEST route in 1993. This increase was confirmed by data from the Official Airline Guide (OAG) and reflected the expansion of the route network by the major airlines. It noted that the percentage increase in traffic in the November sample period in 1993 was significantly less than that recorded for the July period: 1.6 % for November compared with 6.2 % in July.

2.4.4 The high and low cases were formed by not only varying the economic assumptions, but also by varying the estimates of available capacity arising from changes in growth in other markets and the competitive strategies of the major airlines.

Estimated number of movements

2.4.5 The forecasts of both passengers and aircraft movements were similar to those presented in 1993. The 1998 passenger forecast was slightly higher (53.4 versus 53.2 million) while the 1998 aircraft movement forecast was 2.3 % lower (305,200 versus 312,500).

2.4.6 In actual terms, the forecast was for the number of passengers to increase by 15 million between 1993 (estimated at 41.3 million) and 1999 (56.3 million), an average annual growth rate of 5.3 %. The equivalent increase in the number of flights was just over 77,000 (4.7 % annually), from an estimated 242,800 in 1993 to 320,100 in 1999.

2.4.7 In the pessimistic scenario, the average annual growth rates for passengers and flights were 4.2 % and 3.7 %, respectively. For the optimistic case, the equivalent figures were 6.6 % annually for passengers and 5.8 % annually for aircraft movements. The range between the 1999 optimistic and pessimistic forecasts was 7.6 million passengers and 38,400 flights (approximately 11-12 aircraft in each direction for the busy hour).

2.4.8 It was stressed that the optimistic and pessimistic scenarios were developed to reflect not only the uncertainties as to economic development but also those associated with the major supply factors, e.g. airline fleet changes, route generation, and airline marketing strategies.

2.4.9 Charter operations were estimated to have declined 6.0 % in 1993 to 12,800. It was assumed that charter flights would remain constant at 12,900 throughout the forecast period.

2.4.10 All-cargo flights (approximately 13,200) were estimated to be up 5.0 % in 1993, largely reflecting the stronger economic growth in both the United States and the United Kingdom. The number of cargo flights were projected to remain constant at the 1993 level throughout the forecast period.

2.4.11 General aviation activity on the North Atlantic increased by 14.4 % in 1993. The Group believed that this growth reflected a continuing shift in business travellers from commercial flights to corporate or private aircraft. General aviation operations could vary significantly from year-to-year. The general aviation operations were increased in the July 1999 forecast (from 4,000 in 1993 to 5,000 in 1999) but reduced slightly in the November 1999 forecast (from 10,000 in 1992 to 8,000 in 1999) because both the July 1993 and November 1992 activity levels were out of line with trends of previous years.

2.4.12 Military activity was estimated to have increased 7.1 % in 1993, with much of the growth assumed to be the result of increased military activity in Somalia and Bosnia & Herzegovina. It was assumed that military activity would return to a more appropriate historical level in 1994 (10,000 operations) and remain at that level for the remainder of the forecast period.

2.4.13 The number of the extended-range twin-engine aircraft increased in both sample periods - up 11.9 and 9.7 %, respectively, in July and November, while there was little change in the number of three and four-engine wide-body aircraft.

2.4.14 In view of the continuing increase in the use of wide-body twin-engine (A-310 and B-767) aircraft operating across the North Atlantic, a ninth aircraft category was added to the analysis to separate this aircraft type which had increased from 1.7 % of **total commercial** aircraft operations in 1985 to 38.5 % in 1993 - 37.9 % in July and 39.2 % in November. It was anticipated that this category would account for 53.8 % of commercial aircraft movements in 1999 - 53.9 % in July and 53.6 % in November. However, much of this increase would be due to the introduction of the B-777, starting in 1995.

2.4.15 In addition to the figures which are at **Appendix B** to this part of the Report, which depict the actual and projected traffic growth, the following medium-term forecasts up to 1999 were also produced:

SCENARIO	ACTUAL					FORECAST					
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
OPTIMISTIC						259.8	274.7	289.4	305.6	323.0	341.2
BASELINE	182.5	207.1	213.0	228.2	242.8	252.8	264.5	277.2	291.2	305.2	320.1
PESSIMISTIC						246.0	254.2	262.9	275.6	288.4	302.8

Table 1 - Medium term forecast (in thousands)

2.4.16 The Group noted that the NAT TFG will update the long-term passenger and flight forecasts at its 29th meeting. It also intended to update the long-term city-pair forecasts when it revises the long-term forecasts. As regards the city-pair forecasts, the Group felt that they would become increasingly important and that the NAT TFG should be informed accordingly.

Problems encountered by the NAT TFG

2.4.17 Following the recommendations of the NAT SPG/29, the chairman of the NAT TFG had contacted IATA to see whether the data of the type previously available could be provided. IATA proposed that they collect this data on a one-off basis in order to meet the needs of the NAT TFG. There was however a charge to be made for these services. Since the NAT TFG's requirement was for more than a one-off collection, it was decided to investigate other ways of obtaining this information before asking IATA to proceed. Potential sources for this information included ICAO (but timeliness was a problem) and the United States DOT T100 data.

Level of Participation

2.4.18 Once again both the FAA and Transport Canada raised the issue of both financial cost and availability of staff resources. The ways and means of ameliorating the cost pressures had been fully discussed and highlighted at NAT SPG/29.

2.4.19 The importance of the United States in terms of traffic generation for the North Atlantic and in the number of airlines operating in the region, means that their participation in the work of the NAT TFG was essential. The effect of the proposed cutbacks meant that the NAT TFG would effectively meet only once every two years. The higher risks associated with this practice were outlined in the NAT SPG/29 report. The Group agreed that the position established at NAT SPG/29 concerning this matter was still valid and agreed to re-iterate its position (NAT SPG Report, paragraphs 4.2.14 and 4.2.15 refer).

CONCLUSION 30/5 - ACTIVITIES OF THE NORTH ATLANTIC TRAFFIC FORECASTING GROUP (NAT TFG)

That States supporting the activities of the NAT TFG take appropriate action to ensure its continuity and the participation of its members, taking into account the increased commitment to this work as expressed by both the NAT Systems Planning Group and the Limited NAT Regional Air Navigation (1992) Meeting.

Range of Uncertainty

2.4.20 In preparing its high and low scenarios, considerable difficulty had been encountered in trying to define consistent conditions which gave both high and low volumes of traffic. This was because airline response to different economic conditions could lead to similar forecast levels of traffic. This raised the question as to whether the NAT SPG would reconsider its requirements in respect of high and low forecasts. It was not being suggested that these forecasts be dispensed with but that some attention could be given to defining the high and low risks of importance to the NAT SPG. These risks should not be defined only in terms of larger or smaller volumes of traffic but also in terms of its geographical split and mix of aircraft types. In preparing its forecasts, the NAT TFG had drawn attention to a higher traffic growth on some axes, and also to the changing aircraft types. For example, the B-777 would be included with the smaller twins even though its capacity is closer to that of a B-747, while the A-340 would be included with the large wide-bodies. The NAT TFG therefore requested the NAT SPG's views on what would comprise a high and low risk scenario in planning terms, and also whether the geographical axes and aircraft type splits were still appropriate.

2.4.21 In response to the NAT TFG's request, the Group suggested that a new aircraft type category be defined for the B-777 and similar aircraft. The geographical axes used in the forecasts seemed appropriate and were being used for developing monitoring criteria; therefore they should be retained. As regards requirements for high and low forecasts, it was noted that, in general the planning of the NAT Region required aircraft movement data rather than passenger movements. Therefore the high forecast should take account of a high increase in passengers in combination with increased utilization of smaller capacity aircraft on more route axes. The low forecast should use the opposite assumptions. The NAT TFG would be apprised of the above.

2.5 Report of the Reduced Separation Standards Implementation Group

Operations/Airworthiness

2.5.1 The Group was informed that the major technical issues related to establishing the criteria for Altimeter System Error (ASE) and the RVSM flight envelopes had been resolved. The FAA had revised the draft material and had circulated it for comment to key players. After reviewing the final comments, the FAA had finalized the Interim Guidance Material (IGM) in April 1994.

2.5.2 It was noted that the IGM material should be published in the Federal Register in June 1995 and would be finalized when the Federal Aviation Regulation governing RVSM was published - scheduled for August 1996. Furthermore, the Joint Aviation Authorities (JAA) had revised the IGM to conform to the JAA document format. A final publication date had not yet been established.

2.5.3 The IGM contained significant improvements over previous drafts in that:

a) aircraft approval criteria and procedures applied to all airspace. There was no requirement for separate approvals for oceanic and domestic airspace as had previously been considered; and

b) there was no requirement for any significant operational restrictions. Some aircraft may have to establish an operating restriction for the extreme corners of the flight envelope; however, this area represented extremes of speed, altitude, and weight.

2.5.4 The Group noted a projected schedule for aircraft manufacturers to develop, aircraft certification offices to approve, and operators to apply data packages. It was noted that the timeframes varied by aircraft type and group. The FAA was in the process of contacting the individual aircraft manufacturers to determine their specific plans and schedules for data package approval. Based on previous discussions with manufacturers, the FAA believed that service bulletins or letters should be approved for major NAT aircraft types in the January 1995 timeframe.

2.5.5 The Group noted that the delay in the publication of the IGM for aircraft/operator approval could affect the percentage of the NAT fleet approved by April 1995. This should not however delay the start of verification efforts but the number of RVSM approved NAT aircraft available for verification in April 1995 would be less than targeted. In this context, it was recalled that the current NAT RVSM implementation schedule required a 21 month verification period prior to the start of operational trials: **April 1995-January 1997**. The timeframe for aircraft/operator approval could affect the January 1997 start of operational trials if authorities, manufacturers, and operators do not proceed in an expeditious manner; this caveat seemed to preclude any possibility of moving the start of operational trials forward.

2.5.6 The Group noted that manufacturers were expending resources to prepare their aircraft for RVSM approval and by late 1994, operators would also begin to expend resources. This should be taken into account in the planning process.

Airspace monitoring

2.5.7 The Group noted that a requirement for two data bases had been identified: a Height Keeping Performance (HKP) data base and an MNPS approvals data base. As regards the HKP data base, it was noted that efforts would be made to achieve a common core of GPS Monitoring System (GMS) and Height Monitoring Unit (HMU) data base content by mid-July 1994 as well as to establish the minimum requirement for meteorological information needed for the HMU in order for it to obtain the requisite correction factor.

2.5.8 It was recalled that the LIM NAT RAN (1992) Meeting had agreed that the approval status of all aircraft entering MNPS airspace needed to be included in field 10 and that the aircraft registration needed to be included in field 18. In this context, the Group recalled that no letter had been identified in the ICAO provisions to meet the above requirement. Accordingly, it was agreed that action should be taken to identify such a letter and that the EUR, NAM and NAT *Regional Supplementary Procedures* (Doc 7030) should be amended accordingly.

2.5.9 It was noted that a trial would be organized to compare the height measurement capability of the HMU and the GMS. Although the RSSIG had agreed that a comparative HMU/GMS trial be carried out at an appropriate time prior to the start of the verification phase, some reservations had been expressed about the extent of the programme that had been proposed.

2.5.10 The Group was informed that the GPS antenna problem resulting from coated cockpit windows had not yet been resolved. Despite the difficulties, it was emphasized that the GPS Monitoring Unit (GMU) functioned correctly but was as yet unable to track sufficient satellites through modern heated cockpit windows. Work was continuing in order to find a technical solution to this problem and also to investigate the possibility of situating the GMU in other parts of the aircraft.

2.5.11 The Group noted a draft GMS implementation plan for the NAT RVSM verification phase which emphasized the importance of determining in advance which operators would be GMS monitored after receiving RVSM approval and the necessity for close coordination between the GMS and HMU activities to ensure the success of the overall programme. Inherent in the plan was that any 'rogue' aircraft with Total Vertical Error (TVE)/APE in excess of 300/245 feet would be notified to the CMA within 72 hours of receipt of the raw data during the verification phase.

Use of RVSM by the military

2.5.12 Regarding the use of RVSM airspace by military transport aircraft, it was agreed that, at the very least, the IGM and all other relevant information concerning RVSM operations should be promulgated to the military.

Real time alerts

2.5.13 The whole philosophy behind real time alerts to ATC from the HMU as well as what information should be made available to ATC was debated. In this context, the Group was informed of the proposals made in the draft IGM concerning this matter and it recalled the material contained in the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL 290 and FL 410 inclusive* (Doc 9574). Also, it noted that, in accordance with paragraph 4.7.2.1.2 of the NAT Consolidated Guidance Material (T13/5N), it was necessary to report all deviations of 300 ft or more to the CMA. Finally, concern was raised over the possibility of aircraft being grounded unnecessarily because of false or incorrectly interpreted information.

2.5.14 With the above in mind, the Group agreed that, taking into account the functions of the hybrid monitoring system (GMS/HMU), there was no operational need for real time monitoring or alerts of altitude deviations. Furthermore, it was felt that the implementation of such alerts could lead to liability problems which would need to be resolved before implementation could begin. This could in turn lead to implementation delays. Accordingly, the Group agreed that the design of the HMU should take into account the above decision. In arriving at this decision, the Group was cognizant that parts of Conclusion 28/25 were no longer valid. Finally, it was noted that the representative from IFALPA could not support the above agreement.

CONCLUSION 30/6 - REAL TIME ALERTS

That:

a) no operational need for real time monitoring or alerts of altitude deviations exists; and

b) account be taken of a) above in the design of the Height Monitoring Units and height monitoring data bases.

Update the RVSM Guidance Material

2.5.15 The Group was presented with the final draft of the NAT RVSM Guidance Material which took into account the decisions made at the Special NAT SPG meeting and the publication of the IGM. The Group agreed that the Guidance Material was mature enough to be published as the first edition and that it be given widespread distribution.

CONCLUSION 30/7 - NORTH ATLANTIC REDUCED VERTICAL SEPARATION MINIMUM (RVSM) GUIDANCE MATERIAL

That:

a) the ICAO European and North Atlantic Office publish the RVSM Guidance Material on behalf of the NAT Systems Planning Group (NAT SPG) and distribute it to all concerned;

b) the RVSM Guidance Material and all other relevant information be promulgated to the military; and

c) all States and international organizations concerned use the RVSM Guidance Material developed by the NAT SPG in follow-up to Limited NAT Regional Air Navigation (1992) Meeting Conclusion 2/17.

Further amendments to the NAT Regional Supplementary Procedures (Doc 7030/4)

2.5.16 The Group recalled that it had agreed at its last meeting that an omnibus amendment to Doc 7030/4 should be prepared for submission to ICAO for formal processing as soon as possible. It was recognized that some issues, which were not yet mature, may generate further changes to Doc 7030/4. Nevertheless, it agreed on a cut off date of June 1995.

Reduced horizontal separation minima

2.5.17 The Group noted that reductions in horizontal separation minima were tributary to two main issues, namely the need to re-assess the Collision Risk Model (CRM) and operational requirements. As regards the first issue, the Group was informed that it was not possible to carry out the necessary studies needed to adjust the CRM before the end of 1994 without a re-allocation of resources which could have a knock-on effect on other programmes.

2.5.18 As regards the operational requirement and implications for ATC, the Group noted the effects that reductions in separation minima could have on down-stream domestic ACCs and that these should be taken into account when planning for reductions in separation minima as a significant increase in traffic density could have major impacts on some domestic ACCs.

2.5.19 The Group was presented with information on the possible way ahead for the implementation of reduced longitudinal separation. It noted that major factors, not presently taken into account in the analysis of the longitudinal separation minimum, were time-clock accuracy and individual aircraft along-track position keeping. As regards time-clock accuracy, it was noted that, on the basis of a study that had been carried out, time-clocks were generally good but that a substantial proportion of the sample taken (up to 20 percent) exhibited large errors with some in the range of two to four minutes.

2.5.20 The representative from IATA indicated that it would seem feasible and desirable to introduce a longitudinal separation minimum of seven or eight minutes by 1995 in order to provide additional airspace capacity and thereby efficiency. The Group agreed that it was necessary to start planning for the introduction of reduced horizontal separation minima, priority being given to reduced longitudinal. However, based on the work that would have to be carried out to sustain this reduction in longitudinal separation, the timeframe envisioned by IATA appeared overly optimistic.

Preparation of RVSM presentation package and Aeronautical Information Circular

2.5.21 The Group noted that once the RVSM Guidance Material had been distributed (paragraph 2.5.15 above refers), ICAO should be requested to send a letter to all States and international organizations concerned informing them of their responsibilities vis-à-vis the approval of aircraft and emphasizing the need to obtain required approvals in a timely manner so as not to jeopardize the RVSM implementation schedule. The letter would also invite those concerned to provide a positive indication from each operator (airspace user) as to whether RVSM approval would be sought for all, some or none of its fleet. The information would be used to help develop an assessment of aircraft which would be monitored by the HMUs and those that would be monitored by the GMS.

2.5.22 In addition, it would be necessary to develop an Aeronautical Information Circular (AIC) which would be disseminated simultaneously by all NAT provider States in September 1994. The AIC would highlight the implementation schedule as well as the requirement for aircraft to be approved in order to be able to operate in MNPS airspace after 2 January 1997; it should also provide guidance on where to find the necessary information to obtain aircraft approval.

Preparation for the RVSM seminar

2.5.23 In follow-up to NAT SPG/29 Conclusion 29/30, the Group discussed the convening of a seminar relating to the implementation of RVSM. The Group agreed that the seminar should be held in January 1995 and it noted, with appreciation, that Denmark would host it.

CONCLUSION 30/8 - SEMINAR ON THE IMPLEMENTATION OF REDUCED VERTICAL SEPARATION MINIMA (RVSM) IN THE NAT REGION

That:

a) NAT Implementation Management Group co-ordinate the preparations for a seminar to be held in January 1995 in Copenhagen to address the implementation of RVSM in the NAT Region; and

b) the seminar should deal with regulatory, engineering, aircraft operations and Air Traffic Management issues related to the implementation of RVSM.

Turbulence data collection

2.5.24 The Group was presented with a progress report on the effects that turbulence may have on risk and the development of procedures to mitigate any risk that may exist. It was noted that major airlines would be willing to collect information from the Digital Flight Data Recorders (DFDR). However, no procedures on how to collect the data had been agreed. Two possibilities were envisioned: the first would consist of systematically analysing all data whereas the other would be to only analyze DFDR data of aircraft that had reported moderate to heavy turbulence. Another

issue that required resolution concerned the need to agree as to who would carry out the analyses of the data. The Group noted the plan developed by the RSSIG to progress this issue.

Cost/benefit studies and decision making tools

2.5.25 The Group recalled that many plans for improving the air navigation system in the NAT Region had been proposed which had brought about great competition for scarce resources. One study, which had been carried out in the past, was the OASIS study which showed that RVSM would provide significant benefits and that subsequent reductions in horizontal separation would provide very little benefit in terms of fuel savings. However, the study appeared to be dated as some of the underlying assumptions had changed, particularly the aircraft mix. Additional studies, with more realistic aircraft mixes, also showed that RVSM would provide benefits. However, it was noted that no studies had been carried out to justify additional changes in the air navigation system nor did tools exist to enable managers to decide between competing proposals. In this context, it was recalled that the NAT HLM Meeting had noted the need to carry out a cost/benefit study relating to the implementation of ADS.

2.5.26 The Group agreed that it was important to investigate the usefulness of existing tools as well as the value of previous studies in order to determine whether they should be adapted to the requirements of the NAT Region. In this context, the Group felt that it had the expertise within the NAT IMG to oversee such a task. However, an important caveat was identified, namely the need for administrations and international organizations concerned to provide the resources which would be required to actually do the work.

CONCLUSION 30/9 - DEVELOPMENT OF DECISION MAKING TOOLS AND REVIEW OF BENEFIT TO COST STUDIES

That:

a) the NAT Implementation Management Group (NAT IMG) oversee the development of tools designed to facilitate the choice between competing alternatives for changes in the air navigation infrastructure and which would concentrate on generating the relative benefits and costs of the competing alternatives;

b) the NAT IMG review previous benefit to cost studies which had focused on proposed changes to separation minima; and

c) States and international organizations concerned provide the necessary resources to support the activities mentioned in a) and b) above.

