29
E

NAT SPG/29

NORTH ATLANTIC SYSTEMS PLANNING GROUP

Summary of Discussions and Conclusions of the Twenty-Ninth Meeting of the North Atlantic Systems Planning Group

Paris, 7 - 16 June 1993

TABLE OF CONTENTS

INTRODUCTION i-7

LIST OF PARTICIPANTS/LISTE DES PARTICIPANTS i-8

LIST OF CONCLUSIONS i-9

AGENDA ITEM 1: AIR NAVIGATION SYSTEM SAFETY PERFORMANCE REVIEW

1.1 Introduction 1-1

1.2 Navigation performance accuracy achieved in the NAT Region during the period 1 March 1992 to 28 February 1993 1-1

1.3 Methods of improving the observed standard of navigation performance 1-3

1.4 Methods of improving the current monitoring procedures 1-5

1.5 Review of in flight contingencies 1-6

1.6 1992 collision risk estimation 1-7
OCCUPANCY 1-7
APPLICABILITY OF THE WEIGHTING SET TO CURRENT ENVIRONMENT 1-8
GROSS NAVIGATION ERRORS 1-8
COLLISION RISK 1-9
BREAKDOWN OF THE RISK INTO COMPONENTS 1-11
FUTURE DEVELOPMENTS IN LATERAL RISK ESTIMATES 1-11
Traffic outside Gander and Shanwick Airspace 1-11
Use of actual OTS and random traffic counts 1-11
Use of monthly occupancy estimates by the CMA 1-12
CORE NAVIGATION PERFORMANCE 1-12
PRESENTATION OF RESULTS 1-12

1.7 Aspects of the future NAT System 1-13
IMPLICATIONS OF THE USE OF FUTURE TECHNOLOGIES IN THE NAT 1-13
Automatic Dependent Surveillance (ADS) 1-13
Future Collision Risk Models 1-13
LONGITUDINAL AND HORIZONTAL SEPARATION 1-14
EFFECTS OF NAVIGATION ACCURACY ON COLLISION RISK 1-15
VERTICAL OCCUPANCY AND RISK 1-15
Predicting future occupancy 1-15
Classification of height deviations 1-17

1.8 Mathematicians work programme for 1993/94 1-18

APPENDIX A - ERROR CLASSIFICATION TABLE 1-A-1

APPENDIX B - SAMPLE OF ERROR INVESTIGATION FORM 1-B-1

APPENDIX C - TRENDS IN NAT MNPS AIRSPACE BEHAVIOUR 1-C-1

AGENDA ITEM 2: NAT AIR NAVIGATION SYSTEM OPERATIONS REVIEW

2.1 Introduction 2-1

2.2 Air Traffic Services operations 2-1

SEPARATION STANDARDS FOR TURBOJET AIRCRAFT OPERATING OUTSIDE MNPS AIRSPACE 2-1

DOMESTIC/OCEANIC INTERFACES AND TRANSITION PROBLEMS ADJACENT TO NAT MNPS AIRSPACE 2-2

Eastbound OTS Information and flight planning procedures 2-2

Reduced Vertical Separation Minimum Transition Area simulation 2-3

ATFM matters 2-3

POSSIBLE FURTHER SHORT TERM ATM IMPROVEMENTS AND DETERMINATION OF ACTION FOR THEIR IMPLEMENTATION 2-3

High Frequency (HF) VOLMET broadcast plan 2-3

Common content and format for Preferred Routes Messages (PRM) from NAT operators to NAT provider States 2-5

EUR-CAR tracks 2-5

Use of flight levels not appropriate to direction of flight in the NAT Region . . 2-6

The use of FL 310 for Eastbound OTS core tracks 2-7

Control responsibility for airspace proximate to 45°N 2-7

Oceanic clearance delivery procedures 2-8

Update on outstanding issues 2-9

2.3 Communications operations 2-9

AERONAUTICAL FIXED SERVICES 2-9

Aeronautical Fixed Telecommunications Network (AFTN) circuits in the Northern part of the NAT Region 2-9

Performance of Santa Maria OAC ATS Direct Speech Circuits 2-9

AERONAUTICAL MOBILE SERVICES 2-9

New COM facilities in Iceland 2-9

General Purpose (GP)/VHF facilities 2-10

HF family NAT-F 2-10

HF family NAT-G 2-10

Frequency designators in the NAT HF network 2-11

Use of 12-tone Selective Calling system (SELCAL) equipment 2-12

HF and GP/VHF data collection 2-12

NAT message intercept procedures 2-13

Harmful interference to NAT HF operations 2-13

Other matters related to communications operations 2-13

2.4 Determination of the performance of the NAT air navigation system and the services provided to airspace users by ATC 2-13

APPENDIX A - TABLE ATS 2 - HF VOLMET BROADCASTS 2-A-1

APPENDIX B - STATION NAME
EXAMPLE OF HF AND GP/VHF DATA COLLECTION 2-B-1

APPENDIX C - EXAMPLE OF STATISTICS ON PEAK DAY 2-C-1

AGENDA ITEM 3: TECHNOLOGICAL DEVELOPMENTS OF INTEREST IN THE NAT REGION

3.1 Introduction 3-1

3.2 ATC automation and traffic display systems in oceanic area control centres 3-1

3.3 Developments in global navigation satellite systems 3-2

3.4 Data link developments 3-2

3.5 Other technological developments of relevance to the NAT Region 3-3

APPENDIX A - COMMON MESSAGE FORMAT FOR THE DELIVERY OF OCEANIC CLEARANCES BY VHF DATA LINK 3-A-1

AGENDA ITEM 4: PLANNING AND IMPLEMENTATION IN THE NAT REGION

4.1 Introduction 4-1

4.2 Air navigation systems planning and production of supporting statistical data on future traffic demand 4-1

4.3 Reports of the implementation sub-groups 4-4
REPORT OF THE NAT AIR TRAFFIC MANAGEMENT GROUP (ATMG) 4-4
Air traffic flow management matters related to the NAT Region 4-4
Individual flight plans from this point (IFPFP) procedures 4-6
Common procedures for radio communications failure 4-7
Operational requirements for airspace management (ASM) messages 4-7
Standardized phraseology 4-7
Review of the planned reductions in separation standards in the NAT Region 4-7
Future work programme and terms of reference of the NAT ATMG 4-8
REPORT OF THE NAT AUTOMATIC DEPENDENT SURVEILLANCE DEVELOPMENT GROUP 4-8
Review of ADS trials 4-8
Simulation studies and inter-group liaison 4-8
Certification of aircraft and operators 4-10
NAT ATM evolution 4-10
Evolution of engineering considerations 4-12
NAT ADS-ATC system implementation plan 4-13
Institutional matters 4-13
Future work 4-14

REPORT OF THE NAT ON-LINE DATA INTERCHANGE GROUP 4-14
Air traffic services coordination messages in the common coordination ICD . 4-14
Air traffic flow management and airspace management messages 4-15
Review of the common Aeradio Interface Control Document 4-15
Review of the contents and structure of the common data base 4-15
Migration to the Aeronautical Telecommunications Network 4-15
Common rules related to the application of separation minima 4-17
Future work programme 4-17
REPORT OF THE NAT VERTICAL SEPARATION IMPLEMENTATION GROUP 4-17
Requirements for system monitoring 4-17
Matters related to airspace monitoring 4-19
Amendment to the NAT Regional Supplementary Procedures 4-19
Airplane/operator approval 4-20
Cost/benefit analysis 4-21
Updates to the Guidance Material 4-21
Effects of turbulence on collision risk 4-21
Non-approved aircraft climbing or descending through MNPS airspace 4-22
Future role of the VSIG and work programme 4-22
Height monitoring units - cost sharing 4-23
Cost recovery 4-24

4.4 Management of the NAT Implementation Document 4-25

4.5 Follow-up action from the Limited NAT Regional Air Navigation Meeting 1992 . 4-26

4.6 Possible radar coverage over Greenland 4-27

APPENDIX A - NORTH ATLANTIC TRAFFIC FORECASTS 4-A-1
FIGURE 1 - ANNUAL PASSENGERS: 1971 - 1998 . . . . . 4-A-1
FIGURE 2 - ANNUAL PASSENGERS: 1992 - 1998 . . . . . 4-A-2
FIGURE 3 - AIRCRAFT MOVEMENTS: 1976 - 1998 . . . . . 4-A-3
FIGURE 4 - AIRCRAFT MOVEMENTS: 1992 - 1998 . . . . . 4-A-4

APPENDIX B - COMMON PROCEDURES FOR RADIO COMMUNICATIONS FAILURE OF OCEANIC AIRCRAFT OPERATING IN THE NAT REGION 4-B-1

APPENDIX C - ADS-ATC EVOLUTION - PHASE 1 . . . . . 4-C-1

APPENDIX D - AIRCRAFT PARTICIPATING IN THE ATC DATALINK TRIALS . . . 4-D-1

APPENDIX E - PROPOSED CHANGES TO ICAO PANS-RAC 4444 . . . . . 4-E-1

APPENDIX F - PROPOSED AMENDMENT TO DOC 7030 . . . . . 4-F-1

AGENDA ITEM 5: GENERAL MATTERS

5.1 Introduction 5-1

5.2 NAT Consolidated Guidance Material 5-1

5.3 Minimum Navigation Performance Specifications Airspace Operations Manual . . 5-1

5.4 Manual on International General Aviation 5-2

APPENDIX A - PROPOSED AMENDMENT TO THE NAT MNPS AIRSPACE OPERATIONS MANUAL 5-A-1

AGENDA ITEM 6: FUTURE WORK

6.1 Introduction 6-1

6.2 Need to convene a meeting of high level civil aviation managers of the NAT SPG Member States 6-1

6.3 Establishment of an implementation programme coordination function within the NAT SPG 6-2

6.4 Organization of the communications aspects of the future work 6-3

6.5 Terms of reference for the implementation sub-groups in relation to the management of the NAT Implementation Programme Document 6-4

6.6 Organization of future work 6-4
SPECIAL NAT SPG MEETING IN JANUARY 1994 6-5
MEETING OF HIGH LEVEL CIVIL AVIATION MANAGERS 6-5
ORGANIZATION OF NAT SPG/30 6-5

APPENDIX A - TERMS OF REFERENCE OF THE NAT IMPLEMENTATION SUB-GROUPS 6-A-1
COMMUNICATIONS AND AUTOMATION GROUP (COMAG) 6-A-1
AUTOMATIC DEPENDENT SURVEILLANCE DEVELOPMENT GROUP (ADSDG) 6-A-2
AIR TRAFFIC MANAGEMENT (ATM) GROUP 6-A-3
REDUCED SEPARATION STANDARD IMPLEMENTATION GROUP (RSSIG) 6-A-4
RSSIG - OPS/AIR SUB-GROUP 6-A-5
AIRSPACE MONITORING SUB-GROUP 6-A-6

APPENDIX B - DRAFT AGENDA FOR NAT SPG/30 . . . . . 6-B-1

AGENDA ITEM 7: ANY OTHER BUSINESS

7.1 Participation in the work of NAT SPG 7-1

7.2 Farewell to Mr. J. O'Farrell 7-1

- - - - - - - - - - - - - - - -

INTRODUCTION

i.1 The Twenty-Ninth Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in Paris from 7 to 16 June 1993. The sub-groups mentioned in paragraph 3 below met as of 2 June 1993. The meeting was chaired by **Mr. Karsten Theil**, the Member for Denmark who had been elected to that position at the ad-hoc meeting of the NAT SPG held in Cascais on 11 November 1992.

i.2 In addition to IAOPA, IATA, IFALPA, IFATCA and Inmarsat, the Group had, as usual, also invited Spain and the Russian Federation to attend this Meeting. A list of participants is at page i-8.

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. Edward H. Roberts** 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;

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; and

d) several ad-hoc working groups were established in the course of the meeting to consider specific points and to report their findings to the meeting.

i.4 Mr. Christian Eigl, ICAO Representative, European and North Atlantic Office was Secretary of the Meeting and was assisted by Messrs Jacques Vanier, Daniel Oudin, Vincent Galotti, RAC/SAR Technical Officers, Alfred Suban and Vitali Oustinovitch, COM Technical Officers and Bo Barrefors, MET Technical Officer, from the European and North Atlantic Office of ICAO. Mr. Roderick Heitmeyer, Chief of the Joint Financing and Facility Management Branch, also attended part of the meeting. 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 Norway's request to become a Member of the NAT SPG and accordingly, he welcomed Mr. Rolf Grimsrud as the new Member for Norway; he also welcomed Mr. Einar Einarsson, who replaced Mr. Gudmundur Matthiasson as the Member for Iceland and Mr. Paul Wood who was returning as the Member for the United Kingdom. He also informed the Group that Mr. André Berman would be acting for Mr. Jacques Dopagne, the Member for France. He also took the opportunity to thank, on behalf of the Group, Mr. Gudmundur Matthiasson, the previous Chairman, for his dedicated services to the Group. He also expressed his hope that he would perform the functions of Chairman to the satisfaction of all the participants.

- - - - - - - - - - - - - - - -

LIST OF PARTICIPANTS/LISTE DES PARTICIPANTS

CANADA
Don MacKEIGAN*
Brian BOWERS
Don MacLEAN
Jacques PAQUETTE
Bill STILWELL

DENMARK/DANEMARK
Karsten THEIL*
(Chairman/Président)
Svend GRAVESEN
Jorgen HENNEBERG
Knud ROSING

FRANCE
André BERMAN*
Maxime BRUGEL
Bruno HALLER

ICELAND/ISLANDE
Einar EINARSSON*
Stefan ARNDAL
Leifur HAKONARSON
Loftur JONASSON
Ásgeir PÁLSSON
Halli SIGURDSSON

IRELAND/IRLANDE
Jim F. O'FARRELL*
Patrick KEATING
Patrick SHANAHAN
Myles MURPHY
A.C. O'CONNOR

NORWAY/NORVEGE
Rolf GRIMSRUD*
Einar S. HAUGEN
Terje STEINKJER

PORTUGAL
Jaime R. VALADARES*
Alvaro CARVALHO
Artur MATEUS
Rui RODRIGUES
Joao SEQUEIRA

RUSSIAN FEDERATION/
FEDERATION DE RUSSIE ♯
Gueorgui SAMARINE
Serguei SESKOUTOV

SPAIN/ESPAGNE ♯
Luis MORALES
Miguel GARCIA ARAUJO
Jose L. COLETO

UNITED KINGDOM/
ROYAUME-UNI
Paul WOOD*
Liz DAVIES
Lawrie DUNN
Dave HOGG
Ian PARKER
Bernie PERRY
Ted ROBERTS
Phil SIMMONS
John NORDBØ

UNITED STATES OF
AMERICA/
ETATS UNIS D'AMERIQUE
Frank PRICE*
Dick COVELL
Drazen GARDILCIC
Roy GRIMES
Ray HILTON
Dale LIVINGSTON
Michael PUMPHREY
Gerald RICHARD
Cameron SHACKELFORD
Gene WHITE

IATA ♯
King GRAHAM
Andy BECK
Lucien BIGEAULT
Matt FRONZAK
Harry GALLAGHER
Alan GILBERT
Helmut HACKL
Mike HIXSON
Mark HURSTON
Michael JOHNSTONE
Howard ROSE
José TENA
Evelyn WHITTINGTON
Paul WIGGINS
Brett WILKIE

IFALPA ♯
Tom KREAMER

IAOPA ♯
Peter BERRY

IFATCA ♯
Eddie WALLACE

INMARSAT ♯
Fintan RYAN

* Member/Membre
♯ Observer/Observateur

- - - - - - - - - - - - - - - -

LIST OF CONCLUSIONS

CONCLUSION 29/1 - INCLUSION IN RISK ANALYSIS OF GROSS NAVIGATION ERRORS REPORTED BY ICELAND 1-5

CONCLUSION 29/2 - ACTION TO BE TAKEN BY STATES WHEN DETECTING A GROSS NAVIGATION ERROR (GNE) IN MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) AIRSPACE 1-6

CONCLUSION 29/3 - REVISION OF THE ERROR INVESTIGATION FORM 1-6

CONCLUSION 29/4 - PRESENTATION OF THE ANNUAL SYSTEM APPRAISAL . 1-13

CONCLUSION 29/5 - COMPUTER SIMULATIONS TO PREDICT FUTURE OCCUPANCY 1-16

CONCLUSION 29/6 - AMENDMENT TO THE NORTH ATLANTIC REGIONAL SUPPLEMENTARY PROCEDURES (NAT SUPPs, DOC 7030) . 2-2

CONCLUSION 29/7 - COORDINATION BETWEEN PROVIDER ORGANIZATIONS . 2-3

CONCLUSION 29/8 - REVIEW OF THE NAT HIGH FREQUENCY (HF) VOLMET BROADCAST PLAN 2-4

CONCLUSION 29/9 - PRINCIPLES FOR THE CONSTRUCTION AND PUBLICATION OF EUR/CAR TRACKS 2-5

CONCLUSION 29/10 - USE OF FLIGHT LEVELS NOT APPROPRIATE TO DIRECTION OF FLIGHT IN THE NAT REGION 2-6

CONCLUSION 29/11 - HIGH FREQUENCY (HF) FAMILY NAT-G 2-10

CONCLUSION 29/12 - NAT HF NETWORK DESIGNATORS 2-11

CONCLUSION 29/13 - HIGH FREQUENCY (HF) DATA COLLECTION 2-12

CONCLUSION 29/14 - NAT MESSAGE INTERCEPT PROCEDURES 2-13

CONCLUSION 29/15 - COMMON MESSAGE FORMAT FOR THE DELIVERY OF OCEANIC CLEARANCES BY VERY HIGH FREQUENCY (VHF) DATA LINK 3-3

CONCLUSION 29/16 - OPERATION OF AIRBORNE COLLISION AVOIDANCE SYSTEMS (ACAS) 3-4

CONCLUSION 29/17 - ACTIVITIES OF THE NORTH ATLANTIC TRAFFIC FORECASTING GROUP (NAT TFG) 4-4

CONCLUSION 29/18 - PROVISION OF INFORMATION ON PLANNED FLIGHT OPERATIONS BY AIRCRAFT OPERATORS 4-5

CONCLUSION 29/19 - AIR TRAFFIC FLOW MANAGEMENT (ATFM) IN THE NAT REGION 4-6

CONCLUSION 29/20 - DELETION OF ALL REFERENCES TO AIR TRAFFIC FLOW MANAGEMENT (ATFM) CELLS FROM THE NAT IMPLEMENTATION DOCUMENT 4-6

CONCLUSION 29/21 - USE OF THE FLOW NOTIFICATION MESSAGE (FNM) 4-6

CONCLUSION 29/22 - COMMON PROCEDURES FOR RADIO COMMUNICATIONS FAILURE 4-7

CONCLUSION 29/23 - NEED FOR STATES TO MAKE AVAILABLE SLOTS FOR THE SIMULATION OF THE IMPLEMENTATION OF AUTOMATIC DEPENDENT SURVEILLANCE (ADS) IN THE NAT REGION 4-9

CONCLUSION 29/24 - EARLY IMPLEMENTATION OF ALL AUTOMATIC DEPENDENT SURVEILLANCE (ADS) PANEL DEFINED ADS DATA BLOCKS 4-11

CONCLUSION 29/25 - USE OF COMMON APPLICATIONS AND MEANS IN AUTOMATIC DEPENDENT SURVEILLANCE (ADS) TRIALS 4-12

CONCLUSION 29/26 - MANAGEMENT AND PUBLICATION OF THE NAT COMMON COORDINATION INTERFACE CONTROL DOCUMENT (ICD) 4-14

CONCLUSION 29/27 - AMENDMENT TO THE PROCEDURES FOR AIR NAVIGATION SERVICES AND RULES OF THE AIR AND AIR TRAFFIC SERVICES (PANS RAC, DOC 4444) 4-15

CONCLUSION 29/28 - SITING OF HEIGHT MONITORING UNITS (HMU) 4-18

CONCLUSION 29/29 - PROPOSAL FOR AMENDMENT TO THE NAT REGIONAL SUPPLEMENTARY PROCEDURES 4-20

CONCLUSION 29/30 - WORKSHOP ON THE AIRWORTHINESS REQUIREMENTS FOR THE IMPLEMENTATION OF REDUCED VERTICAL SEPARATION MINIMUM (RVSM) IN THE NAT REGION .. 4-20

CONCLUSION 29/31 - GUIDANCE MATERIAL ON THE IMPLEMENTATION OF REDUCED VERTICAL SEPARATION IN THE NAT REGION 4-21

CONCLUSION 29/32 - SURVEY ON THE EFFECTS OF TURBULENCE ON OPERATIONS IN THE NORTH ATLANTIC MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS AIRSPACE 4-22

CONCLUSION 29/33 - COST SHARING FOR HEIGHT MONITORING IN THE NAT REGION 4-25

CONCLUSION 29/34 - UPDATING OF THE NAT IMPLEMENTATION DOCUMENT (NAT ID) 4-26

CONCLUSION 29/35 - COST/BENEFIT MODEL OF EXPANDED RADAR COVERAGE IN GANDER AND REYKJAVIK OCEANIC CONTROL AREAS 4-27

CONCLUSION 29/36 - CONVENING OF A MEETING OF HIGH LEVEL CIVIL AVIATION MANAGERS FROM NAT SPG MEMBER STATES 6-1

CONCLUSION 29/37 - ESTABLISHMENT OF A NAT IMPLEMENTATION PROGRAMME COORDINATION TEAM 6-2

CONCLUSION 29/38 - CHANGES TO THE ON-LINE DATA INTERCHANGE (OLDI) GROUP 6-4

CONCLUSION 29/39 - CHANGES TO THE TERMS OF REFERENCES AND WORK PROGRAMMES OF THE NAT SPG IMPLEMENTATION SUB-GROUPS 6-4

AGENDA ITEM 1: AIR NAVIGATION SYSTEM SAFETY PERFORMANCE REVIEW

1.1 Introduction

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

a) navigation performance accuracy achieved in the NAT Region during the period 1 March 1992 to 28 February 1993;

b) methods of improving the observed standard of navigation performance;

c) methods of improving the current monitoring procedures;

d) review of in-flight contingencies;

e) 1992 collision risk estimation;

f) aspects of the future NAT system; and

g) mathematicians work programme for 1993/94.

1.2 Navigation performance accuracy achieved in the NAT Region during the period 1 March 1992 to 28 February 1993

1.2.1 The Group completed a scrutiny of observed gross navigation errors (GNE) in the NAT Region and found that a total of 37(50)* errors were reported during the period under review. 10(17)* of these errors occurred outside Minimum Navigation Performance Specifications (MNPS) airspace and were classified as Table 'CHARLIE' errors. Of the remaining 27(33)* errors, 17(10)* were not eligible for inclusion in the risk analysis as defined by 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 paras 1.2.7 to 1.2.9. The remaining 10(23)* errors which form the basis of detailed scrutiny were classified as Table 'ALPHA' errors.

1.2.2 A breakdown of the 10 Table 'ALPHA' errors included in the risk analysis is given at **Appendix A** to this part of the report. The format is in accordance with established procedures, but varies slightly from previous summaries in that it no longer includes information concerning 'Model 1', the discontinuation of which was agreed at NAT SPG/28 (NAT SPG/28 Report, paragraph 1.2.2.3 refers).

1.2.3 The Group was pleased to note the reduction in the overall number of Table 'ALPHA' errors compared with the previous year (10 compared with 23 in the 1991/92 monitoring year), in conjunction with a 15% rise in observed traffic. The Group, however, was concerned that, notwithstanding this reduction, the increase in Table 'BRAVO' errors (17 compared with 10 in the 1991/92 monitoring year), resulted in the combined Tables 'ALPHA' and 'BRAVO' errors remaining high this year (27 compared with 33 in the 1991/92 monitoring year).

---

* For comparison purposes, corresponding figures for the last monitoring period (1991-92) are shown in brackets.

1.2.4 From Appendix A, the breakdown of the 10(23)* Table 'ALPHA' errors shows two main aspects:

a) the combined number of errors in classification C1 (equipment control error, including waypoint insertion error) [4(6)*] and in classification C2 (waypoint insertion due to the correct entry of incorrect position) [3(7)*] still accounts for more than half the errors reported, and

b) an encouraging lack of reports in classification A (aircraft not certified for MNPS operations), together with a reduction in classification F (other navigation errors including equipment failure of which notification was not received by Air Traffic Control (ATC)).

1.2.5 The Group noted that errors attributed to mistakes involving waypoint insertions still accounted for more than half the Table 'ALPHA' errors. Concern was expressed that in several errors, reports showed that the filed track was not given and that a change of clearance had been involved. It was considered that these aspects still required publicity.

1.2.6 The Group noted that the one(5)* error which was caused by some failure and/or malfunction of the navigation equipment, involved Inertial Navigation System (INS).

1.2.7 In reviewing the 17(10)* Table 'BRAVO' errors the Group noted with concern the increase over the number of these errors in the previous year.