Arrangement on the joint financing of the NAT Height Monitoring System

2.5.27 It was recalled that the Special Meeting of the NAT SPG had agreed on a hybrid height monitoring system to support the implementation of RVSM in the NAT Region. It had also agreed on a methodology for cost sharing and recovery of the system as prepared by a group of financial experts in response to NAT SPG/29 Conclusion 29/33.

2.5.28 The arrangement developed by the group of financial and operational experts was based on the description of the height monitoring system as determined by the Special Meeting of the NAT SPG. The NAT height monitoring system proposed was to be a hybrid one composed of two elements: the HMU and the GMS. Consequently, the financial experts adapted their previously

recommended proposal for HMU cost sharing/recovery to the requirements and circumstances of the hybrid HMU/GMS in the most cost-effective manner and taking into account the proposal made by the United States with respect to the GMS.

2.5.29 Due to the unique situation associated with its cost recovery system, the United States presented a proposal by which it would fund the total R&D and capital costs associated with the GMS as well as on-going Operations & Maintenance (O&M) costs for fiscal years 1995 and 1996 and a US$ 200,000 contribution to the O&M costs for fiscal year 1997 - estimated total was US$2.4 million. These costs would not be recovered through NAT user charges. This amount represented the United States' share for establishing and operating a NAT height monitoring system for RVSM.

2.5.30 With respect to the HMUs, the arrangement developed by the group of financial experts included the establishment of a joint financing arrangement under ICAO auspices for participation by the following provider States with NAT OACs providing air navigation services in NAT MNPS airspace: Canada, Iceland, Ireland/United Kingdom and Portugal. The costs involved would be recovered by a NAT RVSM user charge to be billed and collected by the United Kingdom Civil Aviation Administration (CAA) on behalf of ICAO.

2.5.31 The Special Meeting of the NAT SPG had also agreed that the implementation of the joint financing arrangement for the NAT height monitoring system would require an agreement between all NAT provider States concerned that should be finalized in 1994. It also agreed that ICAO, through its Joint Financing Section, should be requested to develop the arrangement on the basis of the proposal prepared by the group of financial experts.

2.5.32 In accordance with Special NAT SPG Conclusion SP/4, the Chairman of the NAT SPG, by letter dated 22 April 1994, requested on behalf of Canada, Iceland, Ireland, Portugal, the United Kingdom and the United States that the Secretary General of ICAO establish and administer the Joint Financing Arrangement for the North Atlantic Height Monitoring System. The Secretary General of ICAO, by letter dated 10 May 1994, agreed to assume the responsibilities associated with the request. Consequently, initial steps had been taken to ensure that the implementation dates, as outlined by the Special NAT SPG meeting in January 1994, were met.

2.5.33 In addition, States were to inform ICAO by the end of May 1994 whether they would be able to commit the necessary funds to proceed with the project. All States have either provided a positive response or have indicated that they did not expect any difficulties.

CONCLUSION 30/10 - FINANCIAL ARRANGEMENT FOR THE NORTH ATLANTIC HEIGHT MONITORING SYSTEM

That:

a) the financial Arrangement for the NAT Height Monitoring System be signed and finalized by all concerned by 15 September 1994;

b) if required, a meeting of legal and financial experts shall be convened in order to meet the above deadline; and

c) NAT SPG/31 be provided with a progress report on the above.

2.6 Report of the Automatic Dependent Surveillance Development Group

Review of the activities of other NAT SPG implementation groups

2.6.1 The Group recalled that several ATM issues had been brought to its attention at NAT SPG/29. As a result of on-going consultations, the Group noted that there were still many unanswered questions as to exactly how certain elements of the future ADS-ATC system would operate. Work on separation minima using ADS was ongoing in several fora and the issues of Human/Computer Interface (HCI) were just beginning to be studied. Even though many concerns were in the early stages of being resolved, it was nevertheless clear that certain capabilities would exist in the first generation of ADS equipment. In this context, the following issues were noted.

The size of areas of common interest

a) The areas of common interest were defined as areas within which ADS reports were being disseminated to more than one ATS unit and that this did not relate to the display of information. Furthermore, it was emphasized that the areas of common interest had to relate to areas within which co-ordination data had been exchanged. The extent of the areas of common interest should be based on bi-lateral or, in some cases, multi-lateral agreements.

   As regards conflict probes, they should continue in accordance with existing agreed procedures; these areas were independent of the areas of common interest. Nevertheless, the size of the area within which conflict probes would be carried out in the future could be reduced on the basis of experience and the evolution of ATC systems.

The impact of ADS on controller workload

b) Firstly, ADS per-se may not have any impact on ATC workload; however, the reduced need to manually process position reports would definitely reduce controller workload. Secondly, the new ATC procedures that would stem from the use of ADS could have an impact on ATC workload, either positively or negatively depending on the HCI. Thirdly, the availability of CPDLC, which is an adjunct to an ADS-ATC system, would have an impact on the controller workload, again depending on the HCI. This matter had to be evaluated in the context of on-going trials.

The use of CPDLC in an oceanic environment

c) A clear statement on the implementation of CPDLC could not be provided until such time as some trials had been carried out. Nevertheless, the operational requirements for CPDLC, including the priority of the types of ATC messages required, should be developed.

2.6.2 Although some of the issues examined could not be clearly resolved due to the lack of maturity of systems and standards, it was nevertheless felt that it was of the utmost importance that ATS providers make every effort to render benefits to equipped aircraft as soon as possible and that this be kept in mind during the planning and implementation process.

Report on NAT trials

2.6.3 The Group was informed that, on the basis of on-going activities being carried out by NAT provider States, some common threads had been identified. The first was that most activities related to ADS were based on ARINC 745 Supplement 2 as embodied in the RTCA Minimum Operational Performance Specifications (MOPS) DO212. As regards Two Way Data Link (TWDL), all activities were based on RTCA MOPS DO219. This reaffirmed the decision that these specifications, modified or enhanced to reflect requirements, were indeed valid as the core ones for trials (NAT SPG Conclusion 29/25 refers).

2.6.4 In addition to the above, some States considered trials as pre-operational service whereas others considered them as engineering trials. The point was raised as to whether efforts should be focused on pre-operational trials or on engineering trials. In this context, it was pointed out that few certification issues would arise for engineering trials whereas certification would be an important issue in pre-operational trials leading to operational service.

2.6.5 From the above, it was evident that two schools of thought had emerged. The first was to use the ARINC 622 specification to obtain early experience of the various applications (pre-operational trials) whereas the second was to head directly towards the end state which was the ATN (engineering trials).

2.6.6 Although no consensus concerning pre-operational trials could be reached, it was noted that a NAT unified trial based on ATN protocols and taking into account the activities under way in France, the United Kingdom and the United States on the use of ATN communications protocols to support ADS would be carried out. In this context, the Group noted that the basic requirements for participation in the unified trial, which included the technical infrastructure, applications, some scenarios, technical and operational objectives as well as initial time lines, had been agreed to.

The NAT ADS-ATC implementation plan

2.6.7 The Group was presented with information on developments in the field of avionics which would support the implementation of data link applications. The first presentation concerned a system upgrade for the B747-400, called FANS-1, that was compatible with existing and future avionics upgrade plans of the Boeing family of aircraft. FANS-1 would complement the ICAO global plan as well as regional planning activities on-going in several parts of the world. Industry was seeking global standards through the appropriate trade and standards-setting organizations.

2.6.8 The following baseline requirements for FANS-1 were noted:

a) implementation of FANS capability must proceed incrementally, with benefits for the operators and administrations being readily realizable in the foreseeable future;

b) benefits must outweigh cost at each step;

c) plans to implement FANS functions must consider all of the requirements necessary to achieve maximum benefits - ground and airborne;

d) there should be maximum utilization of existing equipment and a minimum requirement for new equipment or software;

e) integrity issues must be addressed at the system level; and

f) B747-400 system upgrade plans must be consistent with plans for upgrading other Boeing aircraft.

2.6.9 The following functionality would be included in the FANS-1 avionics:

a) Automatic Dependent Surveillance (RTCA MOPS DO212);

b) Controller-Pilot Data Link Communication (RTCA MOPS DO219);

c) Company data link;

d) Global Positioning System integration; and

e) Required Time of Arrival (RTA).

2.6.10 ADS and CPDLC would use the currently-defined and operational data networks with the ARINC 622 protocol. These networks would link the airplane, ground and satellite environments.

2.6.11 Information was also provided on the FANS-A avionics unit, dedicated to ATS communications, which was being specified for the Airbus family. The Air Traffic Services Unit (ATSU[2]) would help minimize the impact of the introduction of new ATC data link functionality on existing aircraft systems. Benefits would appear when introducing initial ATC data link applications and with future evolution. The ATSU concept may also ease the potential problems stemming from retrofits. The ATSU would be built to:

a) meet near term requirements;

b) have the flexibility to evolve without complete redesign; and

c) have, from the start, the potential to fulfil final ATN requirements.

2.6.12 The ATSU would manage the ATC communication functions required for ARINC 622, Mode S and later the ATN. It would also be responsible for the cockpit HCI and would manage ATC applications such as ADS and CPDLC.

2.6.13 The Group noted that some concern had been expressed by the ADSDG regarding certification of the CPDLC application, particularly as regards the assurance that the pilot would respond to ATC clearances and instructions in accordance with ATC's intention. Therefore, in order to get a better understanding of the interface between the pilot and the avionics, efforts would be made to collect information on CPDLC message templates used to display ATC instructions and clearances to the pilots.

The use of CPDLC in the NAT Region

2.6.14 The Group noted that a proposal, which designated three specific CPDLC (Oceanic Clearance Message (OCM), waypoint position reporting and flight level reclearances) services for

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[2] ATSU is avionics terminology and should not be confused with Air Traffic Services terminology

near term implementation had been made. The rationale behind the proposal was that it could provide incremental benefits to the users in a cost effective manner. However, on the basis of experience gained through various trials, the proposal would have to be introduced simultaneously across the NAT Region after sufficient pre-operational trials, with parallel HF voice procedures, had been carried out.

2.6.15 No consensus on implementing the proposed messages operationally or on a trial basis using the ARINC 622 characteristic over the current character based networks could be achieved. However, bearing in mind the planned equipage by the airlines of ARINC 622, the ADSDG had agreed that the NAT trials should be expanded to evaluate the operational benefits and impact of implementing RTCA MOPS DO212 and DO219 in the NAT Region using ARINC 622. In addition, it was recognized that, in accordance with the request by the NAT HLM meeting, any implementation plan based on the outcome of the above trial would need to be the subject of cost to benefit analysis.

2.6.16 The Group noted that the proposal could have useful operational advantages. However, before implementation could begin, several issues would need to be clarified. Firstly, it would be necessary to agree on common definitions and meanings of terms such as engineering, pre-operational and operational trials. It would also be necessary to study the feasibility of implementing CPDLC from an operational point of view. In addition, the work being done by the ICAO ATN Panel would have to be taken into consideration. Finally, because aircraft would begin equipping with the new avionic packages, the Group agreed that this was a priority item, that the NAT IMG should be informed accordingly and that the cost benefit studies should begin without delay.

ATM system certification

2.6.17 The Group was presented with information which addressed the question of certification of ATM systems, of aircraft and of operators. It was recognized that aircraft and ATM systems certification could play an important role in the implementation schedule of an operational ADS-ATC system. In this context, it had been noted that the FANS Phase II Committee, at its fourth meeting (Montreal, 15 September to 1 October 1993), had addressed the issue of the certification of ATM systems as reflected in its Recommendation 5/1.

2.6.18 The Group recognized that this was a very complex problem particularly as little knowledge existed for "groundworthiness". Furthermore, in order to properly address this task, it would be necessary to have expertise from the following fields: operations/airworthiness, ATC operations, communications engineering and ATM automation. The Group noted that any action on this point would have world-wide implications. Therefore, the Group felt that they should await the world-wide guidance that should be developed in follow-up to the FANS Recommendation cited above.

2.7 Report of the Air Traffic Management Group

Co-ordination with other NAT implementation working groups

2.7.1 The Group noted the RVSM tracking plan pertaining to ATM related milestones which had been developed on the basis of the implementation schedule agreed to at the LIM NAT RAN (1992) Meeting. From the tracking plan, it was noted that the operational trial should begin on 2 January 1997 (an AIRAC date) and that all preparations would have to be completed by September 1996 (three AIRAC cycles before the implementation date) in order to promulgate NOTAM in a timely manner. In this context, it was noted that a Special Meeting of the NAT SPG may be required in September 1996 to review and, if needed, make a go/no go decision.

2.7.2 The Group was presented with information on the simulations of RVSM which had been carried out by Canada, France, Ireland and the United States. In all cases, the initial results had shown that RVSM was operationally feasible subject to some modifications to sector boundaries and, in the case of the United States where the transition would be in un-surveilled airspace, changes in communications procedures. Again, in all cases, the conclusions had shown that additional simulations would be required and that they should be carried out in a co-operative manner.

Review of NAT documentation and common procedures

2.7.3 The Group noted that Canada, on behalf of the NAT SPG, would make arrangement to have the NAT SUPPS amended so as to include the communications failure procedures which had been endorsed at the last meeting (Conclusion 29/22).

The need for a standard NAT Oceanic Clearance Delivery application

2.7.4 The Group was informed that each NAT OAC had its own Oceanic Clearance Delivery (OCD) data link working group and that there was little co-ordination between these groups. A concentrated and co-ordinated effort was required by ATS providers, operators and communications service providers in order to standardize NAT OCD data link applications. Only in this way could their utility be maximized and the potential benefits be optimized. The earliest feasible implementation of an operational NAT OCD data link function was highly desirable as it would relieve congestion in the Very High Frequency (VHF) band, provide positive benefits in respect of controller and pilot workload and significantly contribute to air safety both in the oceanic and the interfacing domestic areas. As traffic continued to grow, each of these facets would increase in importance. The sharing of all available trial data should provide absolute "proof of the concept" and justification for operational implementation. Maximum utility, and hence benefit, of data link OCD would only be achieved by standardisation of the application across all NAT OACs. The Group agreed that the NAT IMG should be informed of the above and that it should add this matter to their work programme.

Development of standardized phraseology

2.7.5 The Group recalled that it had developed standardized phraseology. In follow-up to the implementation of the phraseology, the Group was informed that the United States had significant difficulties with the proposal because it would require a controller to use different phraseology for aircraft operating in the same sector depending on their route of flight. The representative from IFALPA indicated that greater effort should be made by all concerned to implement the agreed standard phraseology as soon as possible.

Common approach to airspace reservations

2.7.6 The Group agreed on the common approach to airspace reservations which is at **Appendix C** to this part of the Report. The Group also agreed that the NAT Consolidated Guidance Material should be amended to incorporate the procedures and that the NAT IMG be apprised of the above so that the procedures could be incorporated into the software engineer's version of the common *Application of Separation Minima* document.

CONCLUSION 30/11 - COMMON APPROACH TO AIRSPACE RESERVATIONS

That the common approach to airspace reservations, as shown in Appendix C to the Report on Agenda Item 2, be included in the NAT Consolidated Guidance Material (T13/5N) and in the Application of Separation Minima document.

Follow-up action relating to Air Traffic Flow Management

2.7.7 The Group noted that the ATMG had examined a proposal which entailed that the Flight Data Processing Systems (FDPS) would not have to handle messages transiting to/from the various Air Traffic Flow Management (ATFM) units. Indeed, with the exception of the Flight Notification Message (FNM), all communications between ATFM units and between ATS units and ATFM units, other than an ATS unit's related ATFM unit, would be through the related ATFM unit. In practical terms, oceanic facilities would not assign slots but would request an ATFM unit to carry out the requisite co-ordination and to assign the slots on its behalf.

2.7.8 States had different approaches to providing ATFM services because of the differences in the operating environments; in addition, the proposal was a departure from current practice in some cases. Accordingly, the Group noted that each provider State would determine the most effective method of delivering efficient ATFM services taking into account various environmental factors. In this context, the need for ATFM expertise at ATMG meetings, when required, was stressed.

NAT airline/ATS provider focus group

2.7.9 The Group was provided with an update of the focus group which had met simultaneously with the ATMG. It was noted that the focus group had been conducting trials comparing pseudo-flight plans with actual airline flight plans for six NAT traffic flows. Because the results had indicated a predictive capability of at least equivalent to existing European flight/route prediction standards, it had been planned to conduct operational trials between 16 May and 16 November 1994 in order to establish that:

a) a route correlation between the pseudo-flight plans and actual flight plans of $\pm 1°$ of latitude for 80% of traffic could be sustained; and

b) using pseudo-flight plans as a basis for NAT selected flow prediction through NAM and EUR domestic ATC sectors would provide improved utilisation of ATC capacity, lower ATC related delays and reduced flow restrictions.

2.7.10 The focus group had been satisfied that the proposed solution had no impact on NAT planning and operational procedures. For this reason, it was planned to commence the operational trial on the basis of existing co-ordination procedures between ATFM organisations and other ATS units. However, should the NAT SPG identify difficulties with the planned trial procedures and their impact on NAT Region operations, the ATFM executive units would seek ways to accommodate these concerns. Finally, it was noted that the focus group had completed its work by identifying a way forward and had therefore been disbanded.

Development of procedures related to the implementation of reduced separation minima

2.7.11 The Group noted the general discussion of the effects that further reductions in separation minima could have on operations in the NAT Region and in particular, the impact that the increased traffic density could have on adjacent domestic ATS units. In this context, it was agreed that a cautious approach should be taken when additional resources were required to handle increased traffic density in the NAT Region knowing that some domestic units were already saturated.

Radar coverage charts of the NAT Region

2.7.12 The Group was presented a radar coverage diagram which would show the actual and planned radar coverage of the NAT Region. It was felt that such a diagram would provide a useful

planning tool. Accordingly, the Group agreed that, subject to several changes, the radar coverage chart developed by NAT ATMG should be incorporated in the NAT Consolidated Guidance Material.

Rapporteurship of the NAT ATMG

2.7.13 The Group was informed that Canada would take over the rapporteurship of the ATMG. In this context, the Group thanked the Member for the United States for the support it had given to the ATMG.

2.8 Report of the Communications and Air Traffic Management Automation Group

Review of the common co-ordination interface control document

2.8.1 The Group recalled that the NAT common co-ordination ICD has been under development for a number of years and improvements have been, and would continue to be proposed. At the same time, provider States had engaged in various activities aimed at implementing more advanced ATM automation. It had been recognised that the constantly changing requirements posed a problem for States as they had to freeze their design requirements at some time in order to tender for new FDPSs.

2.8.2 With the foregoing in mind, an urgent requirement to define intermediate steps to ensure synchronized progress towards a stable end state had been identified. It was proposed that, by defining stable baselines which States could use in drawing up their FDPS specifications, the above concerns could be met. It was also postulated that, if action was not taken, a real danger existed that emerging automation systems might implement variations of the ICD - which would be a detriment to harmonization, a stated goal of the NAT ANP.

2.8.3 It was considered extremely important that each provider State's investment in automation systems should be protected and that early implementation of automated co-ordination procedures should be facilitated. Accordingly, it was agreed that implementation of the evolving NAT ICD should be based on agreed "baseline" documents and that Version 1.1 of the NAT ICD, which was already under configuration management, should constitute *Baseline 1* and that no changes to that document should be made.

2.8.4 In the context of facilitating the migration to the ATN, significant changes to Version 1.1 of the ICD had been agreed to. In particular, it had agreed to discontinue using the Data Transfer Serial Number (DTSN) and to use instead the Aeronautical Fixed Telecommunications Network (AFTN) message acknowledgement scheme. In addition, it had also been agreed that the ICD be amended to take into account several editorial changes: the renaming of the CNL as the MAC in order to correspond to the European Region; the deletion of the EST message; and the removal to an Attachment of Part III - EUR interface messages. The Group also agreed that a table that would cross-reference the ADS data link Guidance Material on AIDC should be included in the common co-ordination ICD. Keeping in mind the decision not to change Version 1.1 of the ICD (Baseline 1), it was agreed that a second baseline document, to be called Version 1.2 or *Baseline 2*, should be established and be considered as the current one.

2.8.5 Notwithstanding the foregoing, the Group also agreed that the ICD would have to be amended yet again to meet evolving requirements such as the co-ordination of a flight between three or more ATS units. This situation occurred, for example, when a flight left FIR A and entered FIR B, while at the same time travelling close (within the lateral separation standard) to the boundary of FIR C. For such a case, the controlling FIR, FIR A, must co-ordinate the flight not only with FIR B, but also with FIR C. This complex problem could be resolved by using a well known

protocol, the two-phase commit protocol, which has been used by data base vendors to update distributed data bases. This protocol had been analyzed extensively and was known to be reliable. By reliable it was meant that the data base was never left in an indeterminate state. The actual update process was atomic: either the update was performed completely, or it was not performed at all.