1.2.8 The following table shows a breakdown of the Table 'BRAVO' errors into the established error classifications:

Error Classification	Number of errors
A	4(1)
B	2(1)
C1	4(5)
C2	5(2)
D	0(0)
E	0(0)
F	1(1)
Unclassified	1(0)
Total	17(10)

1.2.9 The Group noted with concern that, as in Table 'ALPHA', the combined errors listed under C1 and C2 still comprised a large proportion of the total Table 'BRAVO' errors. In addition, the errors which resulted in the increase of Table 'BRAVO' errors included four attributed to non-approved users.

1.2.10 The Group then considered Table 'CHARLIE' errors, and was pleased to note that the number of errors reported outside MNPS airspace showed a reduction from the previous monitoring period.

This for the sixth year running, viz.

63 in the year 1987-88
40 in the year 1988-89
31 in the year 1989-90
22 in the year 1990-91
17 in the year 1991-92
10 in the year 1992-93

1.2.11 The Group noted that of the 10 errors, one occurred above MNPS airspace and 9 below. The trend of previous years remained, in that the majority of Table 'CHARLIE' errors occurred below MNPS airspace.

1.2.12 In accordance with monitoring procedures, follow-up action was taken with any reported error in excess of 50 NM. The Group noted that the one error above MNPS airspace and 4 below were in this category. The Group found that the one error above MNPS airspace involved the failure of the aircraft's long range navigation equipment. Of those errors which occurred below MNPS airspace and which required follow-up action, 2 involved the failure of navigation equipment, one aircraft was equipped with short range navigation aids only and one was attributed to an error in waypoint insertion.

1.2.13 The Group was of the opinion that, as expressed at NAT SPG/28, the reduction in the number of errors attributed to aircraft operating below MNPS airspace was, in part, due to the carriage and use of Global Positioning System (GPS) navigation equipment.

1.2.14 The Group was pleased to note that the number of errors attributed to International General Aviation (IGA) operators continued to decrease.

1.2.15 With respect to the continued application of the ten minutes longitudinal separation in MNPS airspace, the Group noted that three reports of erosion of longitudinal separation had been received by the Central Monitoring Agency (CMA) during the monitoring year.

1.2.16 The Group noted details of height deviations reported to the CMA within the monitoring year and agreed that it was essential that the CMA continue to receive such reports. The Group noted that discussions were taking place within the Mathematicians' working group regarding future classification and assessment of height deviations.

1.3 Methods of improving the observed standard of navigation performance

1.3.1 In considering the methods by which the observed standard of navigation performance might be improved, the Group took into account:

a) the lessons derived from the review of navigation performance reported in section 1.2 above and;

b) the discussions of, and points emerging from, relevant working papers.

1.3.2 A major concern of the Group was the high number of Table 'ALPHA' and Table 'BRAVO' errors involving waypoint insertions and it felt that publicity was still needed to combat this problem.

1.3.3 The Group noted that reports of investigations into the causes of some errors had shown that mistakes had been made in amending the data base used in the aircraft navigation computer. The Group felt that it should be stressed that the procedures for such activities are equally as important as those required when information is loaded into an aircraft's on-board navigation equipment. It was agreed that IATA would undertake to draw the attention of the data base suppliers to the consequences of such errors in the NAT Region. IATA would also endeavour to coordinate this matter with other airspace users.

1.3.4 The Group noted the results of the tactical monitoring of the MNPS approval status of selected operators entering MNPS airspace, as collected by the CMA throughout the monitoring year. The Group was of the opinion that, with the trend showing a reduction in the number of aircraft who were not able to confirm their approval status, the exercise was effective. Notwithstanding this view, the Group found that non-approved operators were still attempting to use MNPS flight levels and it was of the opinion that such a situation could prevail in the future. The Group considered that tactical monitoring of the MNPS approval status of selected operators remained a valid means of combatting this problem.

1.3.5 As in previous years, the Group considered the part played by Oceanic Area Control Centres (OAC) in containing the number of GNEs through timely intervention to prevent incorrect routing.

1.3.6 Within the period of the monitoring year, Gander OAC advised the CMA of a total of 20(17)* occasions when mistakes were noted, and action taken, by ATC to prevent a GNE. The causes of these mistakes may be broken down as follows:

a) 7 instances in which the aircraft stated they had been so cleared by other ATC units;

b) 6 instances in which no explanation was offered for an incorrect forward estimated position;

c) 3 instances in which the aircraft admitted a mistake had been made on the flight deck;

d) 2 instances in which mistakes had been made by ATC in processing the clearance details;

e) 1 instance in which the aircraft used a flight plan route instead of that which had been issued as the clearance; and

f) 1 instance in which the aircraft stated that it had quoted from its navigation computer.

1.3.7 The Group noted the information concerning those occasions when ATC actions at Gander OAC had averted GNEs. It was felt that this type of information would be useful and should be expanded to include indications of occasions when interventions avoided vertical deviations. Other Air Traffic Services (ATS) units should be encouraged to provide similar information.

1.3.8 Notwithstanding these interventions, the Group noted, in its review of GNEs, that incorrect forward estimates are, on occasions, still not being picked-up. The Group felt that future designs of Flight Data Processing Systems (FDPS) could improve this situation.

1.3.9 It was noted that, within the monitoring year, the CMA, on behalf of the Group, had sent letters to the Authorities of two States of Registry whose operators had experienced three or more GNEs within the previous twelve month period. The Group was pleased to note that responses from

the States involved had indicated that steps were being taken to improve the situation. Furthermore, it was proposed that the CMA should carry out further analysis of GNE reports taking into account the frequency of operations in the Region by the operator with a view to encouraging remedial action by those operators.

1.4 Methods of improving the current monitoring procedures

1.4.1 In view of the development work being completed on the proposed Reduced Vertical Separation Minimum (RVSM) in the NAT Region, the Group considered it to be important that the CMA continue to receive reports of all altitude deviations in excess of 300 ft from all Area Control Centres (ACC) or OACs in the NAT Region notwithstanding difficulties in resource allocation.

1.4.2 The Group noted that it was now possible to establish a radar window within the Reykjavik Oceanic Control Area (OCA) and that, together with the ability to make available traffic information in relation to this window, it would be possible to include in the risk analysis GNEs observed by Iceland. The Mathematicians' working group would need to examine the influence on the risk analysis of such GNEs.

CONCLUSION 29/1 - INCLUSION IN RISK ANALYSIS OF GROSS NAVIGATION ERRORS REPORTED BY ICELAND

That:

a) Iceland establish a radar window based on a line extending along the 62nd parallel of latitude from 10W to 30W and thence along that meridian to 68N and forward to the Central Monitoring Agency the following:

i) observed error information relating to the radar window;

ii) monthly Minimum Navigation Performance Specifications traffic counts broken down by random and Organized Track System, excluding those aircraft which would also be counted by Gander and Prestwick;

iii) for the 4th and 15th of each month, flight data for those aircraft transiting Reykjavik area; and

b) the Mathematicians' working group analyse the information supplied with a view of including it in the lateral risk analysis and report the results to NAT SPG/30.

1.4.3 In considering the results of investigations into some errors, the Group found difficulty in identifying the precise elements leading to the deviation, particularly when changes of clearance were involved. The Group felt that this situation could be improved by including, if available, the fact that a reclearance had been involved, in the details noted by the reporting OAC in their letter of notification of the error.

1.4.4 The Group was aware that at a previous meeting, it had been agreed that when it was considered that a reclearance may have some bearing on a GNE, the radiotelephony (RTF) tape, or a suitable copy, should be retained to assist in the subsequent investigation (Conclusion 26/4 refers). The Group agreed that further information regarding clearance negotiations could appreciably assist in the assessment of all GNEs and considerably aid in the identification of the elements leading to the error.

CONCLUSION 29/2 - ACTION TO BE TAKEN BY STATES WHEN DETECTING A GROSS NAVIGATION ERROR (GNE) IN MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) AIRSPACE

That, following a report of a GNE in MNPS airspace:

a) States concerned take necessary measures to obtain information of the clearance negotiations;

b) the reporting Air Traffic Services (ATS) unit request that the action mentioned in a) above be undertaken by the other ATS units concerned; and

c) the information collected be routinely passed to the Central Monitoring Agency.

1.4.5 It was noted that new aircraft types and models with the latest navigation equipment were appearing in GNE reports. The Group felt that it was not able to fully assess all the aspects of such reports in view of the information requested on the "Error Investigation Form" shown on pages E-7 and E-8 of the sixth edition of the Consolidated Guidance Material North Atlantic Region *(NAT DOC 001, T 13/5N)*.

1.4.6 The Group also noted that in cases where more than one error involving the same type of aircraft attributed to one operator occurred, knowledge of the aircraft registration involved may have been beneficial.

1.4.7 The Group felt that the information requested on the 'Error Investigation Form' could better reflect aircraft types and models, navigation equipment and registration details, and therefore agreed that amendments to Parts 2 and 4 of the form, as shown at **Appendix B** to this part of the report, be implemented.

CONCLUSION 29/3 - REVISION OF THE ERROR INVESTIGATION FORM

That:

a) the error investigation form contained in Appendix B to the Report on Agenda Item 1 be used immediately; and

b) the NAT guidance material be amended accordingly.

1.5 Review of in flight contingencies

1.5.1 The Group welcomed the contingency reports from Gander, Shanwick, Reykjavik, Santa Maria and New York OAC/ACCs. The report from New York had missing data from a number of fields for many of the events; accordingly, the Group felt that the New York ATC authorities should be encouraged to ensure that more complete reporting is carried out in future. In this context, it was also felt that details of all reported contingencies within the NAT Region should be summarized.

1.6 1992 collision risk estimation

OCCUPANCY

1.6.1 The Group considered the estimates of lateral occupancy derived by Canada for 30°W and 40°W and by the United Kingdom for 20°W and 30°W. The estimates were for the monitoring period 1 March 1992 to 28 February 1993 and were based on data for the 4th and 15th days of each month; a total of 24 days. However, as data for three of the days in the United Kingdom sample were corrupt, the United Kingdom estimates were based on a reduced data set of 21 days.

1.6.2 The Canadian and United Kingdom occupancy estimates were combined to give overall average estimates for the 1992 monitoring year; these are shown in Table 1.

Table 1 - 1992 Occupancy Estimation

	Same Direction			Opposite Direction		
	OTS	Random	Total	OTS	Random	Total
United Kingdom 20W	1.362	0.236	0.964	0.003	0.013	0.007
United Kingdom 30W	1.382	0.264	1.015	0.002	0.007	0.004
Canada 30W	1.307	0.429	0.975	0.002	0.008	0.004
Canada 40W	1.304	0.438	0.982	0.001	0.004	0.002
1992 Combined Estimate	1.335	0.350	0.980	0.002	0.008	0.004

Note: The overall value is the traffic weighted average of the United Kingdom 20°W estimate and the Canadian 40°W estimate with the traffic weighted average of both 30°W estimates. Table 2 shows the sample traffic counts which were used.

Table 2 - 1992 Sample Traffic Counts

	Traffic Samples		
	OTS	Random	Total
United Kingdom 20W	7542	4123	11665
United Kingdom 30W	7464	3651	11115
Canada 30W	8182	4967	13149
Canada 40W	8176	4833	13009

1.6.3 Table 3 presents same and opposite direction occupancy estimates for the years 1988 to 1992. For same direction traffic, it can be seen that the occupancies for both OTS and random traffic have increased from previous years, leading to an overall increase in occupancy for the total traffic sample.

Table 3 - Occupancy Estimates for the Years 1988 to 1992

		Year				
Direction	Traffic	1988	1989	1990	1991	1992
Same	OTS	1.090	0.995	1.031	1.214	1.335
	Random	0.160	0.302	0.287	0.325	0.350
	Total	0.670	0.697	0.710	0.884	0.980
Opposite	OTS	0.007	0.004	0.002	0.008	0.002
	Random	0.003	0.006	0.006	0.007	0.008
	Total	0.005	0.005	0.004	0.008	0.004

1.6.4 For opposite direction traffic there has been a decrease in the OTS occupancy level from the previous year. This is due to the discontinuation of the practice of publishing OTS tracks for opposite direction traffic 1° separated from other tracks. This practice was in operation for the first half of the previous monitoring year, resulting in a high OTS opposite direction occupancy level. Thus, overall, there has been a decrease in the opposite direction occupancy from 1991.

APPLICABILITY OF THE WEIGHTING SET TO CURRENT ENVIRONMENT

1.6.5 In follow-up to the discussions at NAT SPG/27, it was 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. If the relative same and opposite direction occupancy levels differed too much from the levels used in the derivation, there would be inaccuracy in the weighting set. The occupancy values used in the derivation of the large error weighting set used for risk estimation were 0.45 for same direction occupancy and 0.0055 for opposite direction occupancy. For the 1992 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

1.6.6 Taking into consideration the findings shown in section 1.2 above, 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 in the Zeta area. The results are presented in Table 4.

Table 4 - 1992 Weighted Gross Navigation Errors

			Weighted GNEs		
Class	>30 NM	Risk Bearing	OTS	Random	Total
A	0	0	0.00	0.00	0.00
B	2	2	0.00	0.91	0.91
C1	4	4	0.58	0.99	1.57
C2	3	2	0.00	0.66	0.66
D	0	0	0.00	0.00	0.00
E	0	0	0.00	0.00	0.00
F	1	0	0.00	0.00	0.00
Unknown	0	0	0.00	0.00	0.00
Total	10	8	0.58	2.56	3.14
Sample Traffic Count			122424	81616	204040
Error Rate x 10-4			0.05	0.31	0.15

1.6.7 Table 5 presents weighted risk bearing error rates for the years 1988 to 1992. (It should be 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.) It can be seen that both the OTS and the random rate have shown a substantial decrease from previous years. Hence the rate for the combined traffic sample has also decreased.

Table 5 - Risk-Bearing Error Rates (x 10^{-4})
for the Years 1988 to 1992

Traffic Sample	YEAR				
	1988	1989	1990	1991	1992
OTS	0.27	0.29	0.16	0.15	0.05
Random	1.73	0.80	0.90	0.90	0.31
Total	0.86	0.49	0.45	0.45	0.15

COLLISION RISK

1.6.8 Collision risk estimates for OTS and random traffic can be calculated using the Reich model. However, 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.

1.6.9 The CMA reported a total of 204,040 flights at the monitoring windows for the 1992/93 monitoring year. This total was used to estimate error rates. Using the conventional 60/40 OTS/random split resulted in estimates of 122,424 OTS aircraft and 81,616 random aircraft. The NAT Traffic Forecasting Group (NAT TFG) provided an estimate of 228,200 aircraft operating within NAT airspace during 1992. Thus, making the assumption that all OTS flights are seen at the monitoring windows, 105,776 random flights are 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 10,074. Thus the total number of random aircraft operating within MNPS airspace was calculated as 95,702.

1.6.10 Table 6 presents lateral risk estimates for the 1992 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 estimate 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.

Table 6 - 1992 Risk Estimates for MNPS airspace

Traffic Type	Total MNPS Count	Risk x 10^{-8}
OTS	122424	0.33
Random	95702	0.69
All MNPS	218126	0.49

1.6.11 Table 7 presents lateral risk estimates for the years 1988 to 1992. As in Table 5, the figures for years previous to 1990 have been calculated retrospectively.

Table 7 - Lateral Risk Estimates for the Years 1988 to 1992

Risk (x 10^{-8})	1988	1989	1990	1991	1992
OTS	1.62	1.49	0.87	0.98	0.33
Random	1.67	1.46	1.59	1.83	0.69
All MNPS	1.64	1.47	1.22	1.38	0.49

BREAKDOWN OF THE RISK INTO COMPONENTS

1.6.12 Based on the agreed error classes, Table 8 presents a breakdown of the 1992 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. ATC loop errors and waypoint insertion errors (B, C1 and C2) accounted for all of the estimated risk in the current monitoring year. Errors of this type persisted despite training efforts aimed at their elimination and the introduction of advanced cockpit technology (some of the waypoint insertion errors were committed on aircraft with glass cockpits and mapping displays).

Table 8 - Analysis of Components of the Risk for 1992

	Traffic Type		
Error Class	OTS	Random	MNPS
A	0.0 (0)	15.4 (2)	0.0 (0)
B	0.0 (0)	0.0 (0)	15.6 (2)
C1	100.0 (1)	35.5 (2)	73.1 (4)
C2	0.0 (0)	38.7 (3)	11.3 (2)
D	0.0 (0)	25.8 (2)	0.0 (0)
E	0.0 (0)	0.0 (0)	0.0 (0)
F	0.0 (0)	0.0 (0)	0.0 (0)
Unknown	0.0 (0)	0.0 (0)	0.0 (0)
Total	100 (1)	100 (7)	100 (8)

FUTURE DEVELOPMENTS IN LATERAL RISK ESTIMATES

Traffic outside Gander and Shanwick Airspace

1.6.13 The Group discussed the effect of the increasing use of OTS tracks entirely below latitude 45°N. This traffic was not recorded by Shanwick or Gander and was therefore not included in the traffic counts and occupancy estimates used in the collision risk estimation process. It was agreed that the effect was likely to be very minor but, in future, if data became available from New York and/or Santa Maria OACs the possibility of updating the analysis to incorporate this information would be considered. It was suggested that, when designing future automated systems, New York OAC consider supplying traffic data in electronic format for collision risk estimation and other analyses.

Use of actual OTS and random traffic counts

1.6.14 The Group examined the proportions of OTS and random traffic recorded in the actual traffic counts now available from Gander and Shanwick OACs for the 1992/93 monitoring year. The actual split was 62% OTS and 38% random. This compares closely with the estimate used this year and previously of 60% OTS and 40% random. The difference in the risk estimates produced using the actual traffic counts was of the order of 1%. The Group agreed that in future the actual values

should be used in the risk calculations as part of the process of continuous refinement of the lateral collision risk estimation process.

Use of monthly occupancy estimates by the CMA

1.6.15 The Group discussed the results of a trial of providing data on a monthly basis for the estimation of moving twelve month average occupancies for use in the collision risk estimates contained in the monthly CMA reports. It was recommended that the CMA base its monthly reports on the occupancies obtained from the most recently available 12 month period.

CORE NAVIGATION PERFORMANCE

1.6.16 Information which described the results of an analysis of the lateral navigation accuracy of westbound aircraft leaving the NAT airspace between June and August 1992 was presented. This study found the sample standard deviation of lateral deviations from track for those aircraft exiting MNPS airspace to be 1.9 NM. This value was consistent with those found in previous studies of westbound aircraft and was well within the MNPS requirement of 6.3 NM. In addition, the performance of aircraft operating above and below MNPS airspace was examined. Those aircraft operating above MNPS airspace had a performance consistent with that observed for MNPS aircraft (Standard Deviation (SD) 2.2 NM). For aircraft operating below MNPS airspace the lateral navigation performance was significantly worse (SD 3.9 NM).

PRESENTATION OF RESULTS

1.6.17 Figures 1, 2 and 3 of **Appendix C** show trends in occupancy, risk bearing error rates and sources of error respectively from 1987 to 1992. It was felt that the presentation of the data in graphical form would assist the NAT SPG in the identification of trends in the behaviour of the system components.

1.6.18 The graphs represented the principal components of interest in estimation of the risk. Occupancy (Figure 1) had been portrayed in "standard units" which included both same and opposite direction lateral occupancy estimates in combination with their respective parameters from the collision risk model. That is, the formula:

$$O_{standard\ units} = E_y(same)\left[\frac{|\overline{\Delta V}|}{2\lambda_x} + \frac{|\overline{\dot{y}(60)}|}{2\lambda_y} + \frac{|\overline{\dot{z}(0)}|}{2\lambda_z}\right] + E_y(opp)\left[\frac{2|\overline{V}|}{2\lambda_x} + \frac{|\overline{\dot{y}(60)}|}{2\lambda_y} + \frac{|\overline{\dot{z}(0)}|}{2\lambda_z}\right]$$

had been used. This allowed the year to year comparison with reference to a common basis.

1.6.19 Figure 2 shows the risk bearing error rates for OTS, random and all MNPS traffic from 1987 to 1992.

1.6.20 Figure 3 was based on the data presented in Table 8 above and showed the number of risk bearing errors in three categories - human errors (B, C1 and C2), non-approved users (A) and navigation errors (D, E and F) occurring for the years 1987 onwards. It could be seen from Figure 3, that risk bearing errors committed in MNPS airspace by non-approved users had decreased steadily over the period shown. This could be attributed to the success of the tactical monitoring for non-approved users and continued vigilance was encouraged. Errors due to aircraft suffering an equipment failure had also decreased, however, errors having a human cause had remained at a

consistent level. The Group encouraged the continued close observance of correct operational procedures in order to decrease the occurrence of this type of error.

CONCLUSION 29/4 - PRESENTATION OF THE ANNUAL SYSTEM APPRAISAL

That graphs, similar to those shown in Appendix C to the Report on Agenda Item 1, be included for a period up to ten years in the annual system appraisal report.

1.6.21 The possibility of deriving a confidence estimate on the risk was discussed. It was noted that, fortunately, the small number of errors which had occurred increased the difficulty of this process. It was agreed that the United Kingdom would continue to look at possible methods for the inclusion of confidence intervals in the presentation of risk estimates.

1.7 Aspects of the future NAT System

IMPLICATIONS OF THE USE OF FUTURE TECHNOLOGIES IN THE NAT

Automatic Dependent Surveillance (ADS)

1.7.1 The Member for the United Kingdom presented information which described an initial investigation into the effects of ADS in the NAT Region. It was pointed out that the scenario considered was very much simplified. The results indicated that although the introduction of ADS may afford substantial safety benefits, it alone would not be sufficient to allow reduced lateral separation to 30 NM, if a future lateral TLS equal to the agreed vertical TLS was adopted (5×10^{-9} fatal accidents per flight hour). However, analysis of the GNEs which ADS could not be assumed to eliminate showed that a large proportion were committed by aircraft which did not have MNPS approval or by aircraft having older navigation systems such as OMEGA. It was noted that the frequency of such errors reported in recent years had diminished. Indeed, Tables 4 and 8 indicated no such risk bearing errors in the last monitoring year. Elimination of these errors, in addition to those assumed to be removed by ADS, reduced the estimate of lateral collision risk to a level below the possible future TLS of 5×10^{-9} fatal accidents per flight hour.

1.7.2 The Group felt that improved links with the NAT ADS Development Group (ADSDG) would be of mutual benefit. In particular the Mathematicians' working group would require detailed information on how ADS systems would be used by ATC. The United Kingdom presented data which listed the types of information on ADS which would be required in order to assess the extent of the safety benefits which might be achieved and indicated which items would be provided by the United Kingdom ADS trials. The United States updated the Group on the progress of analysis from the Pacific Engineering Trials. Analysis of the data from these trials was continuing and the Federal Aviation Administration (FAA) was also involved in the North Atlantic trials.

Future Collision Risk Models

1.7.3 The Member for Canada presented information which described work which had been performed under contract to Transport Canada on new methods for the assessment of collision risk in the future CNS/ATM systems. New collision risk assessment techniques would be necessary in the NAT Region as new technologies were introduced allowing reduced separations resulting in more aircraft receiving optimum time tracks, greater use of crossing routes, and changes in the current procedures. The future CNS/ATM systems would allow a more dynamic tactical operating capability. In this context, a new method for assessing the utilisation of the airspace based on the achieved minimum separations between aircraft in time and space was presented to the Group. The proposed

method could allow aircraft pairs with better navigation performance to receive reduced separations without violating an established TLS. The Group suggested that it would be useful to test the concepts of the methodology using data for the current system. In this context, it was noted that Transport Canada would make their information available to other NAT provider States and would inform the ICAO Review of the General Concept of Separation Panel (RGCSP).

LONGITUDINAL AND HORIZONTAL SEPARATION

1.7.4 The Member for the United States presented information which outlined work being performed or planned in the United States to investigate possible methods of reducing horizontal separation minima. In particular, the work was planned to explore the possibility of taking account of different aircraft navigation performance, communication or surveillance equipment, to allow the use of different separation minima between sub-groups of the aircraft population. This approach would allow the analysis of reduced lateral or longitudinal separation between suitably equipped aircraft in the system. Initially the work would involve making changes to the way in which aircraft overlap probabilities were estimated. Following that, a thorough examination of the longitudinal collision risk model would be undertaken. In outlining the future work, it was pointed out that the plan called for starting with the existing collision risk methodology and selectively relaxing the assumptions to allow analysis of a more interactive control environment. Finally, it was proposed that a more generalised collision risk model be employed that would be used to analyse route intersections. This model existed but had not been used practically. The United States believed that the theoretical foundations behind collision risk methodology were sound and that adequate flexibility existed to analyse the future technology and oceanic environment contemplated by the NAT SPG. The Group expressed interest in this work and hoped to be kept informed of progress in the research.