2.8.6 It was agreed that the proposal was an excellent one and that it should form the basis of a new version, or baseline, of the ICD. In agreeing to the foregoing, it was recognized that a significant change to the ICD would be required. The co-ordination phase would be divided into two distinct functions - initial co-ordination and subsequent co-ordination. The initial co-ordination phase would always be initiated with a Current Flight Plan (CPL) whereas a new message mnemonic, called the - Clearance Update Request (CUR), which would be an equivalent to the Co-ordination (CDN) message, would be used to initiate all subsequent re-negotiations of the original CPL. In addition, three other messages would also be required to support the multiple-ATS co-ordination function: RDY (ready), ROL (rollback) and CMT (commit). Finally, a standby (SBY) message, which would only inhibit timeouts in the ATS unit responsible for the rollback, would be required to prevent significant timeout problems.

2.8.7 The Group agreed that the above proposal should be considered as an integral part of the advanced FDPSs stipulated in the NAT ANP. Accordingly, it agreed that developments should continue and, when it felt confident with the changes, it would adopt Version 2.x, when finalized, as *Baseline 3*. The Group also agreed that all States should plan for the implementation of *Baseline 3* throughout the NAT Region by 1998. In order to achieve the 1998 milestone, the Group agreed that it was necessary to complete Version 2.x of the ICD by the end of 1994.

2.8.8 While procurement schedules may dictate the adoption of *Baseline 1* by some States, the Group agreed that States be urged to adopt *Baseline 2* as quickly as possible, as this baseline provided significant enhancements over *Baseline 1*, particularly in transitioning to the ATN. Interfaces to those States that would be at a lower baseline should ensure backward compatibility.

CONCLUSION 30/12 - GRADUAL IMPLEMENTATION OF THE COMMON CO-ORDINATION INTERFACE CONTROL DOCUMENTS (ICD)

That:

a) States implement the common co-ordination ICDs in accordance with agreed baseline documents;

b) interfaces to those States at a lower baseline should ensure backward compatibility;

c) Version 1.2 of the common co-ordination ICD be considered under configuration management and that all changes be subject to agreement by all concerned;

d) the ICAO EUR/NAT Office publish, on behalf of the NAT SPG, Version 1.2 of the NAT common co-ordination ICD; and

e) Baseline 3 of the NAT common co-ordination ICD be implemented by all States concerned by 1998.

Finalize the common aeradio interface control document

2.8.9 The Group agreed that Version 1.1 of the common aeradio ICD should be brought under formal configuration management. It agreed that a departure from the current practice of sending one message, which reflected the actual pilot-aeradio communications procedures, could be used in order to accommodate increasing levels of automation. In this context, it also agreed that certain messages received from the pilots by the aeradio operators should be split into components for onward transmission to the responsible ATSU.

CONCLUSION 30/13 - COMMON AERADIO INTERFACE CONTROL DOCUMENT (ICD) AND OPERATING PROCEDURES

That:

a) Version 1.1 of the NAT common aeradio ICD be considered under configuration management and that all changes to it be subject to agreement between all concerned;

b) the ICAO EUR/NAT Office publish, on behalf of the NAT SPG, Version 1.1 of the common aeradio ICD; and

c) when feasible, aeradio stations concerned split messages into component parts for onward transmission to the responsible Air Traffic Services Unit.

Finalize the common data base document

2.8.10 The Group was informed that an industry standard for Aeronautical Information Services (AIS) data bases existed and that most major NAT airspace users utilized the standard when updating Flight Management Systems (FMS). With the foregoing in mind, the COMAG had felt that it would be counter-productive, in the long-run, to develop a NAT Region specific data base structure that would not be compatible with the one that was evolving for AIS requirements and which was being used by industry to update FMSs. Accordingly, the policy concerning the development of the common data base document should reflect the foregoing. Nevertheless, States should still continue to collect and exchange data in order to eliminate as many sources of error as possible.

Review the second draft of the common application of separation standards document

2.8.11 The Group was presented an update on the work concerning the development of an adjunct to the *Application of Separation Minima* document which would be used to define a rigorous and consistent set of rules suitable for implementing automated systems. However, due to the style of the presentation of the separation minima in the *Application of Separation Minima* document and in the NAT SUPPs, a number of questions arose which had required some clarification. In this context, it was pointed out that this might be an appropriate time to eliminate complicated separation minima that would be expensive to automate and which were rarely used.

2.8.12 The Group was informed that the document was expected to be finalized in the last quarter of 1994; in the meantime, the NAT IMG would be apprised of progress and the final results would be incorporated into the *Application of Separation Minima* document.

Air Traffic Flow Management messages

2.8.13 The Group was informed that the COMAG had been able to fashion an ATFM message set on the basis of information provided by the NAT ATMG. In developing the message set, every effort had been made, from a technical point of view, to tie the ATFM messages to the common co-ordination ICD. For example, the same error message list and communications methods were used. However, because the NAT ATMG had not been able to provide a clear indication of how the messages were to be used, the COMAG had not been able to draft the purpose and policy part of the document. The Group agreed that the NAT IMG should be apprised of the foregoing.

2.8.14 The Member for the United Kingdom, on behalf of the Central Flow Management Unit, expressed appreciation for the work that had been done in this area as it would contribute to the harmonious development of systems on both sides of the North Atlantic.

Airspace Management messages

2.8.15 The Group was given a progress report on attempts to automate the altitude reservation (ALTRV) request procedure, it was pointed out that the task was more complicated than anticipated because of the requirement to take into account the existing procedures. Accordingly, the task could not be advanced until this matter was reviewed within administrations, taking into account the requirements of the military.

2.9 Implementation planning process

The NAT Implementation programme document

2.9.1 As a result of the review of the regional planning documentation by the NAT IMG, and in particular the NAT IPD, a proposal to restructure the NAT IPD was developed in order to facilitate its management. The main objectives of the proposal were to clearly indicate who would be responsible for specific parts of the NAT IPD and to make it more user friendly.

2.9.2 The Group noted that the NAT IPD actually contained two parts, namely the NAT Implementation Strategy and the NAT Implementation Plan - the Implementation Plan contained the Lines of Action and associated implementation timeframes and milestones. As the Implementation Strategy essentially addressed policy matters associated with the implementation of the ANP, it was felt that Part I should continue to be managed by the NAT SPG itself. However, as regards Part II, the Group agreed that, taking into account the reason why the NAT IMG was created, this part should be managed by the NAT IMG.

2.9.3 A review of the Implementation Strategy had been carried out and, as a result, it was agreed that one major milestone, reductions in horizontal separation minima throughout the region, should be moved from Phase I to Phase 2. In agreeing to the foregoing, it was stressed that work should continue on planning for such reductions and that tactical uses of reduced horizontal separation minima should be considered for use in the timeframe of Phase I of the Implementation Strategy. Changes in dates to other major milestones were also proposed on the basis of current developments in CNS/ATM technologies. The proposed revised Implementation Strategy is at **Appendix D** to this part of the report.

2.9.4 Although it was not possible to carry out an in-depth analysis of the contents of the Implementation Plan, a proposal which would greatly facilitate the use of the document was examined. It was agreed that the suggestion, which showed the inter-relationship of tasks, should be

pursued and incorporated into the NAT IPD as soon as possible. It also agreed that Part II of the NAT IPD should be reviewed as soon as possible after NAT SPG/30 by the NAT IMG.

2.9.5 Finally, as a consequence of the above, while recalling Conclusion 29/34, the Group agreed that the NAT IPD be renamed the NAT Implementation Document (NAT ID) in order to more clearly reflect the proposed structure and management set up.

CONCLUSION 30/14 - CHANGES TO THE NAT IMPLEMENTATION PROGRAMME DOCUMENT (NAT IPD)

That the :

a) NAT IPD be renamed the NAT Implementation Document (NAT ID);

b) Implementation Strategy contained in the NAT IPD be replaced with the contents of Appendix D to the Report on Agenda Item 2; and

c) the Implementation Strategy (Part I of the NAT ID) be managed by the NAT SPG whereas the Implementation Plan (Part II of the NAT ID) be managed by the NAT Implementation Management Group.

Report of the NAT Implementation Planning Co-ordination Team

2.9.6 The Group was informed that the NAT IPCT had met in Ottawa from 2 to 4 August 1993 in follow up to NAT SPG/29 Conclusion 29/37 in order to review the work programmes of the various implementation working groups, to examine the assignment of the lines of action from the NAT IPD and to examine the schedule of meetings of the implementation working groups.

2.9.7 The Group was also informed that the Team had proposed several changes to the NAT ID which had been presented to the exploratory meeting of the NAT IMG.

2.9.8 The Group was also informed that the Team, when examining the tentative meeting schedule for the various implementation working groups and relevant sub-groups, had scheduled their meetings in such a way that outputs from one working group could be processed and prepared as inputs for other working groups that required the information. Experience had shown that the meeting schedule developed by the IPCT worked very well as the inter-group co-ordination difficulties encountered prior to NAT SPG/29 did not arise and it was possible to keep the groups apprised of each others work in a timely manner.

New planning procedures for the NAT Region

2.9.9 The Group was informed of the action taken by the Council with respect to LIM NAT RAN (1992) Meeting Recommendation 6/1 concerning the proposed ANP and FASID. In this context, it was noted that the planning process would be implemented on a trial basis for one year starting on the date of publication of the ANP and FASID.

2.10 Contingency planning in the NAT Region

2.10.1 The Group reviewed the proposal for the establishment of contingency planning in the NAT Region which is at **Appendix E** to this part of the report. It recalled that this matter had been on its work programme for a considerable amount of time. Accordingly, it agreed that the NAT IMG should be tasked with developing a NAT Contingency Plan and of reporting to NAT SPG.

2.11 Radars in Southern Greenland

2.11.1 The Group was presented with the results of a cost/benefit study concerning the provision of radar coverage over the Southern part of Greenland which had been carried out by the Administrations of Denmark and Iceland in co-operation with Transport Canada Aviation and IATA in accordance with Conclusion 29/35 of NAT SPG/29.

2.11.2 The purpose of the analysis had been to identify and quantify the readily measurable benefits from radar surveillance over Greenland, versus dependent surveillance. It had encompassed a study of the actual air traffic that traversed the expected coverage area of radars situated at Sofia Fjeld, Prins Christians Sund, Cap Desolation and Qaqatorqaq. In addition, it had included an evaluation of expected future benefits, based on existing traffic forecasts for the NAT Region. The analysis had been carried out by simulating actual air traffic based on data from 16 July to 15 August 1993 and from 16 October to 15 November 1993 between the hours of 0900 - 1800 UTC.

2.11.3 The Group noted that the benefits for International General Aviation (IGA) operations and the use of the "blue spruce" routes as well as safety considerations for in-flight contingencies had not been included in this analysis. Furthermore, the data collection was limited to the hours of the day when the traffic flow was predominantly Westbound and did not therefore measure the benefits for the hours when the traffic was predominantly Eastbound. Additionally, cruise climb had not been calculated in the analysis but, in studies made in the Pacific Region (by United Air Lines), the application of cruise climb has proven to add significant benefits. It was certain that cruise climb could be used extensively in the proposed coverage area as it was already used in the area now covered by radar stations in Iceland and in the Faroe Islands.

2.11.4 Some of the other operational benefits that would accrue included the ability to organize tracks with 15 NM separation therefore increasing both capacity/efficiency and providing operators with more profiles to flight plan. Random routing would be possible in most cases, and the need for the Organized Track System (OTS) in this area would not be necessary unless a significant increase in traffic was expected. The result of this would be shorter flight planned times as well as actual time en-route. The availability of radar would obviate the need to determine entry points into oceanic airspace based on destination and would allow for aircraft to utilize variable speed for maximum economy.

2.11.5 The analysis also gave a rough estimate of the costs relating to the establishment and operations of the radar stations. All prices were converted to index September 1993, exchange rates of US$ 100.00 = DKK 632.00 = ISK 6,503.00 were used. The Installation costs comprised any cost associated with project specification, site survey, purchase and implementation of radar and communications equipment, display equipment, civil work and installation. The Danish installation costs for one radar station were estimated at DKK 25,990,000 or US$ 4,112,400 and the Icelandic installation costs - independent of the number of radars - were estimated at ISK 2,008,000 or US$ 30,900. Thus, the total installation cost for one radar was estimated at US$ 4,143,200: the total for four radars = US$ 16,480,500.

2.11.6 The O&M costs would comprise any cost associated with the operation and maintenance of all installations and facilities, including satellite communication facilities, related to the operation of the radar station and depreciation of the investment over a ten year period. The Danish annual O&M costs for one radar station were estimated at DKK 1,655,000 or US$ 261,800 and the Icelandic annual O&M costs - independent of the number of radars - were estimated at ISK 535,500 or US$ 8,200. Thus, the total annual O&M costs for one radar were estimated at US$ 270,000: the total for four radars = US$ 1,055,400.

2.11.7 Using the depreciation and interest model presently contained in the Agreement on Joint Financing of Aeronautical Facilities and Services in Iceland and Greenland, i.e. a 10 year linear depreciation of the investment and an interest of 8,5 % (September 1993), and taking into account only the quantifiable benefits, the study had shown that the cost/benefit ratio would be .71 in a 2,000 feet vertical separation environment and .55 in a 1,000 feet vertical separation environment.

2.11.8 In presenting the results of the study, the Member for Iceland stated that the analysis provided sufficient information on which NAT SPG/30 could decide on the implementation of the project. Therefore the Members for Iceland and Denmark proposed that a decision on the matter should be taken at this meeting. The Group agreed with the proposal and felt that the decision should be made solely on the basis of user's requirements.

2.11.9 The representative for IATA questioned the depreciation period of 10 years used in the study and felt that a seven year period would be more realistic as his organization expected ADS to become operational and all the NAT aircraft population to be ADS equipped within seven years. The representative from IATA stated that the requirement would be confirmed, provided that the cost/benefit ratio could be proved to be above 1.0 and that the distribution of costs presently stipulated in the Agreement on Joint Financing of Aeronautical Facilities and Services in Iceland and Greenland could be changed to the effect that only those users that would benefit directly from the services would contribute to the cost recovery. The representative from IACA was in agreement with this position. The representatives from IFALPA and IFATCA stated that their organizations fully endorsed the installation of the radars.

2.11.10 In the ensuing discussion on the analysis, the Group recalled that it had been tasked with making a recommendation concerning the operational aspects of implementing radars in Southern Greenland. In this context, the availability and benefits that would be associated with the advent of new technologies, such as ADS, were considered. It was felt that the time frame for the availability of new technology was very uncertain and that the time frames associated with the implementation of ADS in the NAT Region were questionable. With this in mind, it was considered that the risk of waiting for new technologies was far greater than the one associated with implementing radars. The Group agreed that the operational benefits that operators would get as a result of implementing the radars could be clearly defined in time and that all users operating in the area could receive a significant benefit with no requirement to acquire new equipment or undergo new certification.

2.11.11 As far as the question of cost/benefit ratio was concerned the Group recalled that the study had identified several benefits which were not readily quantifiable, and that adding just one of them - namely the co-location of remote controlled General Purpose VHF (GP/VHF) facilities in Greenland with the radar stations - would shift the cost/benefit ratio to close to unity over a 10 year depreciation period.

2.11.12 The analysis indicated that the real time simulation that had been carried out to measure the minimum benefit of installing the radar stations showed that more than half of the installation, interest and running costs were covered by that minimum alone. In addition, since many additional benefits had not been measured in the study, it was the view of the meeting that they would provide an even greater benefit than the ones measured and that the operation of radars in Greenland would enhance the safety of air traffic in the area especially with reference to in-flight contingencies.

2.11.13 The Group realized that a discussion of the cost recovery mechanism stipulated in the Agreement on joint financing was not within its remit and expressed its concern that IATA's position would severely hamper the implementation of any new services and facilities in Iceland or Greenland. The Group therefore advised the user organizations to seek clarification on this issue as soon as possible in order not to delay the Lines of Actions contained in the NAT ID.

CONCLUSION 30/15 - THE PROVISION OF RADAR SERVICES OVER SOUTHERN GREENLAND

That:

a) the users inform the Member for Denmark by close of business on 11 July 1994 whether they agree to the installation of radars in Southern Greenland in order to provide radar services;

b) if the answer to the above is no, the project shall not be pursued;

c) if the answer to the above is yes, Denmark and Iceland proceed with the project, subject to the availability of funds; and

d) the NAT SPG be informed of the outcome of the above.

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APPENDIX A - TERMS OF REFERENCE FOR THE ANNUAL MEETING OF THE NAT OPERATIONS MANAGERS

(paragraph 2.3.11 refers)