1.7.5 The use of reduced separations for aircraft with high performance navigation could give benefits to those operators who fitted new equipment. If employed, this would encourage the fitting of improved systems. IATA expressed the view that any such changes should not penalise operators which did not have the appropriate equipment until such fit became mandatory.

1.7.6 The Member for the United States also presented information which described the results of research applicable to the lateral overlap probability between aircraft sub-populations with different navigational characteristics. This work sets out the mathematical foundation for analysing situations when routes for better performing aircraft might be erected between existing routes established for ordinary aircraft. Work was continuing in the United States to examine the sensitivity of the overlap probability to the distribution parameters. In this context, Canada and the United Kingdom expressed their support for the research being carried out.

1.7.7 The Group was presented with information that described the results of research carried out to examine the core lateral navigation accuracy of southbound aircraft operating within the Western Atlantic Route System (WATRS) airspace. This work followed on a previous analysis of northbound aircraft presented to NAT SPG/28. The main conclusion of the analysis was that aircraft fitted with modern precision navigation systems showed a lateral navigation performance which was significantly better than that displayed by aircraft with older navigation equipment. The Group agreed that this work could be relevant to the NAT MNPS airspace although the mix of aircraft in the WATRS area was not the same. The navigation accuracy is an important factor in determining the collision risk and the presence of sub-populations of aircraft in the system with significantly different navigation performances could effect the risk estimation.

1.7.8 The Group was also presented with information which described the results of an analysis of aircraft time keeping accuracy in the San Juan Flight Information Region (FIR). The United States indicated that there were no known requirements for maintaining aircraft clocks within a standard of accuracy. A total of 406 aircraft were surveyed with the sample having an SD of 28.7 seconds. This was better than expected, however further research was planned to assess the two major components of time keeping error - clock setting error and clock drift. This work was important both for research into the possibility of reducing longitudinal separation, and for applications of ADS which use aircraft clock times. Work was continuing in the United States on this project.

1.7.9 In addition to clock accuracy, information on the differences between estimated and actual time separations between pairs of aircraft was necessary for the estimation of longitudinal collision risk. Canada was currently developing a method for extracting this information from data recorded at Gander OAC. This work should be completed by early 1994, and should provide necessary data for the analysis into the feasibility of reducing longitudinal separations within the NAT Region.

1.7.10 The observer from IATA proposed that efforts should be directed at reduction in longitudinal separation in the very near term, to provide additional airspace capacity, particularly in the OTS. Recognizing that consideration of reduced longitudinal separations for crossing or random traffic may be more complex, IATA urged that the potential benefits of such reductions in the OTS should not be delayed pending the resolution of those more complex situations.

EFFECTS OF NAVIGATION ACCURACY ON COLLISION RISK

1.7.11 Information which described an analysis of the effects of changes in lateral navigation accuracy on vertical collision risk within the NAT MNPS airspace was reviewed. In predicting the future level of risk, it was necessary to forecast not only lateral navigation changes that might occur in the future but also the changes in traffic levels and the resulting changes in occupancy. For the purpose of this analysis, the reported rate of large height deviations was assumed to be constant over the period examined. The Group noted that lateral navigation accuracy improvements were detrimental to the vertical collision risk but would not become a major problem in a system with the current design unless navigation accuracy had an SD less than 1 NM. Until a substantial proportion of the aircraft population was fitted with highly accurate navigation systems such as Global Navigation Satellite System (GNSS) based equipment, this should not be a problem. However, based on the assumption of constant rates of large errors and the forecast traffic growth, the analysis predicted that the vertical TLS could be exceeded in 1999. This emphasised the importance of reducing the occurrence of large errors or their consequences. This could be achieved through improved procedures and education of the user population, the use of ADS systems to allow ATC surveillance and intervention or the application of lateral offsets designed to reduce the vertical overlap probability. IATA pointed out that the risk would actually be worse if RVSM were not introduced and operational errors remained at their current high rate.

VERTICAL OCCUPANCY AND RISK

Predicting future occupancy

1.7.12 The Member for Canada presented information which described a computer programme which simulated the allocation of traffic to routes and flight levels that could be expected with 1000 ft RVSM. The demand pattern used by this simulation had been derived from cleared flight plans as recorded by Gander. Two methods for the re-assignment of aircraft to the new levels

were considered: (i) 25% of the traffic redistributed to the even flight levels; (ii) 50% redistributed to the even levels.

1.7.13 For each of these cases, four levels of traffic were simulated: current baseline, 25% growth, 50% growth and 100% growth. Differences in vertical occupancies between 2000 ft and 1000 ft Vertical Separation Minima (VSM) environments showed substantial reductions for both OTS and random traffic, although this effect reduced as traffic levels increased. Lateral occupancies were also reduced, but to a lesser extent.

1.7.14 The Group discussed the effect that different routeing demands from operators would have on the results. In particular, the possible tendency for aircraft to concentrate on the core OTS tracks as more flight levels become available was considered. Canada would investigate the sensitivity of the results to this effect. It was agreed that it might be better to use requested routeings rather than cleared routeings in the simulations. The United Kingdom would provide a sample of requested routeings from Shanwick data. Canada would make copies of the computer model and of supporting documentation available for review and comment.

CONCLUSION 29/5 - COMPUTER SIMULATIONS TO PREDICT FUTURE OCCUPANCY

That computer simulation, of the type developed by Canada, be used in predicting the future occupancy for use in collision risk assessment prior to implementation of reduced vertical separation minimum in the NAT Region.

1.7.15 The Group considered the assessments of vertical occupancy in the NAT Region during the 1992/93 monitoring year. The vertical occupancy would be an important element in the assessment of vertical collision risk. Both analyses used the same techniques and data as were used for the lateral occupancy work described in section 1.6, 1.6.1 of this report. The results of the analysis are summarised in Table 9.

Table 9 - Summary of Vertical Occupancy Estimates for 1992/93

			OTS	Random	Combined
20° United Kingdom	Same	East	1.517	0.220	1.050
		West	1.201	0.215	0.860
		Total	1.365	0.218	0.960
	Opposite		0.007	0.040	0.019
30° United Kingdom	Same	East	1.538	0.235	1.096
		West	1.208	0.202	0.899
		Total	1.378	0.220	1.004
	Opposite		0.003	0.032	0.012
30° Canada	Same	East	1.508	0.425	1.971
		West	1.184	0.230	0.851
		Total	1.347	0.340	0.967
	Opposite		0.003	0.025	0.011
40° Canada	Same	East	1.511	0.447	1.094
		West	1.192	0.238	0.858
		Total	1.353	0.352	0.981
	Opposite		0.004	0.023	0.011

1.7.16 It was agreed that in future the analysis of vertical occupancy should include an estimate of the equivalent opposite direction passing frequency.

Classification of height deviations

1.7.17 The Group discussed the need for a classification scheme for large height deviations and agreed on an interim scheme which was based on a two part code and, where necessary a weather indicator. The first part of the code consisted of a number (1-3) which identified the region of airspace in which the final flight level was located. The codes were as follows:

1 Final level within MNPS airspace
2 Final level above MNPS airspace
3 Final level below MNPS airspace

1.7.18 The second part of the code is a letter (A-I or O) which identifies the type of event that caused the deviation.

A	Contingency action due to engine fault
B	Contingency action due to pressurisation failure
C	Contingency action due to other cause
D	Failure to climb/descent as cleared
E	Climb/descent without ATC clearance
F	Entry to MNPS airspace at an incorrect level
G	ATC FL re-clearance resulting in loss of lateral or longitudinal Separation
H	Deviation due to TCAS
I	Aircraft unable to maintain level
O	Other

1.7.19 Finally the weather modifier, W, is to be included in brackets if the cause of the event is due to weather conditions (particularly turbulence).

1.7.20 As indicated above, the Group agreed that this categorisation scheme should be adopted by the CMA as an interim measure subject to further review. It was emphasised that categorisation was only an aid to analysis of the incidents and that detailed scrutiny of each deviation was still an essential part of the overall analysis.

1.7.21 The total time spent at incorrect levels was a vital piece of information for vertical collision risk estimation. Reporting authorities were encouraged to include as much information on event times as possible in incident reports. Time spent at incorrect flight levels could then, when possible, be estimated directly from the incident reports. The Group agreed that the CMA should continue to produce estimates of the time spent at the incorrect level based on the best available information in its monthly reports.

1.7.22 The Group was presented with information concerning an analysis of large height deviations recorded in the Canadian Civil Aviation Daily Occurrence Reporting System (CADORS). In comparing the CADORS reports with those presented by the CMA, one incident was found which had not been sent to the CMA. The full reporting of height deviations was an essential part of the vertical collision risk assessment. There was some concern that all incidents were not being reported to the CMA as a large majority of those events reported appeared to come from Gander OAC. Other OACs/ACCs were encouraged to ensure that all incidents were recorded and reported to the CMA. Based on the reports received by the CMA, the level of incidents was not sufficiently high to preclude implementation of RVSM on current timescales but would need to be reduced to ensure that operations would remain below the TLS into the future.

1.8 Mathematicians work programme for 1993/94

1.8.1 The following work programme was planned for the period up to NAT SPG/30. The dates in the programme were subject to revision as some of the work was dependent on the work of other working groups:

1. **Canada and United Kingdom** to undertake comparative analysis of Reykjavik data for possible use in estimating NAT risk by NAT SPG/30.

2. **United Kingdom** to look at methods for inclusion of confidence intervals in risk estimates by NAT SPG/30.

3. **ALL** to look at data from ADS trials in relation to estimating risk reduction. Ongoing.

4. **Canada** to progress work on the future risk estimation model and report progress to NAT SPG/30.

5. **United States** to examine the mathematical foundation of reduced separation minima based on future aircraft and system performance. (By November 1993).

6. **Canada** to analyse data from Gander with reference to longitudinal performance and relative along track velocities for lateral and vertical aircraft pairs. (By February 1994).

7. **United States** to review longitudinal risk model. (By February 1994).

8. **United Kingdom** to develop documentation for direct vertical risk estimation technique. (By February 1994).

9. **United States** to develop documentation for sequential sampling approach. (By February 1994).

10. **ALL** to produce a vertical risk assessment guidance document by NAT SPG/30.

11. **ALL** to examine the proposed methodology for assessment of risk from contingency manoeuvres and operational errors. (By November 1993).

12. **Canada and the United Kingdom** to examine data for HMU sites in Canada and in the United Kingdom. (By November 1993).

13. **ALL** to consider proposals for RVSM monitoring systems. (By November 1993)

14. **ALL** to consider detailed proposals for a height monitoring programme. (By November 1993)

15. **Canada** to examine the sensitivity of forecast occupancies to aircraft bunching by NAT SPG/30.

- - - - - - - - - - - - - - - - -

APPENDIX A - ERROR CLASSIFICATION TABLE

(Paragraph 1.2.2 refers)

CLASSIFICATION	30 NM ETA ERRORS	RISK BEARING ERRORS		
		Total MNPS Traffic	OTS Traffic	Random Traffic
		Revised Model 2	Revised Model 2	Revised Model 2
A	0 (5)	0	0	0
B	2 (0)	0.91	0	0.91
C1	4 (6)	1.57	0.58	0.99
C2	3 (7)	0.66	0	0.66
D	0 (0)	0	0	0
E	0 (0)	0	0	0
F	1 (5)	0	0	0
Not Classified	0 (0)	0	0	0
TOTAL	10	3.14	0.58	2.56
TOTAL IN LAST PERIOD	23	7.26	1.57	5.69
OBSERVED TRAFFIC		204040	122424	81616
LAST MONITORING PERIOD		177222	106333	70889

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

- - - - - - - - - - - - - - - -

APPENDIX B - SAMPLE OF ERROR INVESTIGATION FORM

(Paragraph 1.4.7 refers)

(Name and address of reporting agency):				
Please complete Parts 2 and 3 (and Part 4 if applicable) of this investigation form. A copy, together with copies of all relevant flight documentation (fuel flight plan, ATC flight plan and ATC clearance) should then be returned to the above address and also to: the North Atlantic Central Monitoring Agency, Room T805 (Attn INT 6); CAA House, 45/59 Kingsway, London WC 2B 6TE, England				
Part 1 - General Information				
Operator's name				
Aircraft identification				
Date/time of observed deviation				
Position (latitude and longitude)				
Observed by (radar unit)				
Aircraft flight level				
Part 2 - Detail of Aircraft and Navigation Equipment Fit				
Number Type	**INS**	**OMEGA**	**IRS/FMS**	**OTHER (please specify)**
Single Dual Triple				
Model No.				
Navigation system Programme No.				
State which system coupled to auto-pilot				
Aircraft Registration and Model/Series				

Part 3 - Detailed description of incident

Please give your assessment of the actual track flown by the aircraft and the cause of the deviation (continue on a separate sheet if required)

Part 4 - Only to be completed in the event of partial or full navigation failure

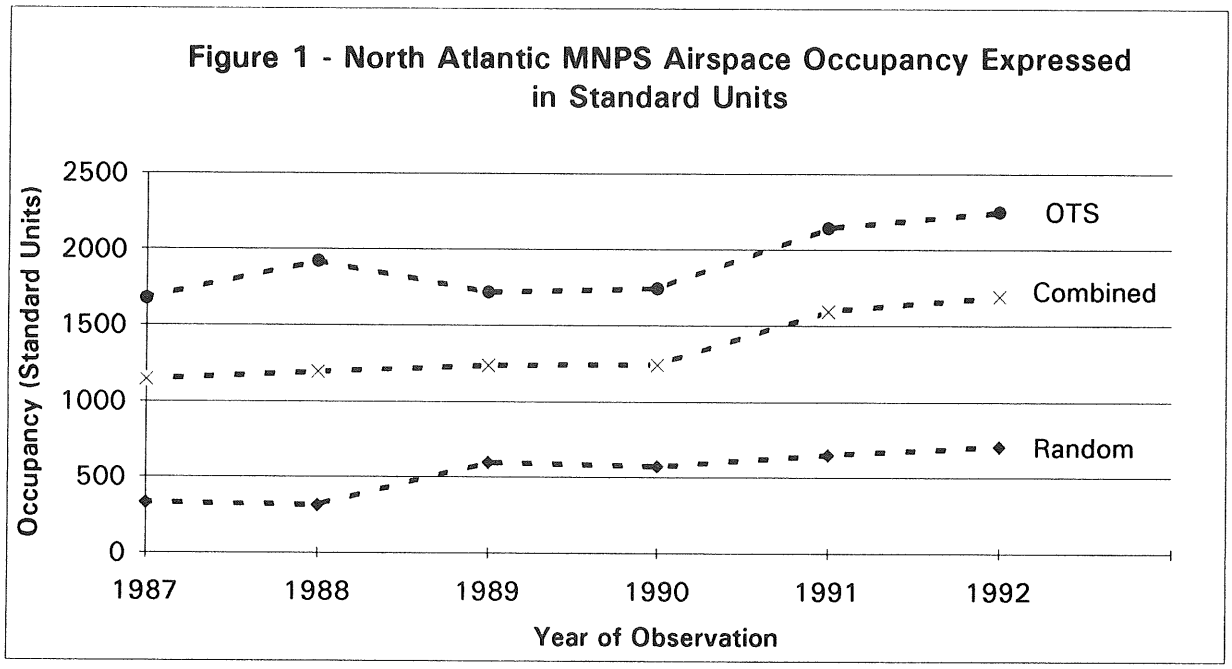
Indicate the number of equipment units which failed	**INS**			**Omega**			**IRS/FMS**			**Other**			
Circle estimated longitude at which equipment failed	60°W	55°W	50°W	45°W	40°W	35°W	30°W	25°W	20°W	15°W	10°W	5°W	0° E/W
Give an estimate of the duration of the equipment failure	Time of failure : Time of exit from MNPS : Duration of failure in MNPS :												
At what time did you advise ATC of the failure ?													

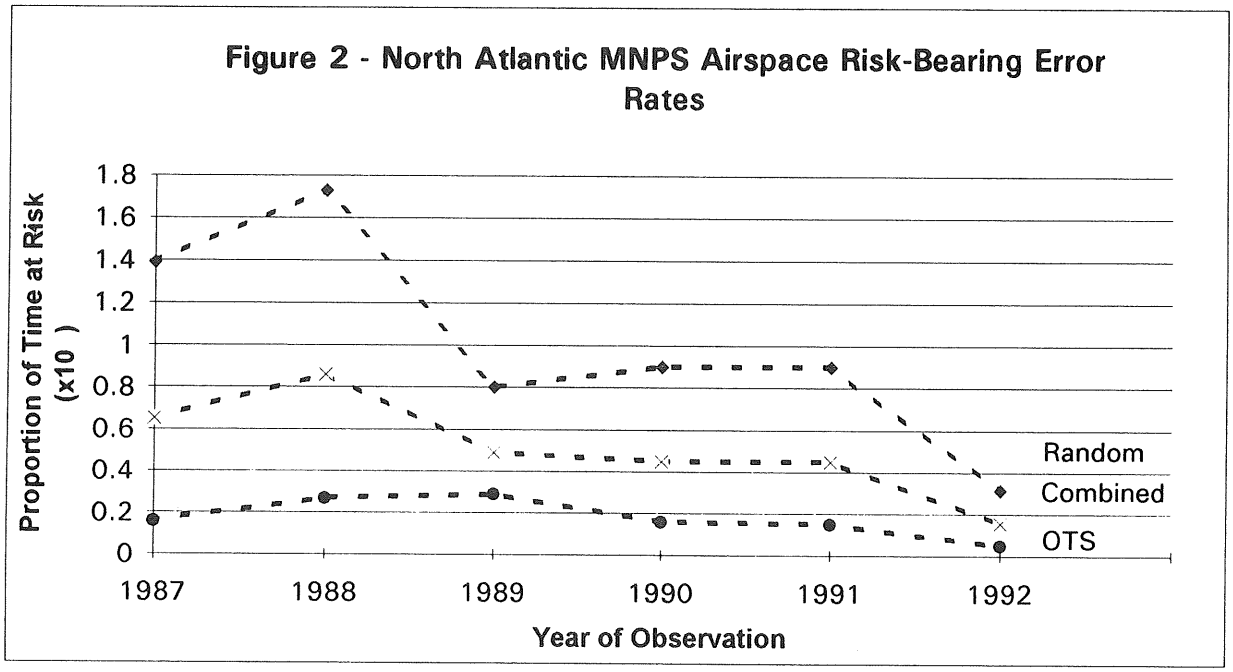
Thank you for your co-operation

- - - - - - - - - - - - - - - -

APPENDIX C - TRENDS IN NAT MNPS AIRSPACE BEHAVIOUR

(Paragraph 1.6.17 refers)





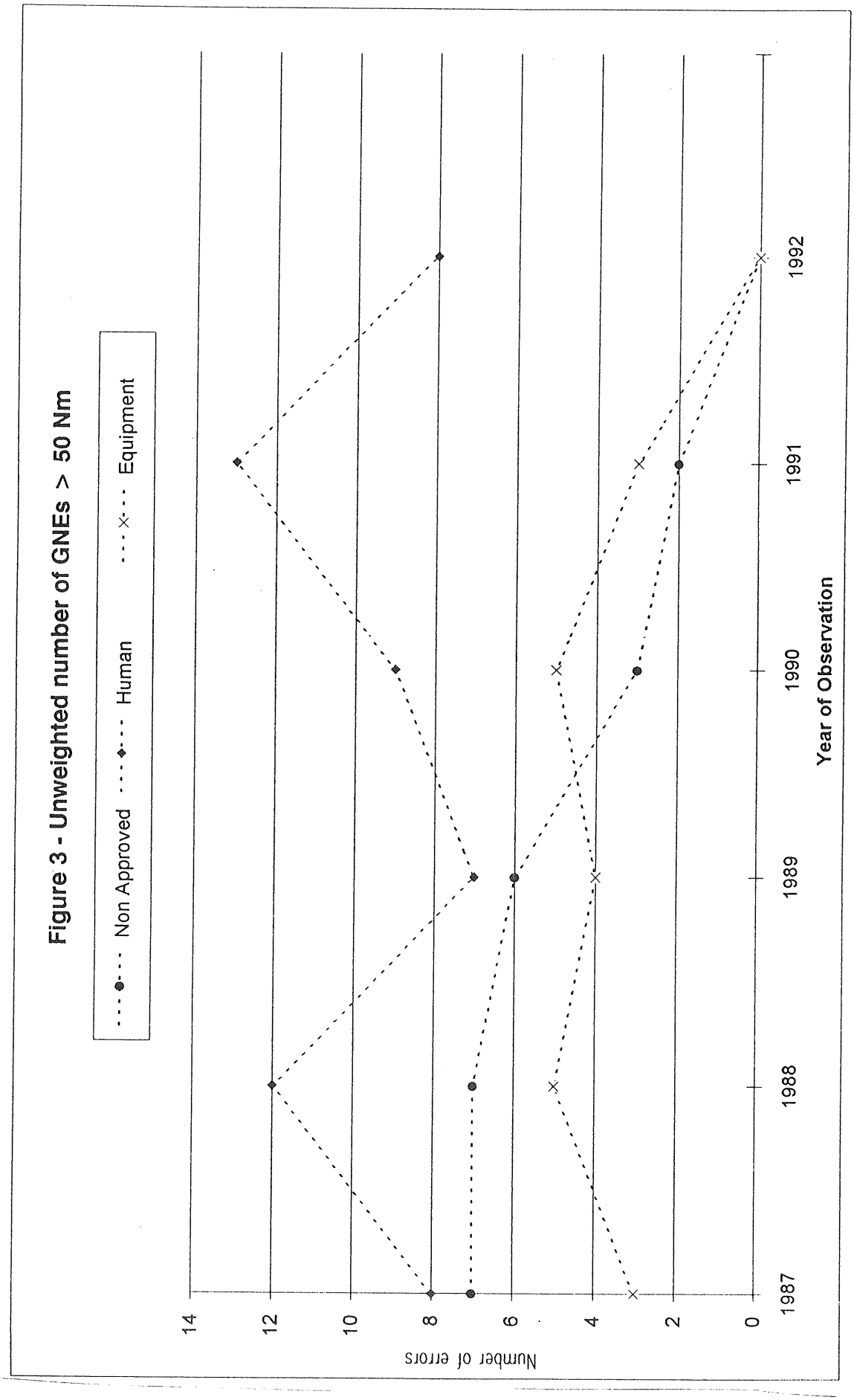


Figure 3 - Unweighted number of GNEs > 50 Nm
Non Approved
Human
Equipment
Number of errors
0
2
4
6
8
10
12
14
1987
1988
1989
1990
1991
1992
Year of Observation

AGENDA ITEM 2: NAT AIR NAVIGATION SYSTEM OPERATIONS REVIEW

2.1 Introduction

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

a) air traffic services operations;

b) communication operations; and

c) determination of the performance assessment of the NAT Air Navigation System and the services provided to the airspace users by ATC

2.2 Air Traffic Services operations

SEPARATION STANDARDS FOR TURBOJET AIRCRAFT OPERATING OUTSIDE MNPS AIRSPACE

2.2.1 In 1989, New York OAC expanded its area of service to 18°N. Accordingly, New York OAC started to provide services in an area where the ICAO Caribbean (CAR) *Regional Supplementary Procedures* (SUPPs Doc 7030) were applicable. In researching the separation standards to use in the WATRS area, New York OAC became aware that in CAR SUPPs the 15 minute longitudinal separation standard for turbojets not on airways was applied whereas the NAT SUPPs did not contain this provision. This situation led to difficulties as two separation minima for the same aircraft had to be applied within the same FIR depending on the aircraft location. In this context, it was pointed out that differences in separation standards utilized for the same aircraft as it crossed center boundaries only caused confusion and increased complexity. Furthermore, it was noted that the large majority of the aircraft operating in the WATRS area for which the 15 minute longitudinal separation standard was not specified, were in transit to or from areas where 15 minutes or less longitudinal separation was utilized.

2.2.2 It was noted that reduced separation standards used in the WATRS and MNPS airspace were based on aircraft performance and equipment. Several studies of over-ocean aircraft indicated performance improvements over that exhibited when the original 20 minute rule was agreed on. In addition, better reporting and recording methods tended to reduce the possibility of there being large excursions from planned oceanic crossing points.

2.2.3 The Group felt that during the last amendment of the NAT SUPPs, the inclusion of the 15 minute longitudinal separation standard for all other turbojet aircraft and the 20 minute longitudinal separation standard between non turbojet aircraft for application in the WATRS was inadvertently omitted. Accordingly, the Group endorsed the inclusion in the NAT SUPPs of the 15 and 20 minute standards for longitudinal separation between turbojet and non turbojet aircraft in the WATRS area and agreed that the Member for the United States make the necessary arrangements within his administration to initiate action to have the NAT SUPPs amended accordingly.

CONCLUSION 29/6 - AMENDMENT TO THE NORTH ATLANTIC REGIONAL SUPPLEMENTARY PROCEDURES (NAT SUPPs, DOC 7030)

That the Member for the United States make the necessary arrangements within his administration to initiate action to have the NAT SUPPs amended in order to include the following:

" On page NAT/RAC-13, dated 2/4/90

Add to paragraph 7.2.3.1

3) 15 minutes between turbojet aircraft not covered by 1) or 2) above.