1. Review common application of separation minima

2. Review standardisation of NAT phraseology

3. Review issues relating to traffic management

4. Review of short term operational developments

5. Co-ordination of airspace changes

6. Co-ordination of airspace reservation activity - normally limited to one day (replacing the NAT ALTRV Conference)

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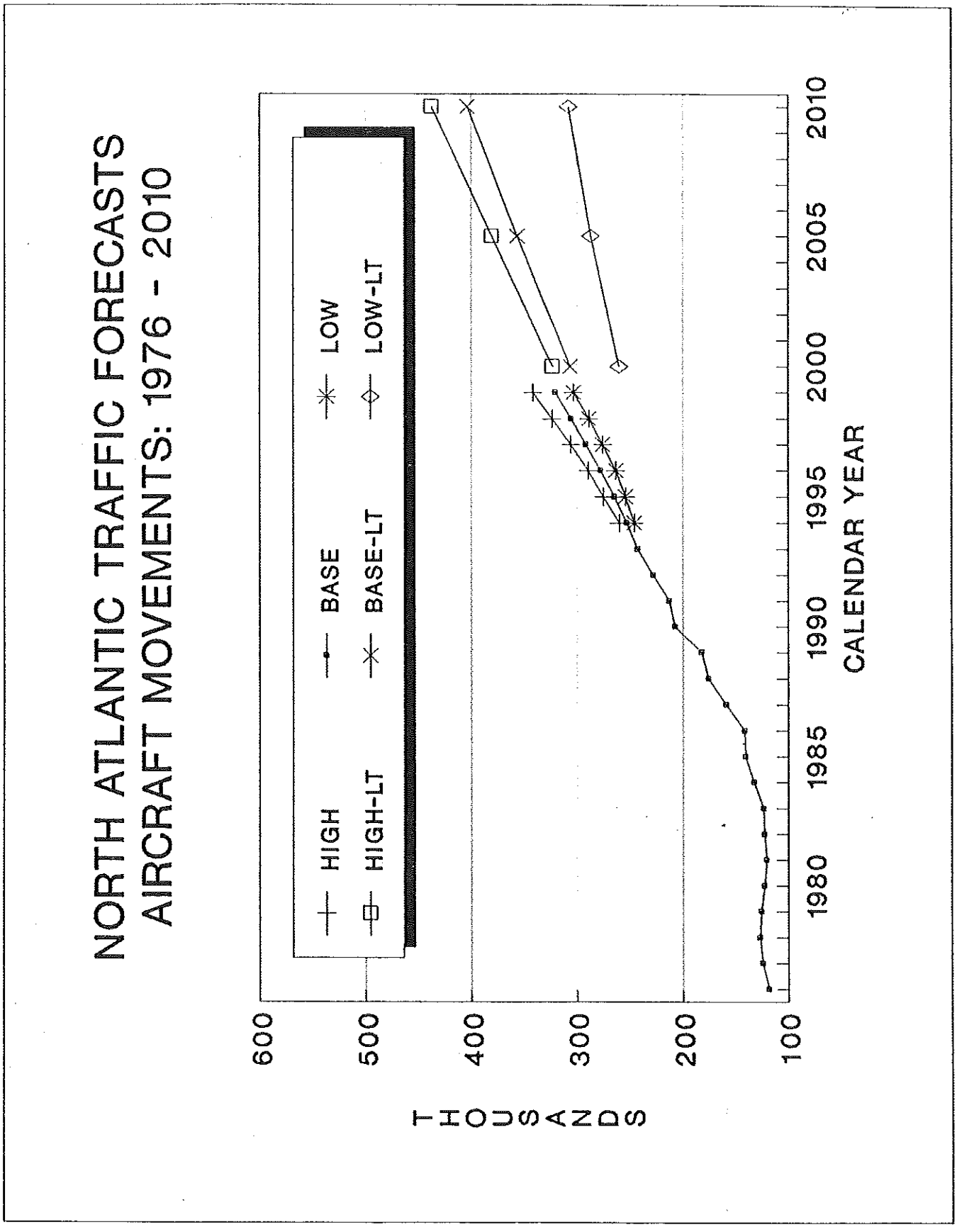
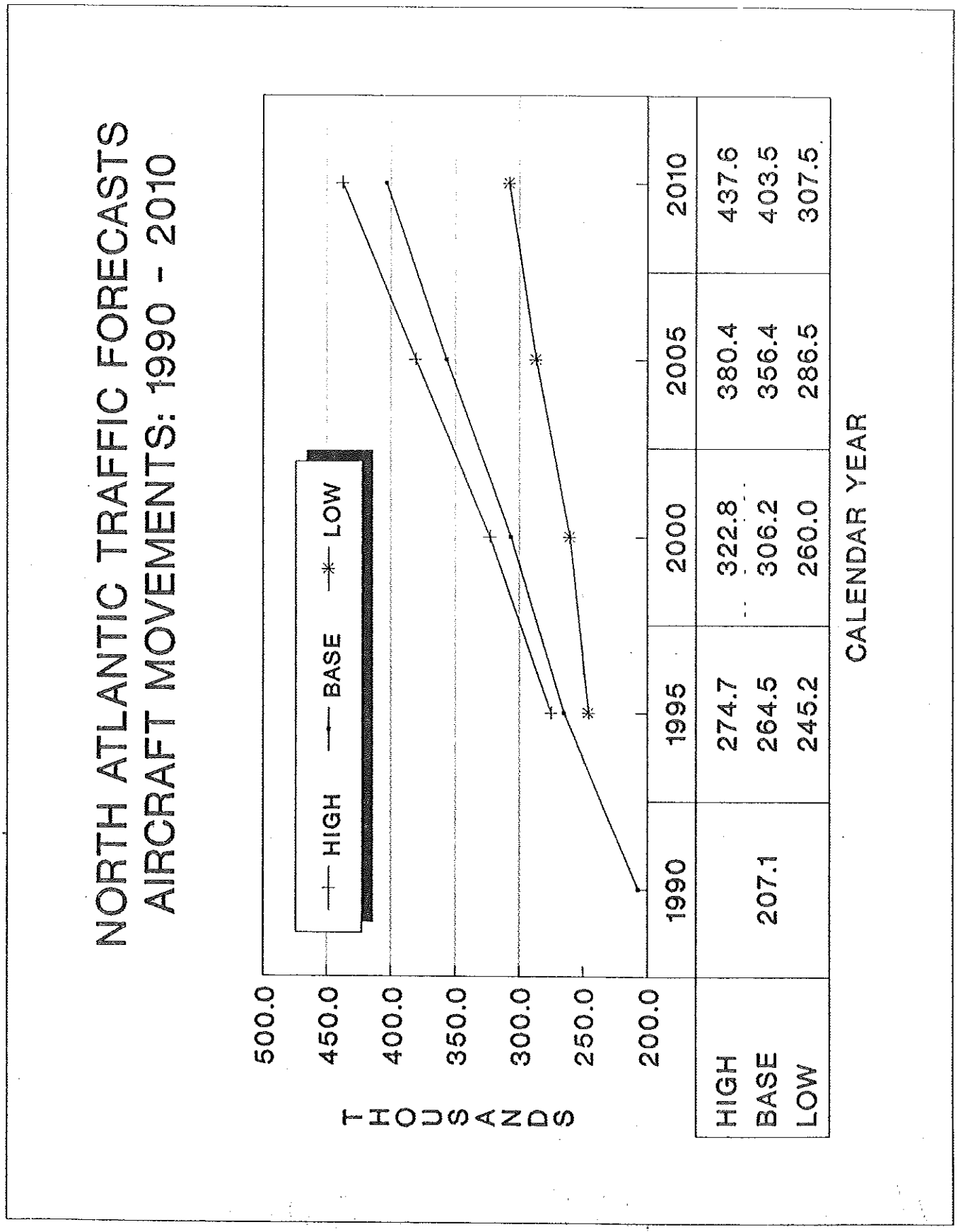
APPENDIX B - NAT TRAFFIC FORECASTS
AIRCRAFT MOVEMENTS: 1976-2010
(paragraph 2.4.15 refers)



AIRCRAFT MOVEMENTS: 1990-2010



	1990	1995	2000	2005	2010
HIGH	207.1	274.7	322.8	380.4	437.6
BASE		264.5	306.2	356.4	403.5
LOW		245.2	260.0	286.5	307.5

APPENDIX C - APPLICATION OF SEPARATION MINIMA - NAT REGION AIRSPACE RESERVATIONS

(paragraph 2.7.6 refers)

1. **Between Airspace Reservations**

A. Moving Airspace Reservations

i) vertical separation

-as contained in the "Application of Separation Minima (North Atlantic Region) Third Edition" paragraph 3.1

ii) longitudinal separation

- as contained in the "Application of Separation Minima (North Atlantic Region) Third Edition" Chapter 5

iii) lateral separation

- 60 NM between the closest tracks of any aircraft for which the airspace is reserved provided all aircraft or formation flights meet the MNPS;

  OR

- 120 NM between the closest tracks of any aircraft for which the airspace is reserved, except that, in the New York OCA west of 60 W, 90 NM may be applied.

  (Note: A formation flight with at least one of the aircraft in the formation meeting MNPS is deemed to meet the requirement for the application of 60 NM above).

B. Stationary Airspace Reservations

i) vertical separation

- as contained in the "Application of Separation Minima (North Atlantic Region) Third Edition" paragraph 3.1

ii) lateral separation

- 60 NM between the boundaries of stationary airspace reservations provided the requesting agencies have guaranteed to confine their activities to the requested airspace, except that, in the New York OCA west of 60 W, 45 NM may be applied;

  OR

- 120 miles between the boundaries of the airspace reservations, if no guarantees have been given, except that, in the New York OCA west of 60 W 90 NM may be applied.

(Note: The requesting agency must guarantee to confine its activities to the requested airspace. If the airspace reservation requests are from different agencies, individual guarantees must be given)

2. **Between An Airspace Reservation And Other Aircraft**

A. Moving Airspace Reservation

i) vertical separation

- As contained in the "Application of Separation Minima (North Atlantic Region) Third Edition" paragraph 3.1

ii) longitudinal separation

- minimum longitudinal separation as contained in the "Application of Separation Minima (North Atlantic Region Third Edition" Chapter 5, may be applied between aircraft operating under the control of the ATC unit concerned and the first and last aircraft operating within a moving airspace reservation.

iii) lateral separation

- 60 NM between the track of an aircraft operating under the control of the ATC unit concerned and the closest track of any of the aircraft for which the airspace is reserved provided all aircraft meet the MNPS requirements;

OR

- 60 NM between the track of an aircraft operating under the control of the ATC unit concerned and the track of a formation flight for which the airspace has been reserved, provided at least one aircraft in the formation AND the aircraft operating under the control of the ATC unit meet the MNPS requirement;

OR

- 120 NM between the track of an aircraft operating under the control of the ATC unit concerned and the closest track of any of the aircraft for which the airspace is reserved, except that, in the New York OCA west of 60 W, 90 NM may be applied.

B. Stationary Airspace Reservation

i) vertical separation

- as contained in the "Application of Separation Minima (North Atlantic region) Third Edition" paragraph 3.1

ii) horizontal separation

- 30 NM between the track of an aircraft operating under the control of the ATC unit concerned or as part of a Moving Airspace Reservation and the nearest limit of the reserved airspace, provided the aircraft meets the MNPS requirements AND the requesting agency has guaranteed to confine its activities to the requested airspace;

  OR

- 60 NM between the track of an aircraft operating under the control of the ATC unit concerned or as part of a Moving Airspace Reservation and the nearest limit of the reserved airspace, provided the aircraft meets the MNPS requirements and the requesting agency has NOT guaranteed to confine its activities to the requested airspace;

  OR

- 60 NM between the track of an aircraft operating under the control of the ATC unit concerned or as part of a Moving Airspace Reservation and the nearest limit of the reserved airspace, when the aircraft does NOT meet the MNPS requirements AND the requesting agency has guaranteed to confine its activities to the requested airspace except that, in the New York OCA west of 60 W 45 NM may be applied;

- 120 NM between the track of an aircraft operating under the control of the ATC unit concerned or as part of a Moving Airspace Reservation and the nearest limit of the reserved airspace, when the aircraft does not meet the MNPS requirements AND the requesting agency has NOT guaranteed to confine its activities to the requested airspace, except that, in the New York OCA west of 60 W 90 NM may be applied.

  (Note: A formation flight with a least one aircraft meeting the MNPS requirement is deemed to meet the requirements for the application of 30 and 60 NM detailed above).

  (Note: The requesting agency must guarantee to confine its activities to the requested airspace.)

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APPENDIX D - THE NORTH ATLANTIC IMPLEMENTATION DOCUMENT
(paragraph 2.9.3 refers)

EXECUTIVE SUMMARY

INTRODUCTION

At the 26th meeting of the North Atlantic Systems Planning Group in June 1990, all North Atlantic Provider States as well as the International Air Transport Association and the International Federation of Airline Pilots Association endorsed "The Future North Atlantic Air Traffic Services System Concept Description". The main objective of this Future Concept was to provide a foundation for harmonized planning throughout the North Atlantic Region, and at the interfaces with adjacent regions, in order to achieve an integrated regional Air Traffic Management system which would permit significant increases in airspace capacity and improvements in flight economy whilst maintaining or improving the current levels of safety.

The North Atlantic Implementation Document, which consists of an Implementation Strategy and an Implementation Plan, forms the basis for the implementation of the NAT Air Navigation Plan which had been endorsed by the Limited (COM/MET/RAC) North Atlantic Regional Air Navigation Meeting (1992) and subsequently which evolved from the Future Concept and approved by the Council (141-16) and must be read in conjunction with it.

THE OBJECTIVES

The Implementation Strategy has four main objectives:

To meet identified and jointly agreed targets in the areas of safety and levels of service provision.

To create a joint programme of managed implementation.

To agree on a development programme with implementation targets which identifies, prioritizes and secures cost effective ATM.

To jointly research and develop the ATM concepts needed to meet user expectations by exploiting the proposed technical developments at an acceptable cost.

The implementation strategy consists of three overlapping phases:

Phase I

- *Improvement of overall efficiency and capacity of the ATS system by promoting, inter alia, the harmonization of the NAT automated ATC systems.*
- *Preparation for the implementation of Phase II.*
- *Planning target up to year 2000*

Phase II

- *Progressive implementation of satellite technology for communications, navigation, and surveillance, whilst co-existing with current systems.*
- *Integration of NAT ATC systems so that boundaries are transparent to airspace users.*
- *Preparation for the implementation of Phase III.*
- *Planning target up to year 2005*

Phase III

- *Full implementation of the ANP and progressive withdrawal of the current systems.*
- *Planning target up to year 2010/15*

PLANNING TARGETS

The Implementation Plan will identify target dates for each task. Individual tasks which are considered to be significant within the first phase are:

Oceanic Clearance by Data Link Operational.

Common On Line Data Interchange Procedures throughout the North Atlantic Region.

Flight Data Processing Systems developed to common minimum standard in all North Atlantic Oceanic Area Control Centres.

Implementation of 1000 ft Vertical Separation Minimum between FL290 and FL410 in the North Atlantic Region.

Advanced Flight Data Processing Systems developed to commonly agreed standards and specifications.

Operational Automatic Dependant Surveillance Service to Suitably Equipped Aircraft.

Note: Although work related to reductions of longitudinal and lateral separation minima will be carried out during Phase I, full operational implementation throughout the NAT Region is not expected until Phase II.

FUTURE WORK

The adoption of a phased approach to implementing the Air Navigation Plan means that both parts of the NAT ID, the Implementation Strategy and the Implementation Plan, must be subject to regular review. The North Atlantic IMG, on behalf of the NAT SPG, will revize existing planning targets, as necessary, and define the new targets required to ensure the smooth and progressive achievement of Phases II and III.

CONTENTS

INTRODUCTION

1. The North Atlantic Implementation Document, which consists of an Implementation Strategy and an Implementation Plan, forms the basis for the implementation of the NAT Air Navigation Plan which had been endorsed by the Limited (COM/MET/RAC) North Atlantic Regional Air Navigation Meeting (1992) and subsequently which evolved from the Future Concept and approved by the Council (141-16) and must be read in conjunction with it.

2. The implementation of the NAT ANP is achieved by developing a strategy and associated plan consisting of three overlapping phases during the time-frame up to 2010/15:

Phase I - To improve the overall efficiency and capacity of the Air Traffic Services system by promoting, inter alia, the Harmonization of the North Atlantic automated Air Traffic Control systems; to prepare for the implementation of Phase II by, for example, conducting tests, trials, and research to influence the definition of associated Communications/Navigation/ Surveillance/Air Traffic Management Standards, Recommended Practices and Application Criteria; and to prepare for the implementation of Phase II.

Phase II - To progressively implement satellite technology for the provision of communications, navigation, and surveillance; to integrate North Atlantic Air Traffic Control systems so that boundaries are transparent to airspace users; to gradually move towards a more tactical Air Traffic Control system; to further increase airspace capacity by the reduction of horizontal separation minima; and to prepare for the implementation of Phase III.

Phase III - To fully implement the NAT ANP and to progressively withdraw redundant systems.

4. The NAT ID is divided into two distinct parts as follows:

Part I - **Implementation Strategy**: identifies the 3 overlapping phases and lists the objectives and means/actions required to achieve them. The responsibility for the Implementation Strategy resides with the NAT SPG.

Part II - **Implementation Plan**: identifies priorities and sets out the time tables for the implementation of the strategy. The responsibility for the Implementation Plan resides with the NAT IMG.

5. The NAT SPG felt that the most effective method of continuously managing the NAT ID would be to request the ICAO European and North Atlantic Office to undertake the task in close co-operation with States and international organizations concerned. Because the NAT ID is considered to be a "live document" that is subject to updates as progress is made in implementing the various lines of action, it is therefore important that States inform the ICAO European and North Atlantic Office of these changes on a continuous basis. Amendments to the NAT ID will be issued by ICAO when deemed appropriate.

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6. To assist in developing detailed implementation plans and to co-ordinate the activities associated with the Lines of Action which are listed in Part II, the Implementation Plan, specialized implementation working groups are created as required.

7. At its 30th meeting (Conclusion 30/1 and Conclusion 30/14 respectively refer), the NAT SPG agreed that:

   a) The NAT Implementation Management Group (NIMG) will be responsible for the NAT implementation working groups and will direct their work programmes.

   b) The NAT IMG should be responsible for the overall management of the NAT Implementation Plan on its behalf.

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Glossary of Acronyms

A

AAC	Aeronautical Administrative Communications
ACARS	Aircraft communications addressing and reporting system
ACAS	Airborne Collision Avoidance Systems
ADS	Automatic Dependent Surveillance
ADSP	Automatic Dependent Surveillance Panel
AES	Aeronautical Earth Station
AFS	Aeronautical Fixed Service
AFTN	Aeronautical Fixed Telecommunication Network
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
AMCP	Aeronautical Mobile Communications Panel (formerly AMSSP)
AMS	Aeronautical Mobile Service
AMSS	Aeronautical Mobile Satellite Service
AMS(R)S	Aeronautical Mobile Satellite (R) Service
ANP	Air Navigation Plan
AOC	Aeronautical Operational Control
APC	Aeronautical Passenger Communication
ASM	Airspace Management
ASPP	Aeronautical Fixed Service Systems Planning for Data Interchange Panel
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
ATSC	Air Traffic Services Communications

C

CIDIN	Common ICAO Data Interchange Network
CIS	Co-operative Independent Surveillance
CMA	Central Monitoring Agency (NAT)
CNS	Communications, Navigation, Surveillance (FANS)
CRM	Collision Risk Model
CTA	Control Area

D

DCPC	Direct Controller/Pilot Communications

E

ELT	Emergency Locator Transmitter
ETOPS	Extended Range Twin-Engined Flight Operations

F

FANS	ICAO Special Committee on Future Air Navigation Systems
FDPS	Flight Data Processing System
FIC	Flight Information Centre
FIR	Flight Information Region
FIS	Flight Information Service
FL	Flight Level
FMS	Flight Management System
FOM	Figure of Merit

G

GES	Ground Earth Station
GLONASS	Global Orbiting Navigation Satellite System (USSR)
GMS	Global Positioning System Height Monitoring System
GNE	Gross Navigational Error
GNSS	Global Navigation Satellite System
GPS	Global Positioning System (USA)
GP VHF	General Purpose Very High Frequency

H

HF	High Frequency
HMU	Hight Monitoring Unit

I

ICD	Interface Control Document
IFR	Instrument Flight Rules
IGA	International General Aviation
INS	Inertial Navigation System
IRS	Inertial Reference System
ISO	International Organization for Standardization

L

LOA	Line of Action

M

MASPS	Minimum Aircraft System Performance Specification
MLS	Microwave Landing System
MNPS	Minimum Navigation Performance Specifications
MNPSA	Minimum Navigation Performance Specifications Airspace

N

NASC	National Aeronautical Information Services Center
NAT SPG	North Atlantic Systems Planning Group
NAT ID	North Atlantic Implementation Document

O

OAC	Oceanic Area Control Centre
OCA	Oceanic Control Area
OLDI	Online Data Interchange Group
OSI	Open System Interconnection
OTS	Organized Track System

R

RASC	Regional Aeronautical Information Services Centre
RCC	Rescue Coordination Centre
RGCSP	Review of the General Concept of Separation Panel
RNAV	Area Navigation
RNP	Required Navigation Performance

S

SAR	Search and Rescue
SARPS	ICAO Standards and Recommended Practices
SATCOM	Satellite Communications
SATSAR	Satellite-aided search and rescue
SICASP	Secondary Surveillance Radar (SSR) Improvements and Collision Avoidance Systems Panel
STCA	Short-Term Conflict Alert
SUPPS	Regional Supplementary Procedures

T

TCAS	Traffic Alert and Collision Avoidance System (USA)
TLS	Target Level of Safety

V

VHF	Very High Frequency
VOLMET	Meteorological Information for Aircraft in Flight
VOR	VHF Omni-directional radio range
VSM	Vertical Separation Minimum

W

WAFS	World Area Forecast System
WARC	World Administrative Radio Conference

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PART I - IMPLEMENTATION STRATEGY

1. OVERALL OBJECTIVE

The overall objective of the North Atlantic Air Navigation Plan is to provide a blueprint to safely and efficiently increase System capacity to meet forecast demands and to respond to evolving user requirements and technological developments.

2. IMPLEMENTATION STRATEGY AND OBJECTIVES

2.1 The aim of this document is to plan the implementation in a smooth and evolutionary manner from the present ATM System to that described in the NAT ANP.

2.2 Strategy - To achieve this, three distinct phases of implementation have been identified, each associated with clear operational objectives to be attained by the whole NAT ATM System. The extent to which system elements will need to be developed for such objectives is defined in Part II of the NAT Implementation Document and must be reflected in the relevant national plans.

2.3 Objectives - to achieve the Strategy, four objectives have been identified:

- To meet identified and jointly agreed targets in the areas of safety and levels of service provision.
- To create a joint programme of managed implementation.
- To agree on a development programme with implementation targets which identifies, prioritizes and secures cost effective ATM.
- To jointly research and develop the ATM concepts needed to meet user expectations by exploiting the proposed technical developments at an acceptable cost.

3. DESCRIPTION OF PHASE I - UP TO 2000

SYSTEM COMPONENT	OBJECTIVE	MEANS/ACTION
1 Communications, Air/Ground	Improve the efficiency and integrity of air/ground communications.	Enhance existing system. Begin implementation of air/ground data links. Prepare for introduction of Automatic Dependent Surveillance (ADS) and satellite voice capability.
2 Communications, Ground/ground	Improve the efficiency and integrity of ground/ground communications.	Implement and improve on-line data interchange (OLDI) between ATC automated systems.