4) 20 minutes between non turbojet aircraft."

DOMESTIC/OCEANIC INTERFACES AND TRANSITION PROBLEMS ADJACENT TO NAT MNPS AIRSPACE

Eastbound OTS Information and flight planning procedures

2.2.4 The Group was presented with information on trends concerning the production and timing of OTS information and flight plans. It was recalled that providers required that flight plans be produced well in advance of the planned departure time for transoceanic flights but that flight planning cannot begin until all relevant OTS information was available. As transoceanic flight planning has become a somewhat complex procedure requiring a labour-intensive effort, operators stressed the effects of the critical time constraints imposed by flight plan production deadlines and the need to have all relevant OTS information available prior to flight plan production.

2.2.5 The Group noted the concern and stressed the importance of publishing Eastbound OTS information in a timely manner while States concerned agreed that improvements can be made and are in fact making attempts at such improvements where possible. In this context, the Group noted that the United States expected the Oceanic Display and Processing System (ODAPS) to be available by the Autumn of 1996 and has additional plans to implement an oceanic planner position for the purpose of improving coordination, therefore providing enhancements to timeliness and availability of necessary information. The imposition of a rigid time standard, however, for the publication of all OTS related information in a single message format was not considered feasible. It was noted that information becomes available at various times and was published according to a pre-arranged format. It was noted that a single message format published at a standard time would have the net effect of actually delaying the publication of the NAT track message.

2.2.6 The Group noted other concerns of the operators dealing with perceived Eastbound OTS message irregularities and information inconsistencies. In this context, it was agreed that efforts could be made toward improved coordination between the providers concerning OTS and Air Traffic Flow Management (ATFM) requirements. The Group was made aware that events often occur which cause disruption and inconsistencies in the daily planning process because ATFM requirements cause operators to fly routes to join the OTS which had not been planned for. The Group agreed to investigate the concern and make further efforts aimed at avoiding inconsistencies between OTS and ATFM requirements.

CONCLUSION 29/7 - COORDINATION BETWEEN PROVIDER ORGANIZATIONS

That provider States concerned make arrangements that would allow daily coordination with each other, prior to the construction of the daily OTS message, in order to preclude the publication of contradictory information and to ensure timeliness of all related information.

Reduced Vertical Separation Minimum Transition Area simulation

2.2.7 The Group was presented with a progress report on simulation studies regarding the impact of the introduction of RVSM in the NAT Region on transition areas. The Group recalled that States concerned should make every effort to carry out the required simulation of the RVSM transition areas so as to avoid any consequent delay in the implementation of the RVSM. It was further noted that a preparatory meeting had been held in Shannon in November of 1992 involving France, Ireland, Portugal and the United Kingdom to explore the possibility of a joint approach to RVSM transition area simulation. At that meeting, France and Ireland had agreed to participate fully in the simulation studies, both fast and real time, while Portugal and the United Kingdom had indicated that they would participate as observers in the fast time simulation. In the same context, the United Kingdom advised the Group that they were progressing with their own simulation studies and expected to have them completed by the end of 1994 and would provide support to France and Ireland in their real time studies.

2.2.8 The Group also noted that Canada and the United States were progressing steadily with simulation studies and were satisfied with their progress made and ability to meet simulation requirements.

ATFM matters

2.2.9 Following information received from EUROCONTROL, the Group noted the recent problems experienced by the Brest ACC in integrating the NAT Eastbound traffic. It was suggested that this might be a symptom of a potentially larger problem that could affect other European ACCs. The Member for France indicated that the increase in NAT traffic transiting the Brest ACC had increased by 25%-27% over the last two years, and was causing difficulties to the French Air Traffic Management (ATM) system. The Group therefore felt that action should be taken by the States in the EUR Region to identify the specific problems and to develop appropriate solutions. To this end, the Group noted with appreciation the offer by the United Kingdom to coordinate the necessary work required to address this issue with the relevant ATM experts in the NAM/NAT/EUR regions.

POSSIBLE FURTHER SHORT TERM ATM IMPROVEMENTS AND DETERMINATION OF ACTION FOR THEIR IMPLEMENTATION

High Frequency (HF) VOLMET broadcast plan

2.2.10 In follow-up to the Limited North Atlantic Regional Air Navigation (LIM NAT RAN) (1992) Meeting Conclusion 2/4, a proposal to review the HF VOLMET plan was examined. In so doing, it was agreed that the VOLMET system should, as its first priority, serve those user needs which were most critical and could not be served by other means. In this context, the Group was informed that new meteorological codes would come into effect on 1 July 1993 and that those new codes could have an influence on the information broadcast and in particular, as concerns time availability. With the above in mind, it was agreed that the broadcast plan be reviewed and where necessary amended/abridged using the following prioritized principles:

a) ensure the inclusion of emergency diversion and en-route alternate aerodromes in the NAT Region;

b) ensure aerodromes in each time slot are broadcast in their order of operational importance to obviate any necessary truncation affecting the most operationally significant aerodromes;

c) delete aviation routine weather reports (METAR) for aerodromes well within the EUR or NAM regions;

d) delete aerodrome forecasts (TAF) for aerodromes within the NAT Region; and

e) eliminate TAFs for aerodromes furthest from the borders of the NAT Region.

2.2.11 It was noted that implementation of the new MET codes may lead to an increase in HF voice traffic due to non-familiarity, particularly when the new codes are first used. Furthermore, not all providers would have implemented them by 1 July 1993. In this context, it was also noted that providers may encounter some difficulties during the transition period if two different sets of codes were received. This would be especially problematic for automated systems. Accordingly, the Group agreed that the proposed HF VOLMET broadcast plan which is at **Appendix A** should be used as a basis for developing a revised HF VOLMET plan. Other implementation concerns, including, inter alia, software enhancements, lead times and coordination of MET product distribution would also need to be addressed and reviewed at NAT SPG/30.

CONCLUSION 29/8 - REVIEW OF THE NAT HIGH FREQUENCY (HF) VOLMET BROADCAST PLAN

That:

a) The United States, Canada and Ireland develop a proposal for amendment to the HF VOLMET broadcast plan contained in the NAT Air Navigation Plan taking into account the contents of Appendix A to the Report on Agenda Item 2;

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

c) States concerned report to NAT SPG/30 on the effects of the implementation of the new MET codes on cycle times and on HF traffic loading as well as on their progress toward implementation of the NAT HF VOLMET broadcast plan.

2.2.12 As regards the inclusion of NAT Region aerodromes in the NAT HF VOLMET broadcast plan, the Group was informed that the Lajes aerodrome was used either for military purposes or by flights serving the Azores Islands. Therefore, it should not be considered as an alternate for civil flights; however, the Group noted that Lajes could be used by civil aircraft in the case of emergency. Accordingly, it agreed that Ireland would coordinate with Portugal in order to determine whether Lajes could be included in the Shannon VOLMET broadcast.

Common content and format for Preferred Routes Messages (PRM) from NAT operators to NAT provider States

2.2.13 The Group was informed of the outcome of two meetings between NAT provider States and users which had aimed at increasing airspace capacity. In this context, the Group noted the changes to the PRM and that the NAT On-Line Data-Interchange (OLDI) group (renamed the NAT COMAG, Conclusion 29/38 refers) would be informed of the agreed structure in order to have the PRM included in the NAT Interface Control Document (ICD) if required.

EUR-CAR tracks

2.2.14 The Group was informed of the implementation of EUR-CAR tracks by New York OAC to deal with traffic flows between Europe and the Caribbean. It also noted that this procedure had previously been presented to NAT SPG/27 (June 1991) and had been rejected. However, in the light of the increasing traffic, the 1992 NAT Oceanic Centre Managers' meeting had agreed that 2 EUR-CAR tracks could be established by New York OAC after a suitable study to determine specific needs and procedures had been carried out. Notwithstanding the foregoing, the tracks had been implemented in January 1993 with no prior coordination. In this connection, concern was expressed that the implementation of the tracks with no prior coordination had caused operational and financial penalties to the operators and that the lack of pre-notification had also led to confusion, especially as regards flight planning. In addition, it was noted that the implementation of these tracks was contrary to the intent of Conclusion 2/2 of the LIM NAT RAN (1992) Meeting as well as of the general provisions concerning airspace organization specified in the new NAT Air Navigation Plan (ANP) which called for a gradual elimination of organized tracks in the NAT Region.

2.2.15 This matter was discussed in order to try to identify possible solutions that could be used to resolve some of the problems which had arisen as a result of the implementation of the EUR-CAR tracks. To carry out this task, the Group created an ad hoc study group consisting of representatives from Canada, Portugal, Spain, the United Kingdom, the United States, IATA and IFATCA. On the basis of the work carried out by the ad hoc group, principles for the construction and publication were agreed to; furthermore, the Group agreed that the principles should be used not later than the second week of July 1993.

2.2.16 The Member for the United States informed the Group that arrangements would be made in order to publish information concerning the EUR/CAR tracks in the appropriate Aeronautical Information Services (AIS) document.

CONCLUSION 29/9 - PRINCIPLES FOR THE CONSTRUCTION AND PUBLICATION OF EUR/CAR TRACKS

That, as of July 1993, the following principles be used for the construction and publication of EUR/CAR tracks:

a) EUR/CAR tracks and their associated times and the number of levels allocated should be kept to a minimum;

b) if only New York identifies a need, then the tracks would be published at and west of 40°W only;

c) if New York and Shanwick identify a need, then the tracks would be published from coast-out to coast-in;

d) the inter centre coordination in establishing the Organized Track System (OTS) be continued as at present;

e) operators would be able to flight plan on random routes which cross, join or leave these tracks; and

f) at and west of 40°W, altitude preference be given to aircraft on these tracks.

2.2.17 With the above in mind, a proposal to cancel ATS routes R99, G61 and UB47 was examined. In this context, it was pointed out that the routes concerned had been endorsed by the LIM NAT RAN (1992) Meeting for inclusion in the proposed NAT Facilities and Services Implementation Document (FASID) but, because the Council had not completed its work on the establishment of the new NAT ANP, the routes had been incorporated in the ANP until such time as action on the air navigation planning process was complete. Accordingly, the Group agreed that the routes should be deleted and that the amendment process could wait until a later date. The Group also agreed that the routes should no longer be used and that appropriate information be included in relevant Aeronautical Information Publications (AIPs) on AIRAC date **16 September 1993**.

Use of flight levels not appropriate to direction of flight in the NAT Region

2.2.18 The practice of assigning flight levels not appropriate to direction of flight was examined. In this context, the history of the Datum line technique, which had been a strategic method of assigning these levels, was recalled. Furthermore, it was noted that the *MNPS Airspace Operations Manual* still included references to the Datum line technique. It was also noted that the strategic release of FL 330 during the Westbound OTS and of FL 350 during the Eastbound OTS within the Gander and Shanwick OCAs was being used and that the procedure could possibly be expanded to the entire NAT Region. The Group noted that this procedure had been implemented on a permanent basis in 1992 and would be reflected in the Canadian and United Kingdom AIPs.

2.2.19 Because of the positive experience gained from the release of opposite direction flight levels, it was agreed that the procedure be formalised and that States be urged to reach agreements in order to reduce coordination between OACs concerned when the technique is used in other areas of the NAT Region. The Group also agreed to change relevant NAT documentation in order to remove all references to the Datum line technique.

CONCLUSION 29/10 - USE OF FLIGHT LEVELS NOT APPROPRIATE TO DIRECTION OF FLIGHT IN THE NAT REGION

That:

a) all NAT documentation be amended so as to remove all references to the "Datum line technique";

b) for flight planning purposes:

i) during the validity of the day Organised Track System (OTS), flight level 330 be made available for Westbound aircraft; and

ii) during the validity of the night OTS, flight level 350 be made available for Eastbound aircraft;

c) the procedures in b) above be published in relevant Aeronautical Information Publications on AIRAC date 16 September 1993 (or first AIRAC date following 16 September 1993); and

d) all States be urged to develop letters of agreement to use flight levels not appropriate for direction of flight in order to reduce prior coordination requirements to a minimum consistent with safety.

The use of FL 310 for Eastbound OTS core tracks

2.2.20 The Group recalled that it had agreed, through correspondence (Fax RAC93214.FAX of 5 April 1993 refers), with the principle of releasing FL 310 for the use of Eastbound traffic during the Eastbound flow. In doing so, it has also agreed that due account needed to be taken of the possible increase in workload in the continental ACC in the EUR Region. In this context, it was pointed out that efforts should be made to spread the traffic right across the OTS rather than loading up the core which could cause capacity problems in the receiving ACCs. With the preceding in mind, it had been agreed that, initially, the use of FL 310 on two core OTS tracks should be implemented on a trial basis and that the results would subsequently be reviewed.