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SYSTEM COMPONENT	OBJECTIVE	MEANS/ACTION
3 Navigation and Separation Criteria	To improve the overall navigation performance in order to support the use of reduced separation minima.	Expand tactical monitoring to exclude non-approved operators from Minimum Navigation Performance Specifications (MNPS) airspace. Introduce measures to enhance the integrity of the 'State Approval' process. Introduce a vertical dimension in the MNPS statement.
4 Surveillance	Improve the monitoring of aircraft progress.	Begin to employ air/ground datalink surveillance information in certain areas.
		Increase and improve radar coverage where feasible and cost-effective.
5 Air Traffic Control	Harmonize the ATC Service provided by the NAT centres.	Adopt common standards and compatible specifications and procedures.
		Harmonize conflict detection and application of separation standards.
	Improve the efficiency and capacity of NAT airspace.	Develop Flight Data Processing Systems (FDPS) to a common minimum standard, introducing or enhancing automated functions.
		Improve and expand the use of on-line data interchange.
		Employ air/ground datalinks for oceanic clearance delivery.
		Develop emergency and communication failure procedures for the evolving Communications, Navigations, Surveillance (CNS) environment.
		Implement flexible sectorisation adaptable to variable traffic flows and patterns.
		Implement 1000ft vertical separation between FL290 and FL410 inclusive.
6 Flight Information Service	Current service continued.	
7 Alerting Service	Take maximum advantage of the improvements in air/ground and ground/ground data and voice transmission systems for the recognition of and reaction to emergencies.	Development of interim procedures for the use of commercial Satellite Communications (SATCOM) and COSPAS/SARSAT* and alerting procedures for loss of ADS data.

* COSPAS SARSAT:
COSPAS = Kosmicheskaya Sistyema Poiska Avariynych Sudov (KOSPAS)
SARSAT = Search and Rescue Satellite-Aided Tracking

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	SYSTEM COMPONENT	OBJECTIVE	MEANS/ACTION
8	Air Traffic Flow Management	Optimize traffic flows where capacity shortfalls continue to exist.	Develop an oceanic Air Traffic Flow Management (ATFM) service with the necessary interfaces with other regions.
9	Airspace Management	Make optimum use of available capacity.	Implement flexible airspace sharing by minimizing permanent airspace segregation.

4. DESCRIPTION OF PHASE II - UP TO 2005

	SYSTEM COMPONENT	OBJECTIVE	MEANS/ACTION
1	Communications Air/Ground	Further improve air/ground communications	Implement AMSS and other data links, namely Very High Frequency (VHF) and Mode S, where applicable. HF will be retained for backup, polar coverage, and for non-satcom equipped aircraft.
2	Communications, Ground/ground	Further improve the communications network	Implement appropriate networks (e.g. Aeronautical Telecommunications Network (ATN)).
3	Navigation and Separation Criteria	To further improve overall navigation performance	Adoption of either a tighter MNPS statement or the Required Navigation Performance (RNP) concept to reflect availability of Global Navigation Satellite Service (GNSS) and other high precision navigation systems. Utilize technological advances in Communications and Surveillance systems.
4	Surveillance	Further improve monitoring of aircraft progress.	Implement ADS based on ICAO SARPS.
5	Air Traffic Control	Integrate the ATC service provided by the NAT centres.	Adopt common standards, specifications, and procedures in specific areas.
		Further improve the efficiency and capacity of NAT airspace	Improve the use of OLDI to the point where no penalty results from airspace divisions.
			Accommodate new surveillance and communications techniques.
			Expand use of air/ground data link to encompass all routine communications.
		Provide greater opportunity for operating on optimal profiles.	Reduce separation minima. Gradually move towards a more tactical ATC system.

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	SYSTEM COMPONENT	OBJECTIVE	MEANS/ACTION
6	Flight Information Service	Automate and improve Flight Information Service.	Capability provided to interrogate Meteorological and Aeronautical Information Service (AIS) data bases. Critical information (SIGMETs etc.) disseminated automatically.
7	Alerting Service	To be developed	
8	Air Traffic Flow Management	Optimize traffic flows where capacity shortfalls continue to exist.	Use emerging technologies to further improve the oceanic ATFM service and the interfaces with other regions.
9	Airspace Management	Make optimum use of available capacity using evolving technology.	Provide flexible configuration to address different user capabilities/needs. Allow all flights to follow random tracks.

5. DESCRIPTION OF PHASE III - UP TO 2010/15

	SYSTEM COMPONENT	OBJECTIVE	MEANS/ACTION
1	Communications, Air/Ground	Complete the integration of airborne and ground computer systems - dialogue based on aircraft requirements and optimum profile.	Developing technology will allow three-way computer negotiations (aircraft, ATC, and airline) to present pilot and controller with optimum solutions.
2	Communications, Ground/Ground	As for Phase II.	OLDI provides total integration of FDPS data bases.
3	Navigation and Separation Criteria	All aircraft equipped and approved for the high precision navigation operations necessary to support the ATC Objectives (See Chapter 5 below).	Use of GNSS or other navigation systems capable of similar accuracy and integrity. Application of Communications and Surveillance systems to ensure that aircraft adhere to their cleared ATC route.
4	Surveillance	Make accurate knowledge of all aircraft positions available to ATC.	In addition to ADS, Cooperative Independent Surveillance (CIS) may be available to give an independent check on aircraft positions.
5	Air Traffic Control	Ensure that all aircraft get optimum flight profiles.	Aircraft able to fly accurate four-dimensional profiles. Reduced separation minima to relieve airspace congestion. ATC offer maximum flexibility in route definition, vertical profile and speed.

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SYSTEM COMPONENT	OBJECTIVE	MEANS/ACTION
6 Flight Information Service	As in Phase II.	
7 Alerting Service	To be developed.	
8 Air Traffic Flow Management	Eliminate the requirement for Air Traffic Flow Management in the Region.	Vast increase in system capacity (due to reduced separation minima) reduces flow restrictions to those which may be imposed by adjacent Regions.
9 Airspace Management	To be developed.	

PART II - IMPLEMENTATION PLAN

CONTENTS

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APPENDIX E - CONTINGENCY PLANNING IN THE NAT REGION
(paragraph 2.10.1 refers)

3.1 ASSUMPTIONS

3.1.1 An Oceanic Control Area (OCA) cannot be closed as it is international high seas airspace. Traffic *may* therefore continue to enter the OCA.

3.1.2 Under the current system, control of an OCA cannot be sub-delegated to another Oceanic Area Control Centre (OAC).

3.1.3 There will be limited Alerting Action in the affected OCA.

3.1.4 Plans must cover levels of service possible from the affected OAC in relation to the availability of staff, e.g. limited staff, no staff etc.

3.2 SHORT TERM OUTAGE (1 TRAFFIC FLOW)

3.2.1 Traffic disposal.

3.2.2 Separations.

3.2.3 Notification.

3.2.4 Responsibilities of adjacent OACs and Area Control Centres (ACC).

3.2.5 Air Traffic Flow Management (ATFM) requirements.

3.3 MEDIUM/LONG TERM (2 + TRAFFIC FLOWS)

3.3.1 *Limited Service*

3.3.1.1 Notification of level of service.

3.3.1.2 Design of the Organized Track System (OTS).

3.3.1.3 No random aircraft.

3.3.1.4 Separations.

3.3.1.5 Responsibilities of adjacent OACs and ACCs.

3.3.1.6 ATFM requirements.

3.3.2 *No Service*

3.3.2.1 Notification of no Air Traffic Control (ATC) service and limited Alerting (ALR) services.

3.3.2.2 Design of contingency tracks.

3.3.2.3 No random aircraft on safety grounds.

3.3.2.4 Responsibilities of adjacent OACs and ACCs in relation to

A. Separation between aircraft entering the OCA.
B. Alerting Action.

3.3.2.5 ATFM requirements.

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 March 1993 to 28 February 1994.

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 March 1993 to 28 February 1994

3.2.2 The Group completed a scrutiny of observed Gross Navigation Errors (GNE) in the NAT Region and found that a total of 40(37)*** errors were reported during the period under review. Of these errors, 15(10) occurred outside MNPS airspace and were classified as Table 'Charlie' errors. From the remaining 25(27), 5(17) were not eligible for inclusion in the risk analysis as defined at NAT SPG/17 (amended by NAT SPG/23) and were classified as Table 'Bravo' errors. A review of these Table 'Bravo' errors is given at paragraphs 3.2.8 and 3.2.9 below. The remaining 20(10) errors, which form the basis of the scrutiny, were classified as Table 'Alpha' errors.

3.2.3 The Group was disappointed to note that there had been a 100% increase in the number of Table 'Alpha' errors compared with the previous monitoring year but was pleased to see that the number of Table 'Bravo' errors was down by 70% compared with the previous year. Overall the Group was content that combined Tables 'Alpha' & 'Bravo' showed a reduction of 2 over the previous years total of 27 and this being in conjunction with a 5% increase in traffic.

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* For comparison purposes, corresponding figures for the last monitoring period (1992 - 1993) are shown in brackets.

3.2.4 The breakdown of the 20 Table 'Alpha' errors is shown in Table 1 below.

CLASSIFICATION (SEE NOTE 1)	ETA ERRORS	RISK BEARING ERROR WEIGHTINGS		
		TOTAL MNPS TRAFFIC	OTS TRAFFIC	RANDOM TRAFFIC
A B C1 C2 D E F	0 (0) 1 (2) 3 (4) 11 (3) 2 (0) 0 (0) 3 (1)	0 0 0.33 3.22 0 0 0.4	0 0 0 2.23 0 0.4	0 0 0.33 0.99 0 0 0
TOTAL	20	3.95	2.63	1.32
TOTAL IN LAST PERIOD	10	3.14	0.58	2.56
OBSERVED TRAFFIC 93-94		213905	134459	79446
OBSERVED TRAFFIC 92-93		204040	122424	81616

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

Note 1:The letters in the Classification Column mean:

A: *Aircraft not certified for MNPS Operations*
B: *ATC System Loop error*
C1: *Equipment control error including inadvertent Waypoint Insertion*
C2: *Waypoint Insertion error due to the correct entry of incorrect position*
D: *Other navigation errors, including equipment failure notified to ATC in time for action*
E: *Other navigation errors, including equipment failure notified to ATC too late for action*
F: *Other navigation errors including equipment failure of which notification was not received by ATC*

3.2.5 The breakdown of the 20 Table 'Alpha' errors points to 3 areas of particular note namely:

a) the combined number of errors in classification C1 (equipment control error, including waypoint insertion error) [3(4)] and in classification C2 (waypoint insertion due to the correct entry of incorrect position) [11(3)] still account for 70% of the reported Table 'Alpha' errors;

b) an increase in the number of classification F (Other navigation errors including equipment failure of which notification was not received by ATC) [3(1)]; and

c) an encouraging trend in classification A (Aircraft not certified for MNPS operations) in that for the second year running no Table 'Alpha' errors were attributed to aircraft flying in MNPS airspace without approval.

3.2.6 The Group was still concerned about the large number of Table 'Alpha' errors attributed to mistakes involving waypoint insertions and that 50% of these could be attributed to circumstances where a re-clearance from the original flight plan had occurred.

3.2.7 In reviewing the 5(17) Table 'Bravo' errors the Group was pleased to note a significant reduction 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 (Note 1 refers to the classifications).

ERROR CLASSIFICATION	NUMBER OF ERRORS
A	0 (3)
B	1 (1)
C1	3 (3)
C2	1 (4)
D	0 (2)
E	0 (0)
F	0 (3)
UNCLASSIFIED	0 (1)
TOTAL	5 (17)

Table 2. Breakdown of Table 'Bravo' Errors

3.2.8 The Group was again concerned that, as with the Table 'Alpha', the combined errors listed under C1 and C2 comprised a large proportion (80%) of the total Table 'Bravo' errors and that 4 of the 5 errors occurred after a re-clearance from the flight plan route.

3.2.9 The Group, whilst considering the Table 'Charlie' errors, noted that the number of errors reported occurring outside MNPS airspace had showed a 50% increase over the previous monitoring period though it also concluded that the previous monitoring year had been exceptional as far as the general trend in the number of GNEs was concerned . Table 3 shows a comparison of the Table 'Charlie' errors over the last 7 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

Table 3. Table 'Charlie' errors for the last 7 monitoring years

3.2.10 The Group noted that the downward trend in the number of reported errors had ceased and that the number had increased by 5 over the previous year's total of 10. It also noted that of the 15 errors, 5 occurred above MNPS airspace whilst 10 occurred below. The trend of previous years had continued in that the majority of Table 'Charlie' errors occurred below MNPS airspace.

3.2.11 In accordance with monitoring procedures, follow-up action was taken for any reported error in excess of 50NM. The Group noted that this had to be done for 11 of the 15 reported occurrences. Of those errors occurring above MNPS airspace, one was caused by incorrect initialisation of an Inertial Reference System (IRS) whilst the remaining 4 were due to equipment failure. Of the 4 equipment failures, 3 were attributed to Omega failure. The 6 reported occurrences below MNPS airspace were caused by either equipment failure or waypoint insertion errors. The 3 equipment failures comprised 1 Omega failure plus 2 GPS failures.

3.2.12 The Group was grateful to the representative from IAOPA for the comprehensive information concerning GNEs for IGA flights. It was noted that, whilst accepting that the previous monitoring year had been exceptional, this monitoring year had seen a continuation in the downward trend of flights per GNE for IGA aircraft. The Group was disappointed to note that despite a slight improvement over the previous monitoring year in the number of flights per GNE for military aircraft, the rate of one per 2682 was very high in comparison to the public transport figure of one per 11290. Notably, in the monitoring year under scrutiny, all 4 GNEs in MNPS airspace involving military aircraft were caused by waypoint insertion errors following a re-clearance from the original flight plan.

3.2.13 With respect to the continued application of the 10 minutes longitudinal separation, the Group was pleased to note that only one report of an erosion of longitudinal separation of three minutes or more below the established minimum had been received by the CMA during the monitoring year. However, the Group noted some additional information on overall longitudinal performance presented in paragraph 3.2.47 below.

3.2.14 The Group noted details of height deviations received by the CMA and expressed concern that an unspecified number of height deviation reports may not have been sent by ACCs despite action taken by the CMA during the year to counter the problem. Notwithstanding that, it was pleased to note the downward trend in the time aircraft spend at incorrect levels in MNPS airspace although it felt that there was still room for some improvement, specifically in the area of the execution of the recommended action to be taken in the event of a contingency whilst flying in the OTS.

Methods of Improving the Observed Standard of Navigation Performance

3.2.15 In considering the methods by which the observed standard of navigation performance might be improved, the Group took into account the lessons derived from the review of navigation performance reported above and the discussions of, and points emerging from, working papers presented to the Group.

3.2.16 A major concern of the Group was the high number of Table 'Alpha' and Table 'Bravo' errors involving waypoint insertions particularly following a re-clearance from the original flight planned track. The Group was of the view that action should be taken to help reduce this number. Whilst noting that the use of data linked route information fed directly to the aircraft FMS was probably the only sure way of eradicating the problem, the Group was pleased to observe that *current* technology used in the flight decks of 'Glass Cockpit' aircraft seemed to be helping to reduce GNEs in that only 2 incidents involved this design of aircraft. This was considered to be a pleasantly

surprising statistic in view of the fact that 'Glass Cockpit' aircraft account for around 50% of the traffic in the NAT Region.

3.2.17 In view of the Group's desire to ensure that publicity be given to the fact that a re-clearance appears to be a contributory factor in a high proportion of GNEs, the Group formulated the following conclusion:

CONCLUSION 30/16 - NOTE TO BE APPENDED TO THE NAT OCEANIC TRACK MESSAGE

That Canada and the United Kingdom co-ordinate, for an initial trial period of six months, the inclusion of the following note in the Organized Track Structure track messages:

"Avoid Gross Navigation Errors. Follow waypoint cross checking procedures especially after a re-clearance."

3.2.18 Whilst scrutinizing the Table 'Alpha' errors, the Group was disappointed to note that during the course of one investigation of a GNE by a United States registered aircraft, it had been stated that 'a contributory factor was a lack of any established procedure for crew members to cross-check each others work during navigation data entry.' The Group considered that organisations within the States of registry responsible for issuing MNPS approvals should be reminded that in addition to a given aircraft having to carry minimum navigation equipment as specified in the MNPS Operations Manual, operators must also have appropriate crew procedures documented in the company operations manual.

3.2.19 As in previous years the Group considered the part played by OACs in containing the number of GNEs through timely intervention to prevent incorrect routing.

3.2.20 Within the monitoring period Gander OAC advised the CMA of 6(20) occasions when loop errors occurred and action had been taken to prevent a GNE. The Group was pleased to note that the number was markedly less than in previous years. The causes of the mistakes may be broken down as follows:

a) one instance where the crew were following a flight planned route instead of an issued cleared route;

b) one instance where the crew failed to hear the last part of a clearance;

c) one instance in which there was an error in transfer of clearance detail from the OAC to the aircraft; and

d) three instances in which no explanation was offered for an incorrect forward estimate of position;

3.2.21 The Group considered that such interventions were invaluable in preventing GNEs but noted, for the second consecutive year, that only one centre had passed the details of interventions to the CMA. The Group felt that similar interventions may have occurred in other areas and agreed that in the future, details of all such incidents be forwarded to the CMA.

3.2.22 The Group also noted that on 2 occasions, action by Shannon OAC had prevented larger oceanic GNEs occurring. The reason for this was that the aircraft crew had contacted Shannon

at around 16° W and had been allocated a squawk which had enabled Shannon to identify the eastbound aircraft before the boundary.

CONCLUSION 30/17 - CHANGE TO ATC COMMUNICATIONS PROCEDURES FOR EASTBOUND AIRCRAFT APPROACHING THE OCEANIC BOUNDARY

That the NAT Oceanic Managers examine the feasibility of changing current ATC communications procedures to instruct all aircraft leaving oceanic airspace to attempt to contact the appropriate Area Control Centre on VHF as soon as possible before the FIR boundary in order to take full advantage of radar surveillance.

Methods of Improving the Current Monitoring Procedures

3.2.23 The Group considered 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. Moreover, the Group was pleased to note that not one GNE had been attributed to an aircraft that did not have MNPS approval.

3.2.24 The Group considered that it was important for the CMA to receive reports of all incidents in the NAT involving altitude deviations in excess of 300ft from **all** the OACs and that these reports be in the format as set out in the guidance material.

Work methods for the Scrutiny sub-group

3.2.25 The Group examined the working methods of the Scrutiny sub-group in order to seek ways of improving the overall efficiency of the NAT SPG. It was noted that, as the monitoring year finished at the end of February, the CMA's report was normally prepared well in advance of the NAT SPG meeting. This was particularly the case recently as the NAT SPG tended to meet in June rather than in April as was done in the past.

3.2.26 With the above in mind, the Group agreed that, if the scrutiny report was circulated to all concerned sufficiently in advance of the NAT SPG meeting to provide for a 45 day comment period, it would not be necessary for the Scrutiny sub-group to meet concurrently with the NAT SPG. If difficulties were encountered in obtaining agreement on the contents of the CMA report, the Scrutiny rapporteur could convene a meeting in order to resolve these issues. The Group agreed that the foregoing procedure should be employed for NAT SPG/31 and that it would be re-evaluated at that time.

CONCLUSION 30/18 - WORKING METHODS OF THE SCRUTINY SUB-GROUP

That:

a) the annual Central Monitoring Agency (CMA) report be circulated to all concerned well in advance of the NAT SPG meeting;

b) States and international organizations concerned provide the rapporteur of the Scrutiny sub-group with their comments within 45 days; and

c) the results of the above consultation be presented to the NAT SPG as the scrutiny report.

MATHEMATICAL MATTERS

1993/94 LATERAL COLLISION RISK ESTIMATION AND RELATED TOPICS

Lateral Occupancy

3.2.27 The Group was presented with estimates of lateral occupancy derived by the United Kingdom for 20W and 30W and by Canada for 30W and 40W. The estimates were for the monitoring period covering 1 March 1993 to 28 February 1994 and were based on data for the 4th and 15th days of each month. However, data for one of the days in both the United Kingdom and Canadian samples were corrupt. Both estimates were therefore based on a reduced data set of 23 days.

	Same Direction			Opposite Direction		
	OTS	Random	Total	OTS	Random	Total
United Kingdom 20W	1.434	0.245	0.995	0.004	0.017	0.009
United Kingdom 30W	1.432	0.237	1.024	0.001	0.005	0.002
Canada 30W	1.361	0.338	0.990	0.002	0.010	0.005
Canada 40W	1.360	0.345	1.004	0.002	0.006	0.003
1993 Combined Estimate	1.397	0.291	1.002	0.002	0.010	0.005

Table 4 - 1993 Occupancy Estimation

	Traffic Samples		
	OTS	Random	Total
United Kingdom 20W	8539	5005	13544
United Kingdom 30W	8543	4441	12984
Canada 30W	8406	4795	13201
Canada 40W	8401	4545	12946

Table 5 - 1993 Sample Traffic Counts

3.2.28 The United Kingdom and Canadian occupancy estimates were combined to give overall average estimates for the 1993 monitoring year; these are shown in Table 4. The overall value is the traffic weighted average of the United Kingdom 20W estimate, the Canadian 40W estimate and the traffic weighted average of both 30W estimates. Table 5 shows the traffic estimates which were used for the weightings. As in previous years, some differences were noted between the United Kingdom and Canadian estimates.

3.2.29 Table 6 presents same and opposite direction occupancy estimates for the years 1989 to 1993. For same direction traffic, it can be seen that the occupancy for OTS traffic has increased whilst that for random traffic has decreased from 1992. However, the general trend in occupancy for the total traffic sample remains an increasing one since the OTS traffic dominates the traffic volume. For opposite direction traffic there has been very little change in occupancy from 1992 and overall the trend remains static. It was recalled that NAT SPG/29 had agreed that this data should also be portrayed graphically and this has been done in **Appendix A, Figure 1**. It was noted that the data extended back to 1987 and that occupancy was expressed in "standard units" that combined both same and opposite direction lateral estimates, weighted according to the kinematic factors of the Reich model.

		Year				
Direction	Traffic	1989	1990	1991	1992	1993
Same	OTS	0.995	1.031	1.214	1.335	1.397
	Random	0.302	0.287	0.325	0.350	0.291
	Total	0.697	0.710	0.884	0.980	1.002
Opposite	OTS	0.004	0.002	0.008	0.002	0.002
	Random	0.006	0.006	0.007	0.008	0.010
	Total	0.005	0.004	0.008	0.004	0.005

Table 6 - Occupancy Estimates for the Years 1989 to 1993

3.2.30 It was also noted that, if the ratio of opposite direction to same direction occupancy was within certain bounds (less than 0.022) the weights used for GNEs remained applicable. For the 1993 monitoring year, both the OTS and random opposite to same direction ratio were within the bound. No modifications to the weightings were therefore necessary.

Gross Navigation Errors

3.2.31 Taking into consideration the findings of the Scrutiny Group, each risk bearing error was assigned a weighting in accordance with its error class and magnitude of deviation to reflect the proportion of time spent within ± 10 NM of an incorrect route centre line. The results are presented in Table 7 below.

			Weighted GNEs		
Class	>30 NM	>50 NM	OTS	Random	Total
A	0	0	0.00	0.00	0.00
B	1	0	0.00	0.00	0.00
C1	3	1	0.00	0.33	0.33
C2	11	9	2.23	0.99	3.22
D	2	0	0.00	0.00	0.00
E	0	0	0.00	0.00	0.00
F	3	1	0.40	0.00	0.40
Unknown	0	0	0.00	0.00	0.00
Total	20	11	2.63	1.32	3.95
Sample Traffic Count			134459	79446	213905
Error Rate x 10-4			0.20	0.17	0.18

Table 7 - 1993 Weighted Gross Navigation Errors

3.2.32 Table 8 presents weighted risk-bearing error rates for the years 1989 to 1993. It was noted that, as the revised Model 2 weighting approach has only been in operation since 1990, the rates for previous years have been calculated retrospectively. Whilst the risk-bearing error rate continued to decline for random traffic, there had been an increase in the rate for OTS traffic which had consequently led to a slight increase in the error rate for the combined traffic sample when compared with the previous year. The data which extends back to 1987 is portrayed graphically in **Appendix A, Figure 2.**

Traffic Sample	YEAR				
	1989	1990	1991	1992	1993
OTS	0.29	0.16	0.15	0.05	0.20
Random	0.80	0.90	0.90	0.31	0.17
Total	0.49	0.45	0.45	0.15	0.18

Table 8 - Risk-Bearing Error Rates (x 10^{-4})for the Years 1989 to 1993

Lateral Collision Risk

3.2.33 Collision risk estimates for OTS and random traffic can be calculated using the Reich model. However, to obtain the appropriate weighting factors to combine the OTS and random risk estimates into a total system risk estimate for all MNPS airspace, the number of random aircraft within the airspace, but not seen at the monitoring windows and counted by the CMA, must be taken into account.

3.2.34 The CMA reported a total of 213,905 flights at the monitoring windows for the 1993/94 monitoring year of which 134,459 flights were due to OTS traffic and 79,446 were due to random traffic. The NAT TFG provided an estimate of 242,800 aircraft operating within NAT airspace during 1993. Thus, making the assumption that all OTS flights were seen at the monitoring windows, 108,341 random flights were estimated to have occurred within NAT airspace. This figure, however, included random aircraft operating above and below MNPS airspace. From Canadian data, the number of random aircraft so operating was estimated to be 12,494. Thus the total number of random aircraft operating within MNPS airspace was calculated as 95,847.

3.2.35 Table 9 presents lateral risk estimated for the 1993 monitoring year, for OTS, random and all MNPS traffic. The OTS and random risk estimates had been derived directly from the Reich model, Py(60) having been calculated using the following equation, where zeta denotes the weighted risk bearing error rate:

$$P_y(60) = \frac{\lambda_y \ zeta}{10}$$

The risk estimated for all MNPS airspace had been calculated as the traffic weighted average of the OTS and random risk estimates. All the estimates were below the Target Level of Safety (TLS) of 2×10^{-8} fatal accidents per flight hour.

Traffic Type	Total MNPS Count	Risk x 10^{-8}
OTS	134459	1.43
Random	95847	0.34
All MNPS	230306	0.98

Table 9 - 1993 Risk Estimates for MNPS airspace

3.2.36 Table 10 presents lateral risk estimates for the years 1989 to 1993. As in Table 8, the figures for years prior to 1990 had been calculated retrospectively. When compared to 1992, the 1993 risk estimate for random traffic had decreased whilst that for OTS traffic had increased leading to an overall increase in collision risk for all MNPS traffic but still within the TLS.

Risk (x 10^{-8})	1989	1990	1991	1992	1993
OTS	1.49	0.87	0.98	0.33	1.43
Random	1.46	1.59	1.83	0.69	0.34
All MNPS	1.47	1.22	1.38	0.49	0.98

Table 10 - Lateral Risk Estimates for the Years 1989 to 1993

3.2.37 Based on the error classes used by the Scrutiny Group, Table 11 presents a breakdown of the 1993 risk by error cause and traffic type. The MNPS breakdown had been estimated from the traffic weighted breakdown of the OTS and random traffic types. Waypoint insertion errors (Types C1 and C2) accounted for almost all of the estimated risk. For the years 1987 to 1993, the

proportions of human error (Types B, C1 and C2), non-approved users (Type A) and equipment error (Types D, E, F) are shown graphically in **Appendix A, Figure 3**. As had been reported at NAT SPG/29, this showed that, whilst equipment errors and non-approved users have tailed off, errors due to human causes (such as waypoint insertion errors) were maintaining consistent levels and continued to dominate.

	Traffic Type		
Error Class	OTS % (n)	Random % (n)	MNPS % (n)
A	0.0 (0)	0.0 (0)	0.0 (0)
B	0.0 (0)	0.0 (0)	0.0 (0)
C1	0.0 (0)	25.0 (1)	10.4 (1)
C2	84.8 (6)	75.0 (3)	80.7 (9)
D	0.0 (0)	0.0 (0)	0.0 (0)
E	0.0 (0)	0.0 (0)	0.0 (0)
F	15.2 (1)	0.0 (0)	8.9 (1)
Unknown	0.0 (0)	0.0 (0)	0.0 (0)
Total	100 (7)	100 (4)	100 (11)

Table 11 - Analysis of Components of the Risk for 1993

3.2.38 The Group was particularly concerned with one of the Table Bravo errors investigated by the Scrutiny Group. In the incident, the aircraft deviated from its cleared track but then, when the mistake was realized, performed a 360 degree turn in order to return to its original cleared track. Such a manoeuvre was considered highly hazardous because of the potential reduction in longitudinal separation when re-joining the original track. This was the second such incident in a little over a year (Conclusion 30/20 also refers).

3.2.39 The Group requested that the Scrutiny sub-group should continue to identify the different aircraft makes and models involved when examining errors. For example, the Group was particularly interested in monitoring whether the gradual introduction of "glass cockpits" was leading to a reduction in the incidence of waypoint insertion errors.

Future Developments in Lateral Risk Estimation

Use of Monthly Occupancy estimates by the CMA

3.2.40 The Group noted that the moving twelve month average occupancies had not been included in the monthly CMA reports as had been discussed at NAT SPG/29. Nevertheless, the data was being made available and efforts were being made to incorporate it as soon as possible.

Use of Reykjavik data for Risk Estimation

3.2.41 In accordance with Conclusion 29/1, Iceland had provided traffic data for the 4th and 15th day of each month during 1993 although not for the full monitoring year. Detailed analysis of this data had not been completed due to lack of time and resources. Before including the Iceland information in the lateral risk estimation, any double counting between the Iceland, Canadian and United Kingdom traffic samples needed to be analyzed. The Group noted the need for more detailed information on the routes followed through NAT airspace by aircraft in the Iceland traffic samples so that weightings for GNEs could be developed. In this context, it was also noted that the United Kingdom would seek to obtain the necessary information from Reykjavik OAC.

ASPECTS OF THE FUTURE NAT SYSTEM

Effects of ADS and Reduced Lateral Separation Minimum

3.2.42 Information was presented which described the effects of ADS system performance on lateral collision risk in a possible future NAT airspace operating with a 30 NM lateral separation standard and with a more stringent TLS of $5x10^{-9}$. Reliability of ADS was considered in two contexts - system reliability and individual aircraft reliability. In both cases it was estimated that the system would be able to tolerate reliabilities of as low as 0.8 without jeopardising the proposed TLS of $5x10^{-9}$, provided that old procedures using HF transmissions could still be reverted to, in the event that the system did go down. Under this scenario, an 80% system reliability could be tolerated provided that all individual aircraft ADS transmissions were 100% reliable. Conversely, a 20% failure rate in aircraft ADS could be tolerated if the ADS satellites and system transmissions operated with 100% reliability. Various other combinations (e.g. 90% / 90%) of system and individual aircraft reliabilities could also be tolerated.

3.2.43 Overall, the analysis provisionally indicated that operation of a 30 NM separation minimum could be feasible in the NAT Region with ADS. However, the analysis was provisional due to assumptions made about the operational nature and capability of the ADS system, which may not conform to the system's actual construction. Activities would, therefore, continue to be directed at refining these assumptions. Of particular importance was the need to take into account the likely increased traffic levels, the effect of navigational accuracy, the risk due to contingency manoeuvres and the likely GNE rate in a reduced separation environment. At the time, only errors 25 NM or greater were collected and, in order to assess what the risk might be with 30 NM separation, this cut-off point needs to be reduced to 15 NM.

3.2.44 Although the Group agreed that these data would be helpful in assessing a possible reduction in lateral separation to 30 NM using any means (not just ADS), it was also found that the collection of data should not interrupt or disturb existing operations. The Group noted with appreciation that Ireland and Canada would implement such a data collection on a six-month trial basis. In addition, both States would investigate the feasibility of collecting the data automatically.

3.2.45 The Group reiterated that the data mentioned above would be collected only for the purpose of creating a database and that GNEs less than 25 NM would not be reported. The Group found that errors in the range of 15 to 25 NM should not be eligible for corrective actions nor for regulatory follow-up.

CONCLUSION 30/19 - COLLECTION OF DATA OF ERRORS IN THE RANGE OF 15 NM TO 25 NM

That:

a) Canada and Ireland report to the Central Monitoring Agency and the users concerned all lateral errors of 15 NM or greater; and

b) lateral errors in the range of 15 NM to 25 NM not be eligible for corrective actions nor regulatory follow-up.

3.2.46 Whilst the Group agreed that it was necessary to continue the ADS work in readiness for its possible introduction, it was noted that no cost benefit analysis for ADS had been done and that no detailed plan for its introduction had been made. Accordingly, it was agreed that this concern should be brought to the attention of the NAT IMG.

LONGITUDINAL COLLISION RISK

3.2.47 Canada presented information concerning the longitudinal gain-loss performance in NAT MNPS airspace. Data had been collected from Gander concerning cleared and actual arrival times at waypoints of pairs of aircraft following each other. Two flights were considered to be an eligible pair if they were at the same flight level, flew in the same direction between the same two waypoints and were originally estimated to cross the first waypoint within 30 minutes of each other.

3.2.48 A total of 3,120 valid sample pairs were collected, the core of which showed approximately a zero mean gain-loss with a standard deviation of about 1 minute. However, there was a significant tail distribution with 17 pairs showing a gain or loss of 4 minutes or more up to a maximum of 9 minutes. Although some of these larger gain/losses were undoubtedly due to reporting errors, there was also some evidence to suggest pilots were attempting to make up lost time. From the data, it was not clear whether this was done with clearance from ATC. In this context, it was agreed that users of the NAT Region should be reminded that changing Mach speed without ATC clearance could lead to the loss of longitudinal separation.

3.2.49 The Group noted that, since October 1993, the information on the cleared, as opposed to actual, arrival times was no longer available in its original format from the GAATS database. Further study using the previous method was no longer possible. It was suggested that data obtained manually from flight strips or airline flight plan logs might provide alternatives. Canada and the United Kingdom would look into the availability of data for further studies.

3.2.50 The United States presented information which looked at aircraft time-keeping accuracies based on data recorded in San Juan Flight Information Region. The data collection was achieved by asking pilots to relay to air traffic control the clock time used to report routine positions and then comparing this time to a computer clock synchronised with the universal time from the Naval Observatory in Washington.

3.2.51 A total of 428 measurements were made which showed a mean error of about 1.5 seconds and a standard deviation of 28 seconds. The largest time difference recorded was 4 minutes and 33 seconds. The data were ordered and fit to a family of symetric distribution models. The best fit was found to be a mixture of two LaPlace distributions. 80% of the data (standard deviation: 7 seconds) was modelled by the core distribution while 20% of the data (standard deviation: 1 minute) was attributed to the tail.

3.2.52 Using the same data, attempts were made to isolate those errors due to clock drift from those due to time-setting errors. It was found that the latter type of error dominated the analysis, with the result that it was not possible to draw any strong inferences with regard to clock drift. It did suggest, however, that improved single aircraft performance could be achieved by establishing better procedures for setting aircraft time clocks. It was noted that there did not appear to be guidance for time clock setting or time accuracy maintenance. Since ATC depended largely on accurate time and authorities were looking forward to reducing longitudinal separation, there was a strong need for work in this area.

3.2.53 Information was presented which grouped the aircraft time-keeping errors into commercial, general aviation and military aircraft. It was found that the performance of commercial aircraft types was generally better than both the military and general aviation aircraft groups. Canada, the United Kingdom and the United States agreed to investigate the possibility of carrying out similar time-keeping accuracy studies for NAT traffic.

3.2.54 In the light of the above studies, it was clear that further data collections were necessary if a reduction in the longitudinal separation standard was to be contemplated. However, it was also clear that improvements in time-keeping and system safety could be made immediately by tightening up the user procedures for both time-keeping and reporting. The Group therefore agreed that the users should be informed accordingly. Finally the Group recalled that the NAT IMG, through its RSSIG, had a requirement to develop standards for time-keeping accuracy.

CONCLUSION 30/20 - THE IMPORTANCE OF USING GOOD PROCEDURES IN THE NAT REGION

That States and international organizations concerned inform the NAT user population of the importance of:

a) carrying out contingency procedures when a large deviation from track has been identified while seeking an ATC re-clearance;

b) following the correct procedures for waypoint reporting; and

c) establishing and maintaining good clock setting procedures.

3.2.55 The Group was presented with information which proposed an improved analytical model for computing the probability that two aircraft with a planned en route separation of exactly T minutes lose all longitudinal separation. There were three major sources of error to consider:

a) the aircraft's reported position may be different from its true position. The cause of this error was largely the aircraft's navigational system;

b) the time reported by the aircraft may be different from actual time, due to errors in the aircraft's time-keeping system; and

c) the aircraft may arrive at a fixed position either before or after the time of arrival forecast by the crew at its last position report and used by ATC to maintain inter-aircraft spacing. The cause of this error was usually a combination of the aircraft's Mach number error, wind speed estimate errors and changing meteorological conditions.

3.2.56 Using aircraft-pair loss/gain data, the improved model was able to derive estimates for along-track position-keeping for individual aircraft. Three sets of data were used from different sources and it was found, using the method of maximum likelihood, that a double-double exponential distribution (mixture of two LaPlace distributions) best fitted the data in each case. The model was then further extended to include aircraft time-keeping errors by a convolution of the distribution model of the aircraft-pair loss/gain data with that derived for the time-keeping error data from the aforementioned San Juan study. Finally, an analytical probability distribution model was derived which described aircraft-pair loss in longitudinal separation including aircraft time-keeping errors.

3.2.57 The Group endorsed the proposed model and agreed that its refinement should be continued. It was recognized that further data collections were required using independent surveillance measures in order to determine the individual contributions to the total error made by aircraft navigational system and time-keeping errors. However, such studies were likely to be ATC intrusive since, at the time, this was the only way of obtaining accurate time-keeping information.

3.2.58 The Group was presented with information which emphasized the need for a detailed implementation programme to achieve the proposed reductions in longitudinal and lateral separation by the year 2000 whilst at the same time achieving RVSM in 1997. The Group noted that studies after mid-1995 would conflict with work for RVSM implementation. Also, major system changes such as a reduction in longitudinal separation should be carefully considered during the course of RVSM verification and implementation in order to preserve a consistent base, which is a requirement to be able to provide the requisite advice on the implementation of RVSM.

3.2.59 At the time, no implementation plan for reduced longitudinal separation existed nor had the requisite cost-benefit studies been performed. It was agreed that the foregoing should be brought to the attention of the NAT IMG.

RVSM TOPICS

Vertical Occupancy and Risk

3.2.60 The Group considered information which presented the results of assessments of vertical occupancy in the NAT region during the 1993/94 monitoring year. The vertical occupancy was an important element in the assessment of vertical collision risk. The results of the analysis are summarised in Table 12 below. The same data expressed as equivalent opposite direction passing frequencies, as discussed at NAT SPG/29, are given in Table 13 below.

			OTS	Random	Combined
United Kingdom 20W	Same	East	1.563	0.235	1.094
		West	1.280	0.241	0.877
		Total	1.431	0.238	0.990
	Opposite		0.008	0.047	0.022
United Kingdom 30W	Same	East	1.581	0.228	1.168
		West	1.270	0.199	0.917
		Total	1.437	0.214	1.050
	Opposite		0.003	0.024	0.010
Canada 30W	Same	East	1.562	0.350	1.117
		West	1.228	0.258	0.880
		Total	1.404	0.308	1.006
	Opposite		0.004	0.026	0.012
Canada 40W	Same	East	1.564	0.354	1.136
		West	1.247	0.253	0.900
		Total	1.414	0.307	1.025
	Opposite		0.004	0.024	0.010

Table 12 - Summary of Vertical Occupancy Estimates for 1993/94

	OTS	Random	Combined
United Kingdom 20W	0.271	0.228	0.253
United Kingdom 30W	0.252	0.132	0.215
Canada 30W	0.250	0.154	0.215
Canada 40W	0.250	0.145	0.213

Table 13 - Summary of Vertical Equivalent Opposite Direction Passing Frequencies (EODPF) for 1993/94

3.2.61 The Group noted the summaries of in-flight contingencies which occurred in the NAT Region during 1993 and agreed that such information should continue to be collected.

SIMULATIONS

3.2.62 The Group was presented with information which was an extension of the work performed last year on a computer programme simulating allocation of traffic to routes and flight levels that could be expected under 1000ft RVSM. In response to a request from NAT SPG/29, modifications had been made to the computer model which allowed studies to be made of the effects of traffic concentrations towards the core track. The base demand pattern used by this simulation was the cleared flight plans as recorded by Gander.

3.2.63 Three main scenarios were considered:

a) 2000ft VSM;

b) 1000ft VSM, with an even distribution of traffic to new flight levels, without a lateral concentration of traffic to the core tracks; and

c) 1000ft VSM, with a lateral concentration of traffic to the core tracks.

For each of the three scenarios, the model was run for each of four different traffic volumes (current baseline, 25% growth, 50% growth and 100% growth).

3.2.64 The results showed that the introduction of 1000ft VSM would result in reductions in both vertical and lateral occupancies, over comparable situations with 2000 ft VSM. Vertical OTS occupancies for "concentrated" traffic were significantly higher than occupancies seen when traffic was evenly distributed. This result was expected because the movement of flights towards the most used OTS track increased the vertical density. The difference between evenly distributed and concentrated traffic decreased as traffic levels rose, due to the fact that increasing traffic would cause a normal concentration on the busy routes. With an even distribution, the traffic levels could increase by 50% before reaching the current 2000ft vertical occupancy levels. With the concentrated distribution, a 25% increase would bring a similar result.

3.2.65 The Group agreed that the model provided useful data in consideration of predicted lateral and vertical occupancies. The possibility of extending the model in order to consider longitudinal separation was discussed. This would be a difficult task because the demand file would need to be changed with respect to times between aircraft pairs. Requested, as well as cleared, flight plans needed to be considered and also the effect of longitudinal separation on efficiency. The United Kingdom and Canada agreed to examine this issue and the United Kingdom would also examine the current status of their own simulation model.

EFFECTS OF ACAS/TCAS

3.2.66 The Group reviewed ACAS/TCAS events in the NAT and the proposed joint United Kingdom/United States ACAS/TCAS work programme. Firstly, it was considered important that the CMA should include in their analysis all ACAS/TCAS events in the NAT which resulted in vertical deviations of 300ft or greater without prior ATC clearance. Operators should also be encouraged to report to the relevant agencies all ACAS/TCAS RAs occurring in the NAT. Secondly, it was important to consider the effects of RVSM on ACAS/TCAS alerting in the NAT. Even if the TCAS algorithm was modified to take account of the reduced separation above FL 290, it was likely that there would be an increase in the number of Traffic Advisories (TA) and RAs occurring in the NAT Region. Another problem was getting the new software implemented in time for the proposed RVSM implementation in 1997. The Group agreed that the joint United Kingdom/United States ACAS/TCAS work programme should address these issues as soon as possible.

CONCLUSION 30/21 - EFFECTS OF AIRBORNE COLLISION AVOIDANCE SYSTEMS (ACAS) AND TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEMS (TCAS) ON NAT OPERATIONS

That:

a) the United Kingdom and the United States continue to jointly participate in ACAS developments; and

b) **United States investigate the impact that the implementation of reduced vertical separation minimum above FL 290 would have on the use of TCAS II in the NAT Region.**

CORE NAVIGATION PERFORMANCE

3.2.67 The Group recognized the need to continue to periodically obtain data on lateral track performance in MNPS airspace. It was proposed that Canada and the United Kingdom each carry out a core navigation performance study during the summer of 1995 in readiness for the RVSM verification year. The Group agreed that, if possible, navigation systems should be identified with particular emphasis on GPS-equipped aircraft so that their level of performance could be determined separately.

CONCLUSION 30/22 - NAT CORE NAVIGATION PERFORMANCE STUDY

That:

a) **Canada and the United Kingdom carry out NAT core navigation performance studies in the summer of 1995; and**

b) **the type of navigation equipment be taken into account with emphasis on Global Positioning System equipped aircraft.**

FUTURE COLLISION RISK MODELS

3.2.68 The Group was presented an update on progress made since NAT SPG/29 on a future collision risk model being used to consider the possibility of free-routeing. The Group endorsed the need for this work but noted that further action was dependent on resources and that the NAT IMG should be informed.

PROPOSED MATHEMATICIANS' WORK PROGRAMME FOR 1994/95

3.2.69 The Group noted the following work programme for the Mathematicians sub-group. Although it was recognized that the priorities of the tasks would be dependent on the NAT IMG, it was nevertheless agreed that the priority task of the sub-group was to monitor the health of the air navigation system and to provide advice, as appropriate, to the NAT SPG.

1. **United Kingdom** to review the CRM parameters for use with RVSM.

2. **United Kingdom and United States** to determine a common core set of data from the HMU and GMS monitoring programmes for the height monitoring database by July 1994.

3. **United Kingdom** to provide an assessment of airframes likely to be observed by the HMU system.

4. **United Kingdom and United States** to develop proposals for ASE/TVE action trigger levels for use during the height monitoring programme.

5. **Canada and United Kingdom** to analyze Reykjavik data for possible use in estimating NAT risk.

6. **Canada** to progress work on a future risk estimation model subject to resources and to report progress at NAT SPG/31.

7. **United Kingdom** to implement the use of rolling 12 month occupancy assessments in monthly CMA reports subject to resource availability.

8. **United Kingdom** to progress work on risk assessments of 30 NM lateral separations with ADS.

9. **Canada and United Kingdom** to investigate the availability of data for possible gain/loss analysis for longitudinal separation.

10. **Canada, United Kingdom and United States** to investigate the feasibility of carrying out time-keeping accuracy studies for NAT traffic.

11. **United States** to further progress the development of a longitudinal CRM subject to resource availability.

12. **All** to continue to develop mathematical guidance material for RVSM implementation.

13. **Canada and United Kingdom** to plan a core navigation study for execution during summer 1995.

3.3 **Review of systems operations**

AIR TRAFFIC MANAGEMENT

Restrictions in Montreal FIR

3.3.1 Canada confirmed that the current ATFM requirements with respect to the Montreal Flight Information Region/Control Area (FIR/CTA) affecting NAT Traffic would most likely continue until mid August 1994.

3.3.2 Following discussions the United Kingdom held with Canada and Iceland, the United Kingdom concluded that the only safe way of managing traffic within their area of responsibility to comply with Canadian ATFM requirements was through the imposition of complementary flow management measures on the affected traffic.

3.3.3 The United Kingdom ATFM message, when required would refer to the Canadian ATFM requirements and indicate that there was not a lack of capacity within the United Kingdom area of responsibility.

Oceanic/domestic interface issues

3.3.4 The Group examined two issues relating to domestic/oceanic interfaces. It agreed that these issues should be discussed on a bilateral basis between those concerned as the problems involved domestic FIRs for which the NAT SPG had no remit. As regards the dissemination of track related messages, the importance of promulgating them in a timely fashion was stressed because they are used for ATFM purposes.

Provision of ATS in Bermuda Terminal Manoeuvring Area

3.3.5 The Group was presented information on developments in Bermuda resulting from the changes in United States military commitments there. It was recalled that Bermuda was located entirely within New York Oceanic FIR and that the United States was responsible for the provision of ATS in the area concerned. Accordingly, the Group felt that this was a bilateral issue that should

be resolved between the United Kingdom and the United States. Furthermore, the Group noted that any changes to the current airspace organization would require an amendment to the NAT ANP.

Oceanic clearances

3.3.6 The Group recalled that at its last meeting, it had addressed problems associated with oceanic clearance delivery to aircraft flying from Europe to destinations South of 36°N. In particular, it was recalled that aircraft were not always issued a complete oceanic clearance from coast-out to coast-in. This situation was one of considerable concern since, without a complete clearance, pilots were sometimes unsure of what action to take if they reached the clearance limit before receiving the remainder of their clearance. Additionally, controllers must locate, formulate, and deliver the remainder of the clearance with no advance notice.

3.3.7 The Group was informed that appropriate action had been initiated to remedy the above. However, this problem still persisted. Accordingly, the Group agreed that the NAT Operations Managers should take appropriate action to ensure that complete oceanic clearances were issued by the first Oceanic ATC facility serving the flight.

RVSM transition areas and Class A airspace in high seas portion of Bodø, Stavanger and Trondheim FIRs

3.3.8 The Group was informed that, based upon existing and planned radar coverage, Norway should be in a good position to manage the transition areas for NAT/RVSM traffic transiting to/from the EUR Region through airspace where Norway was providing ATS therefore enabling this traffic to remain on optimum flight profiles for as long as possible.

3.3.9 In this context, the Group was informed that Norway would co-ordinate the location of appropriate RVSM transition areas with Iceland and the United Kingdom in order to meet agreed milestones and the ultimate target date of implementing the RVSM transition areas on 2 January 1997.

3.3.10 The Group was informed of Norway's intention to implement Class A airspace between FL 245 - FL 460 in existing uncontrolled airspace above Norwegian territory (West of 30E) and over the high seas within Stavanger, Trondheim and Bodø FIRs. Target implementation date had been 12 November 1993. However, due to an extensive reorganization process within the Norwegian CAA and planning related to a new main airport in Oslo, the target implementation date had to be postponed. Nevertheless, implementation would be as soon as possible because the establishment of the controlled airspace was a prerequisite for the establishment of RVSM transition areas within Stavanger, Trondheim and Bodø FIRs.

Oceanic clearance delivery - trial procedures

3.3.11 The Group recalled that oceanic clearance delivery trial procedures, in which the daily Eastbound Organized Track Message (OTM) was published with a "Track Message Identification (TMI)" number in the remarks section, had started in November 1993. In this context, it was also recalled that the purpose of the TMI was to:

a) reduce the communications workload associated with the readback of Eastbound oceanic clearances when those clearances contained published tracks; and

b) differentiate between the previous and current days published track message including amendments.

3.3.12 Although the trial procedures had been originally initiated for a six-month period, which terminated at the end of April 1994, they had been extended until November 30, 1994.

3.3.13 The Group was informed that since the introduction of the TMI procedures the clearance delivery process had been significantly streamlined and the amount of time it took to deliver an oceanic clearance had been reduced by half. With the foregoing in mind, the Group encouraged Canada in its efforts and requested them to report their findings to the rest of the Group in order to establish whether the procedure could be used on a region wide basis. For example, on both the East and Westbound OTMs.

COMMUNICATIONS

Harmful interference to NAT HF Operations

3.3.14 As agreed at NAT SPG/29, the Group reviewed reports from States on harmful HF interference. The general conclusion derived from these reports was that, while the interference encountered was annoying and sometimes made communications difficult, it was not of such a nature as to endanger safety of the air/ground communications system. It was agreed that the monitoring should be continued to ensure that any serious problems would be detected and that timely remedial action could be taken.

NAT message intercept procedures

3.3.15 In response to Conclusion 29/14 concerning NAT message intercept procedures, States operating HF air/ground stations carried out an assessment of the advantages/disadvantages which would follow if the intercept procedures were to be discontinued.

3.3.16 Canada maintained that the intercept procedure no longer provided the service for which it was originally created, which was to bypass delays in the dissemination of the information over the AFTN. It was also considered that it was impossible to apply the procedures during situations of adverse HF propagation conditions and heavy workload at the station. In addition there was duplication of service since the same position report was copied by more than one station. Furthermore, Canada and the United Kingdom felt that there was no ATC operational requirement to continue the intercept procedure.

3.3.17 The general opinion shared by Iceland, Ireland, Portugal the United States and the users was that there were more advantages than disadvantages in maintaining the intercept procedures. The above States and users were of the opinion that the practice of message interception enhances flight safety by ensuring that intercepted flight information was distributed to all intended locations in a timely manner. This, in turn, would strengthen the awareness of station personnel to handle the HF traffic more efficiently. The additional workload involved and the duplication of traffic were not considered a significant problem. Therefore these States were in favour of continuing the procedure.

3.3.18 Considering the two positions, the Group agreed that Canada, Iceland, Ireland and the United Kingdom would coordinate an evaluation exercise of suspending the intercept procedure for a duration of four weeks and report the results to the next NAT SPG meeting.

CONCLUSION 30/23 - NAT MESSAGE INTERCEPT PROCEDURE

That Canada, Iceland, Ireland and the United Kingdom coordinate an evaluation exercise of suspending the intercept procedures for a duration of four weeks and report the results to NAT SPG/31.

HF VOLMET broadcast plan

3.3.19 At NAT SPG/29, it had been agreed that the HF VOLMET broadcast plan be reviewed in accordance with a number of principles agreed at that meeting. The Shannon HF VOLMET plan was reviewed on the basis of those principles. The review took into account the avoidance of time slot overloading which would lead to dropping of reports and also the maintenance of relative broadcast positions of related TAFs and METARs. The agreed Shannon HF VOLMET plan is contained in **Appendix B** to this part of the report.

3.3.20 The New York and Gander HF VOLMET plan was also reviewed in accordance with the principles referred to earlier and in consultation with the users. The agreed plan is also contained in **Appendix B** to this part of the report.

CONCLUSION 30/24 - NAT HF VOLMET BROADCAST PLAN

That:

a) the Member for Canada make arrangements within his administration to submit, on behalf of Ireland and the United States, a proposal for amendment to the NAT Facilities and Services Implementation Document concerning the HF VOLMET broadcast plan contained in Appendix B to the Report on Agenda Item 3;

b) States concerned make arrangements to implement the HF VOLMET broadcast plan six months after approval of the proposal for amendment; and

c) States concerned report to NAT SPG/31 their progress toward implementation of the NAT HF VOLMET broadcast plan.

NAT HF Air/ground communications improvement

3.3.21 As a result of shifting various frequencies to implement NAT HF family F, in accordance with NAT SPG Conclusion 28/7, a problem developed that caused Santa Maria, Canarias and Piarco to use frequencies from both HF families A and E for air/ground communications. It was now possible to limit traffic between the three aeronautical stations to HF family E. Family E was preferable to HF family A because of heavier use of the latter. The United States stated that the New York aeronautical station did not use HF family E South of Bermuda. Further, it stated that it would need to evaluate whether the use of HF family E to the South by the three aeronautical stations, Piarco in particular, would adversely affect operations between New York and any of the other aeronautical stations. In view of this, the Group agreed to request only Spain at this time to consider whether it was possible to limit the use of the NAT HF to family E only.

3.3.22 The Member for Portugal stated that once the amendment to the ANP regarding frequency 13354 had been approved, Santa Maria would implement that frequency.

CONCLUSION 30/25 - HF FAMILY E AT THE CANARIAS STATION

That Spain report to NAT SPG/31 on whether it would be possible to limit the use of the HF by the Canarias station to HF family E only.

HF and GP/VHF data collection

3.3.23 In order to better evaluate air/ground frequency loading on an ongoing basis, the Group had agreed to continue HF and GP/VHF data collection. To evaluate the loading of the NAT HF network and to be able to generally better manage that network, it had been agreed at NAT SPG/29 that the statistical data collected be co-ordinated through Portugal so that the interpretation of the results would be more meaningful and useful.

3.3.24 Comprehensive statistics obtained, on the basis of the example contained in Appendix C to the Report on Agenda Item 2 of NAT SPG/29, showed that currently there was no particular loading problem on the NAT HF network. The Group agreed to continue with the data collections and analysis to monitor the HF network to ensure that it be kept adequate at all times. Considering that the reduced vertical separation of aircraft would be introduced in the Region in January 1997, the Group considered that the monitoring of the HF and GP/VHF network was even more necessary in view of the possible increase of the load on the network.

CONCLUSION 30/26 - HF AND GP/VHF DATA COLLECTION

That States concerned present to the NAT Implementation Management Group a report based on the results of HF and GP/VHF data collection exercises, prepared on the basis of the example contained in Appendix C to the Report on Agenda Item 2 of NAT SPG/29, to be conducted on the 4 and 15 of each month, including information on the busiest day based on the example contained in Appendix C to the Report on Agenda Item 2 of NAT SPG/29.

3.3.25 It was agreed that Portugal would coordinate the details of these exercises with those concerned.

NAT HF Family G

3.3.26 At NAT SPG/29 it was agreed that Canada should seek frequencies for the NAT HF family G from VOLMET VEUR and VNAT frequencies. With the decommissioning of the NAT family D in Gander, the HF capacity for the remaining stations in Canadian Northern and Arctic airspace increased significantly. In addition, the implementation in late 1993, of the two GP/VHF facilities in Greenland (at Qaqatoqaq and Kulusuk) remotely controlled from Reykjavik increased the HF capacity of family D. The volume of 1993 HF international messages processed by Canadian stations for Northern and Arctic airspace remained under the level reached in 1990. Additionally, Canada planned to upgrade the related air/ground operator terminals for more efficient service for that part of the airspace.

3.3.27 In view of this, Canada considered that additional HF capacity existed through family D for the foreseeable future. Therefore Canada did not envisage that there was any longer a need to seek frequencies for the HF family G at this time. The Group agreed to this.

Hours of service for NAT HF family A at Gander

3.3.28 NAT HF family A is allotted for aircraft flying Southern routes. Following a study made by Canada, it was found that the HF family A was less busy in Gander than the other HF families used there. In addition, it was also found that the average hourly air/ground messages processed (including readbacks and intercepts) during off peak periods varied from 3.4 to 6.8. Canada concluded that the traffic on that family did not justify 24 hours air/ground service. From the analysis made it was deduced that the service could be cut down to 16 hours ensuring full coverage during peak traffic periods. Therefore Canada decided to undertake a three-week trial

evaluation, from 1 to 21 September 1994, during which the service on HF family A at Gander would be reduced to 16 hours following appropriate prior coordination with the other States concerned. Canada required the comments from States and airspace users concerned to assist in its post evaluation assessment on the 16 hours a day operations on HF family A. Following an in-depth assessment based on comments from States and users concerned, Canada would provide States and users with its conclusions and intended line of action.

3.3.29 The Group noted the action envisaged by Canada in this respect. The majority of the Group expressed concern that a possible reduction of the service could have a negative impact on the HF communications operations in the Region. This view was particularly emphasized by Portugal which was mostly affected due to its current manual system.

3.3.30 The Group agreed that comments should reach Canada within 8 weeks of the end of the trial.

CONCLUSION 30/27 - 16 HOUR SERVICE TRIAL FOR NAT HF FAMILY A AT GANDER

That States and airspace users concerned provide Canada by November 1994 with comments regarding the trial of reducing service to 16 hours daily for the NAT HF family A at Gander planned for the period from 1 to 21 September 1994.

Rationalization of HF communication in the Canadian Northern and Arctic Airspace

3.3.31 Until recently, aircraft entering Canadian airspace from the NAT on Arctic, Northern or Southern Control Tracks were mainly in contact with the aeronautical stations at Iqaluit and Cambridge Bay. In order to optimize resources related to the provision of international HF communications, effective 7 April 1994, Montréal Radio replaced Iqaluit Radio using NAT HF family D with the HF transmitters and receivers remaining at Iqaluit with a satellite link used for the relay of communications. This change has had no impact on HF communications coverage.

3.3.32 A similar arrangement was planned for late 1994 involving moving Cambridge Bay to North Bay on HF family D with the remote HF transmitter and receivers remaining at Cambridge Bay.

3.3.33 It was stated that the planned re-arrangements should have no impact on HF communications.

Implementation of VHF facilities in Greenland remotely controlled from Reykjavik

3.3.34 Following Conclusion 28/18, Iceland and Denmark implemented VHF facilities in Greenland with transmitters and receivers at Qaqatoqaq and Kulusuk remotely controlled from Reykjavik. These facilities filled the gap in the VHF coverage between the Reykjavik and Iqaluit GP facilities and provided continuous VHF coverage across that part of the NAT Region for flights at high levels. The new facilities provided 19 additional reporting points to those already covered by previously existing GP/VHF coverage area. These facilities have also alleviated traffic congestion on HF, particularly as regards family D. The Group noted that the facilities were also available for direct controller pilot communications with Reykjavik OAC and that Iceland would provide coverage maps as required.

Performance of Santa Maria OAC ATS Direct Speech Circuits

3.3.35 The comparison of data relating to the performance of the Santa Maria OAC ATS direct speech circuits for the last 3 years had generally shown that reliability had significantly improved. It was expected that the improvement of these circuits would continue.

SYSTEM EFFICIENCY

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

3.3.36 As at previous meetings, the Group was presented with information on the efficiency of the NAT air navigation services in the format agreed to at NAT SPG/24 (Conclusion 24/11 refers). It was noted that nothing untoward needed to be reported. However, in the same context, the Group noted with appreciation the data presented by the representative from IAOPA on the distribution of traffic in Shanwick FIR.

3.3.37 As regards the system efficiency numbers submitted by the United Kingdom, it was noted that the efficiency for the core and whole day periods were very much alike. It was pointed out that the core time period included a few hours when the Eastbound flow was finishing and the Westbound flow had already started. This reduced the number of flight levels available to Westbound aircraft with the consequential effect on efficiency. The United Kingdom agreed to examine the possibility of changing the core timeframe.

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APPENDIX A

FIGURE 1 - NAT MNPS AIRSPACE OCCUPANCY EXPRESSED IN STANDARD UNITS
(paragraph 3.2.29 refers)

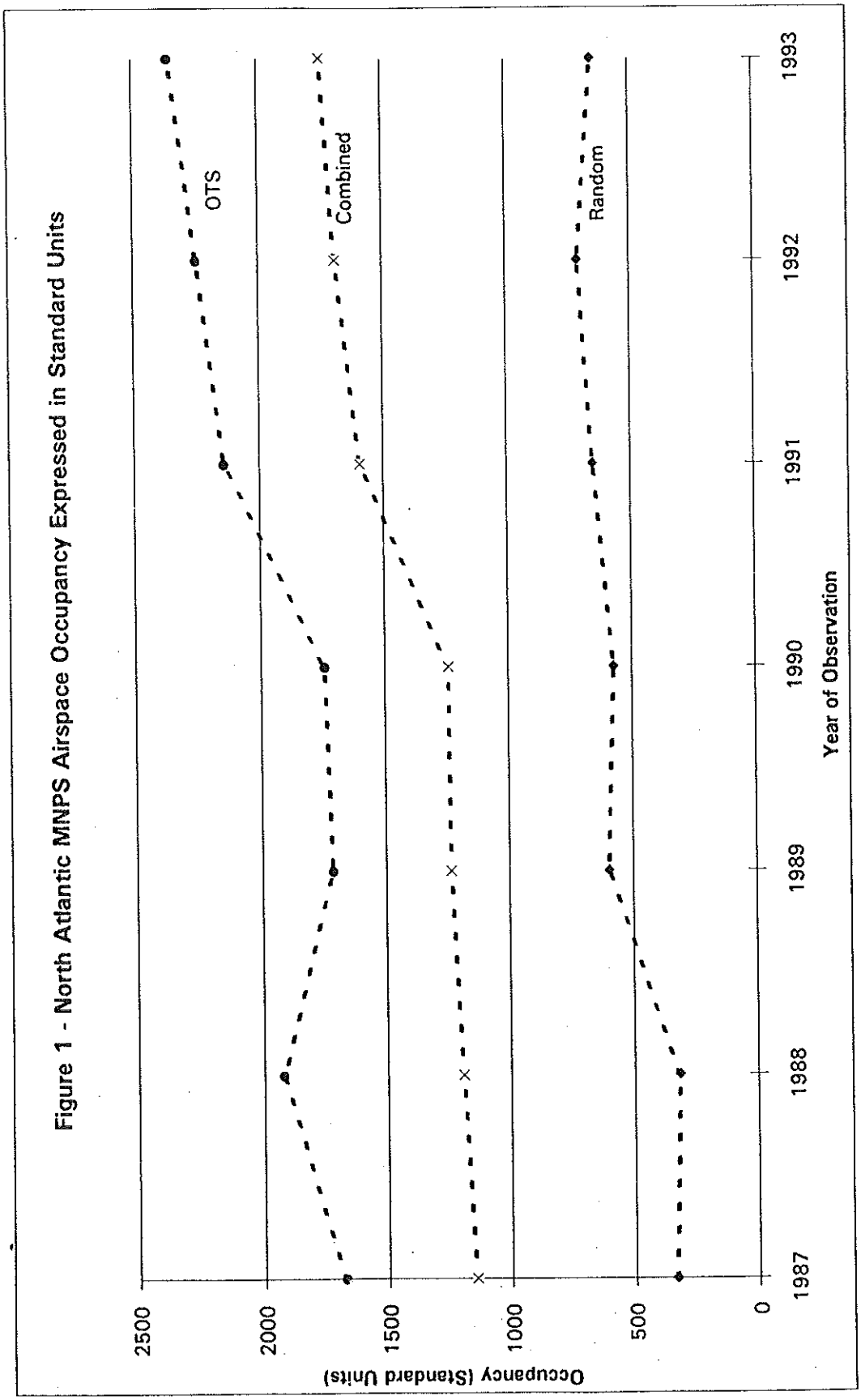


FIGURE 2 - NAT MNPS AIRSPACE RISK-BEARING ERROR RATES
(paragraph 3.2.32 refers)

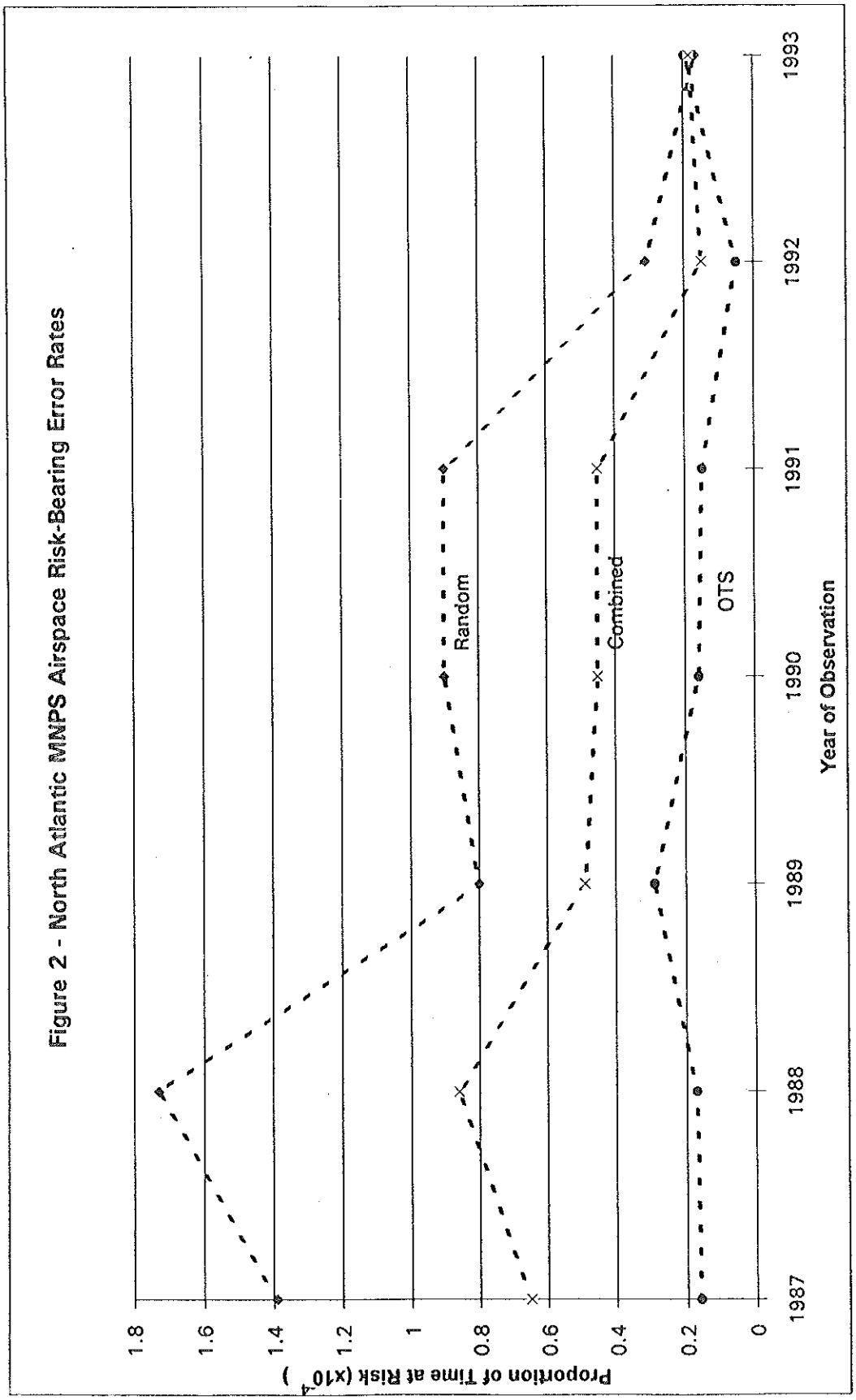
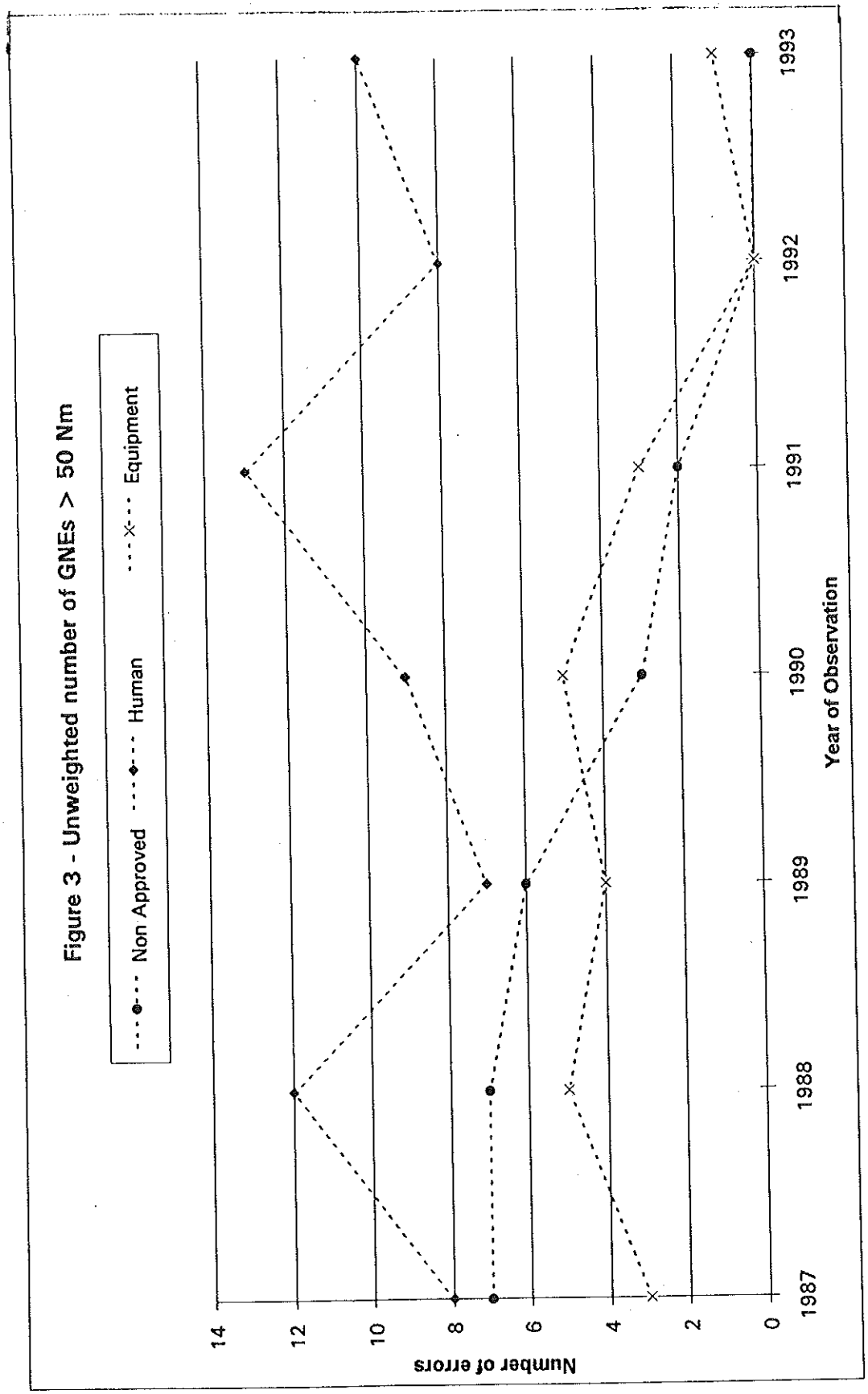


FIGURE 3 - UNWEIGHTED NUMBERS OF GNEs > 50 NM
(paragraph 3.2.37 refers)



APPENDIX B - TABLE ATS 2 - HF VOLMET BROADCASTS

(Paragraph 3.3.20 refers)

EXPLANATION OF THE TABLE

The transmitting station appears at the top of each block.

Names in capital letters indicate aerodromes for which forecasts are provided in order of priority.

Names in small letters indicate aerodromes for which reports (routine and selected special) are provided in order of priority.

NEW YORK & GANDER
FREQUENCIES - FREQUENCES - FRECUENCIAS - 3485, 6604, 10051, 13270 kHz

New York 00-05	New York 05-10	New York 10-15	New York 15-20	Gander 20-25	Gander 25-30
	SIGMET (New York Oceanic)		SIGMET (Miami/ San Juan Oceanic)		SIGMET (1)
DETROIT CLEVELAND CINCINNATI	BANGOR WINDSOR LOCKS CHARLOTTE	NEW YORK/JFK NEWARK BOSTON	BERMUDA MIAMI ATLANTA	MONTREAL/ YMX TORONTO OTTAWA	WINNIPEG EDMONTON [CHURCHILL]
Detroit Cleveland Cincinnati Indianapolis Pittsburgh	Bangor Windsor Locks Norfolk [Charlotte]	New York Newark Boston Baltimore Washington/IAD	Bermuda Miami Nassau Orlando [Atlanta]	Gander Montréal/YMX Toronto Ottawa Goose	Kuujjuaq Winnipeg Churchill Edmonton
30-35	35-40	40-45	45-50	50-55	55-60
	SIGMET (New York Oceanic)		SIGMET (New York Oceanic)		SIGMET (1)
CHICAGO MILWAUKEE MINNEAPOLIS	INDIANAPOLIS ST. LOUIS PITTSBURGH	BALTIMORE PHILADELPHIA WASHINGTON/IAD	NASSAU ORLANDO	GANDER ST. JOHNS HALIFAX	GOOSE IQALUIT SØNDRESTRØM
Chicago Milwaukee Minneapolis Detroit Boston	Indianapoliss St. Louis Pittsburgh [Atlantic City]	Baltimore Philadelphia Washington/IAD New York/JFK Newark	Bermuda Miami Nassau Orlando Atlanta Tampa [West Palm Beach]	Gander St. Johns Halifax Stephenville Montréal/YMX	Goose Iqaluit Søndrestrøm [Kuujjuaq]

NOTES

1. SIGMET information in the Gander broadcasts includes SIGMET or notification of SIGMET affecting flights operating above FL 100 in the Gander Oceanic and Gander, Moncton, Montreal and Toronto flight information regions (FIRs).

2. The reports and forecasts shown in brackets may be deleted from the broadcasts to provide broadcasting time for the inclusion of SIGMET messages.

SHANNON
FREQUENCIES - FREQUENCES - FRECUENCIAS - 3413, 5505, 8957, 13264 Khz

00-05	05-10	10-15	15-20	20-25	25-30
SIGMET BRUSSELS/NATIONAL AMSTERDAM/SCHIPOL Brussels/National Amsterdam/Schipol Frankfurt Hamburg Munchen	 LONDON/HEATHROW LONDON/GATWICK STANSTEAD London/Heathrow London/Gatwick Standtead Prestwick Glasgow	SIGMET DUBLIN SHANNON Dublin Shannon Manchester Keflavik	 SANTA MARIA LISBON MADRID Santa Maria Lisbon Madrid Lajes	SIGMET PARIS/CHARLES DE GAULLE PARIS/ORLY Paris/Charles de Gaulle Paris/Orly Zurich Geneva Milano/Malpensa	 Stockholm/Arlanda Manchester Shannon Kobenhavn/Kastrup Bergen Dublin Helsinki/Vantaa
30-35	**35-40**	**40-45**	**45-50**	**50-55**	**55-00**
SIGMET FRANKFURT KOLN/BONN Frankfurt Koln/Bonn Dusseldorf Munchen Luxembourg	 KEFLAVIK GLASGOW MANCHESTER London/Heathrow London/Gatwick Keflavik Glasgow Manchester	SIGMET OSLO/FORNEBU KOBENHAVN/KASTRUP Oslo/Fornebu Kobenhavn/Kastrup Goteborg/Landvetter Stockholm/Arlanda Bergen	 ZURICH GENEVA Zurich Geneva Paris/Charles-de- Gaulle Paris/Orly	SIGMET HAMBURG Brussels/National Amsterdam/Schipol Frankfurt Koln/Bonn Hamburg	ROMA/FIUMICINO MILANO/MALPENSA Roma/Fiumicino Milano/Malpensa Torino Lisbon Lajes Santa Maria

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) Guidance material;

c) IGA Manual.

4.2 MNPS OPS Manual

4.2.1 The Group noted that the sixth edition of the NAT MNPS OPS Manual had been published by the United Kingdom on behalf of the NAT SPG. The Group was informed that the document was also available in French and Russian.

4.3 Consolidated NAT Region Guidance Material

4.3.1 The Group was presented with a summary of Search and Rescue (SAR) incidents which had occured in the NAT region in recent years. It noted that there had been a significant decrease in SAR incidents since the peak years 1988 - 1990. The Group agreed that the Consolidated NAT Guidance Material and IGA Operations Manual should be updated on a regular basis, but that no further special measures were required at the present time. However, SAR trends in the region should be monitored on a regular basis and States should submit annual returns in respect of aeronautical SAR incidents. The United Kingdom undertook to collect and collate the annual returns for consideration by the NAT SPG.

4.3.2 Information was provided to the Group on initiatives taken by the United States to provide IGA flight crews with information and guidelines in respect of trans-Atlantic flights. The Group agreed that a meeting of SAR experts from the NAT provider States may be required to discuss SAR-related issues as well as other requirements for IGA operations in the Region. It was noted that joint ICAO/IMO SAR meetings had been planned for the last quarter of 1994. It was also noted with appreciation that the Member for the United Kingdom would continue to coordinate this activity.

4.4 IGA Manual

4.4.1 The Group reviewed the draft second edition of the NAT IGA Operations Manual. It was agreed that any additional comments to the draft edition should be provided to the United States within thirty days after NAT SPG/30 whereupon the second edition would be published.

AGENDA ITEM 5: ANY OTHER BUSINESS

5.1 Introduction

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

a) NAT users conference;

b) next meeting of the NAT SPG; and

c) farewells.

5.2 NAT Users Conference

5.2.1 The Member for Iceland informed the Group that a NAT Users Conference had been organized in Reykjavik from 5 to 6 October 1994. The Group expressed its appreciation for the initiative by Iceland, and it was felt that similar conferences should be arranged by other NAT provider States at regular intervals.

5.3 Next Meeting

5.3.1 Taking into account the re-organization of the work methods of the NAT SPG, it was agreed that the next meeting should only be scheduled for five working days. In this context, it was agreed that NAT SPG/31 be planned to be held in Paris from 12 to 16 June 1995.

5.4 Farewells

5.4.1 The Group was informed that its Member for the United States of America, Mr. Frank Price, had been promoted within his administration and would therefore no longer be a Member. The Group expressed its appreciation for the contributions from Mr. Frank Price to its work during the past years and wished him all the best in his new functions, and, at the same time, the Group welcomed Mr. Gerald Richard as the new Member for the United States of America.

5.4.2 Similarly, the Group was informed that its Member for Portugal, Mr. Jaime Valadares, who had been with the Group for several years, had also been assigned new tasks within his administration and would no longer be able to participate in the NAT SPG. The Group expressed its appreciation for Mr. Jaime Valadares' contributions over the years and wished him all the best in his new functions; at the same time, the Group welcomed Mr. Joao Sequeira as the new Member for Portugal.

5.4.3 As a consequence of its decision to merge the Communications sub-group with the ADSDG and the COMAG, the Group also expressed its appreciation for the work that had been performed by the Rapporteur of the Communications sub-group during the past years, Mr. Svend Gravesen from Denmark.

5.4.4 The Group was also informed that the Rapporteur of the Mathematicians sub-group, Mr. Ian Parker of the United Kingdom, had been transferred to other functions within his administration. The work of Mr. Ian Parker was very much appreciated; the Group welcomed Mr. Andrew Du Boulay from the United Kingdom as the new Rapporteur of the Mathematicians sub-group.

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