Control responsibility for airspace proximate to 45°N

2.2.21 The Group noted that major improvements to the Canadian air navigation facilities were being realized with the introduction of monopulse Secondary Surveillance Radar (SSR) processing and radar mosaicing features. It was recalled that it was with this in mind that NAT SPG/27 had requested Canada and the United States to consider the provision of radar service to oceanic traffic operating in airspace contiguous to the New York/Moncton/Gander FIRs or Control Areas (CTA).

2.2.22 In follow-up to the above and subsequent to an examination within the Canadian and United States Administrations, the United States agreed to delegate responsibility for control of the airspace to Canada, pending the availability of necessary Very High Frequency (VHF) communications at Moncton and Gander ACCs, in the following airspace:

> that portion of the New York Oceanic CTA at and above FL 275 bounded by a line beginning at 41°52'00"N 67°00'00"W to 41°08'00"N 67°00'00"W to 44°30'00"N 50°00'00"W to 45°00'00"N 50°00'00"W to 45°00'00"N 53°00'00"W to the point of beginning.

2.2.23 It was recalled that, historically, Gander and Shanwick OACs have controlled latitude 45°N in the NAT Region, providing information on flights operating along 45°N to New York and Santa Maria OACs. In conjunction with the planned changes described in paragraph 2.2.22 above, a proposal was made that the provision of ATS in the airspace of Santa Maria and New York OCAs North of 44°30'N, between 20°W and 50°W, be delegated to Shanwick and Gander OACs, as this would eliminate the requirement for information to New York and Santa Maria OACs on traffic operating along 45°N.

2.2.24 The Group noted the proposed delegation of airspace, FL 275 and above, between Moncton/Gander and New York CTAs. With regard to further delegations, after a general discussion, the Group agreed that it was premature to decide on the matter. Accordingly, it was agreed that Canada and the United States as well as Portugal and the United Kingdom continue to discuss the subject and inform NAT SPG on the outcome.

Oceanic clearance delivery procedures

2.2.25 The Group was informed that oceanic clearance delivery in Canada was a lengthy procedure involving numerous RTF exchanges between the pilot and controller. For example, on initial contact the pilot is requested to provide a coast-out fix estimate, which is entered into the computer which displays the ATC planned oceanic clearance. The clearance is then issued with an abbreviated procedure in accordance with the NAT SUPPs.

2.2.26 In addition, the daily publication of the OTS can result in opportunities for errors and omissions during the transmission of the oceanic clearance for several reasons including the fact that in the current method of OTS publication, there is no differentiation between the previous and the current day's tracks, except the date. In this context, statistics available indicate that fifty-seven percent (57 %) of the clearances issued by Gander OAC are given to aircraft operating on the OTS.

2.2.27 The Group was informed that a more efficient and reliable system of information exchange was possible by using a serialized identification based on the track letter and adding three numeric characters relating to the Julian Calendar date (e.g. Track Tango 264 (September 21)). In this context, the Member for Canada informed the Group that the following would be implemented on a trial basis for the Eastbound OTS publication in the Fall of 1993:

a) Gander would identify tracks of the OTS with an alphanumeric based on the track letter and the current Julian date;

b) Gander would issue clearances and obtain readbacks on the OTS using the alphanumeric system; and

c) Gander would publish instructions to users explaining procedures for the use of the new identification system.

2.2.28 The Group recognized the possible advantages that could be realized by using the above procedures. However, the users expressed some concern about the impact that the implementation of the procedures could have on airline ground based systems and in particular flight planning systems. Accordingly, it was agreed that Canada would act as the focal point for resolving any difficulties should they arise and, in order to be able to further evaluate the benefits of using the procedures, it was further agreed that Canada should report the results of their trial to NAT SPG/30.

2.2.29 An additional issue concerning oceanic clearance delivery was also addressed by the Group. Due to computer data base parameters, aircraft flying from Europe to destinations South of 36°N may not be issued a complete oceanic clearance from coast-out to coast-in. This situation is one of considerable concern since, without a complete clearance, pilots are sometimes unsure of what action to take if they reach 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.

2.2.30 The Group therefore agreed that, bearing in mind the large increase in this traffic, appropriate action should be taken to ensure that complete oceanic clearances were issued by the first oceanic ATC facility serving the flight.

Update on outstanding issues

2.2.31 In follow-up to the discussions held at NAT SPG/27 on possible measures which might enhance the efficiency and capacity of the NAT oceanic system, the Group was informed that a planner position would be implemented shortly in New York OAC. As regards to the delegation of airspace between Reykjavik and Shanwick, the Group was informed that this had been done and that the effects of the delegation on the efficiency of the system was being kept under review. Concerning the possible re-alignment of AR9, coordination with the military resulted in the conclusion that no adjustment should be made to the position of AR9, due to extensive military training. The military allows transition of civil flights through the affected areas whenever possible and no operational gain would result by moving AR9.

2.3 Communications operations

AERONAUTICAL FIXED SERVICES

Aeronautical Fixed Telecommunications Network (AFTN) circuits in the Northern part of the NAT Region

2.3.1 The Group was informed that, in response to Conclusion 27/9, satellite circuits had replaced cable and military troposcatter circuits to provide AFTN between Canada, Greenland, Iceland, Faroe Islands and the United Kingdom. Additionally, a new AFTN/Common ICAO Data Interchange Network (CIDIN) message switch would be implemented at the Gufunes COM Centre (Reykjavik) by July 1993 with connections to London, Montreal and Søndre Strømfjord centres.

Performance of Santa Maria OAC ATS Direct Speech Circuits

2.3.2 The comparison of data relating to the performance of the Santa Maria OAC ATS direct speech circuits for the last 3 years had shown that failures of circuits were decreasing with the exception of Santa Maria/Gander and Santa Maria/Lisbon where a slight increase had been experienced in the period April 1992 to March 1993. From the comparison of the data in the last two years, it was noted that the situation with regard to the Santa Maria/Shanwick had remained essentially unchanged whilst with regard to the circuits Santa Maria/Gander, Santa Maria/Madrid and Santa Maria/New York some degradation had been registered. The Group noted this information and that the circuit performance would continue to be monitored by those concerned with a view to improving it.

2.3.3 It was noted that OLDI facilities were operational at Shannon ACC with an interface with Prestwick OAC, London ACC and Brest ACC.

AERONAUTICAL MOBILE SERVICES

New COM facilities in Iceland

2.3.4 The Group was informed that the aeronautical mobile and fixed services communications centre at Gufunes (Reykjavik) had recently been moved to a new operations building with all new facilities for the operation. A new HF receiving station had also been built some 60 km away from the operating centre. The station, which was unmanned, was equipped with new receivers and antennas, which were remotely controlled from the operating centre. Operations of these new communication facilities had greatly improved the HF services from Iceland owing to a better receiving site, more suitable antennas and advanced new operating facilities.

General Purpose (GP)/VHF facilities

2.3.5 In follow-up to NAT SPG/28, Conclusion 28/10 concerning GP/VHF facilities in Greenland (at Qaqatoqaq and Kulusuk) remotely controlled from Reykjavik, work had been undertaken on the facility at Qaqatoqaq (Søndre Strømfjord) which should be operational by July 1993. The Kulusuk facility was expected to be operational towards the end of 1993 or in 1994.

HF family NAT-F

2.3.6 NAT SPG/26 had identified a requirement for an additional HF family between Gander and Shannon and NAT SPG/28 had agreed on the implementation of HF family NAT-F by Canada and Ireland. In this connection, it had been found necessary to exchange NAT-A frequency 8825 kHz with NAT-E frequency 8906 kHz at New York, Santa Maria, Shanwick and Gander and NAT-E frequency 3476 kHz with NAT-F frequency 2962 kHz at New York and Santa Maria. Following these changes, NAT-F was implemented at Gander and Shannon on 7 January 1993 and HF family NAT-D had been decommissioned at Gander. This action had resulted in a better distribution of the loading on NAT-B and NAT-C families, in a reduction of frequency congestion for the HF family NAT-D and in increased capacity for stations Iqaluit, Cambridge Bay, Churchill and Iceland to provide HF communications on Northern and Polar routes. Ireland and Canada provided services on HF family NAT-F on reduced hours with full coverage during peak traffic periods. The Group considered that the HF family NAT-F had been operating satisfactorily; however, Ireland found that frequency 6622 kHz was not always suitable at night during the winter months.

HF family NAT-G

2.3.7 NAT SPG/26 had identified a requirement for a new HF family NAT-G for eventual use in the Northern part of the region. It had been found difficult to find frequencies for this HF family. Frequencies could be sought from the HF VEUR and VNAT, however, it was considered that those frequencies could be required for other MET services. There were other sources for suitable HF frequencies such as unused Regional and Domestic Air Route Areas (RDARA) frequencies. Whatever frequencies were selected it would be necessary to carry out studies to confirm their suitability especially to ensure that they would be free from interference. It was agreed that when the need arose, frequencies for the HF family NAT-G would be taken from those allocated to HF VOLMET if they were not required for MET services. In addition it was agreed that Canada, with the assistance of Iceland and Ireland, would study the possibilities of finding alternative frequencies for the HF family NAT-G and report to NAT SPG/30.

CONCLUSION 29/11 - HIGH FREQUENCY (HF) FAMILY NAT-G

That:

a) frequencies be sought for the HF family NAT-G from the VOLMET VEUR and VNAT, if those frequencies were not required for MET services; and

b) Canada, with the assistance of Iceland and Ireland, carry out a study with a view to finding alternative frequencies for the HF family NAT-G.

Frequency designators in the NAT HF network

2.3.8 The implementation of HF family NAT-F on 7 January 1993 increased the number of frequency channels in the NAT HF radiotelephony network to twenty-five, distributed over six Families. It was found in the past that the use of two-letter designators, which identified the various channels, greatly assisted coordination between the NAT aeronautical stations in the network.

2.3.9 At NAT SPG/18 (1981), a proposal, which set out a methodology for determining HF designators for NAT families, was agreed to. That agreement, reflected in NAT SPG Conclusion 18/9, stated that the first letter of the code should identify the frequency band and the second should correspond to the particular HF family. Thus, NAT-A frequencies were identified in air/ground messages as QA, TA, VA, YA; NAT-B as QB, TB, VB, YB; and similarly for NAT-C and NAT-D.

2.3.10 In 1982, the ICAO Secretariat published a list of frequency designators for regional dissemination to States for use, if desired. The list took account of NAT SPG Conclusion 18/9 and included the designators then agreed for NAT HF frequencies.

2.3.11 In 1990, HF family NAT-E was implemented at New York and Santa Maria and in 1993, HF family NAT-F was implemented at Gander and Shanwick. As a result, eight additional frequencies were introduced to the network. The new frequencies already carried designators assigned by ICAO which did not conform to the methodology agreed at NAT SPG. Confusion had arisen therefore with some of the NAT aeronautical stations in regard to which designators should apply. Reorganisation of channels within the network, which had also taken place to avoid adjacent channel interference problems, had added to the confusion.

2.3.12 Considering the above, the Group agreed that the list of frequency designators in the NAT HF network, agreed at NAT SPG/18, be applied to the enlarged NAT HF Network. It was also agreed that the designators would be implemented on 1 January 1994 at 0001 hours UTC.

CONCLUSION 29/12 - NAT HF NETWORK DESIGNATORS

That:

a) the list of frequency designators in the NAT HF network be the following:

NAT-A:	**3016/QA,**	**5598/TA,**	**8906/VA,**		**13306/YA**
NAT-B:	**2899/QB,**	**5616/TB,**	**8864/VB,**		**13291/YB**
NAT-C:	**2872/QC,**	**5649/TC,**	**8879/VC,**	**11336/XC**	**13306/YC**
NAT-D:	**2971/QD,**	**4675/TD,**	**8891/VD,**	**11279/XD,**	**13291/YD**
NAT-E:	**2962/QE,**	**6628/TE,**	**8825/VE,**	**11309/XE,**	**13354/YE**
NAT-F:	**3476/QF,**	**6622/TF,**	**8831/VF,**		**13291/YF**

Common Frequency: 17946/ZA

b) these designators be implemented on 1 January 1994 at 0001 hours UTC.

Use of 12-tone Selective Calling system (SELCAL) equipment

2.3.13 Information on SELCAL had been extensively reported at NAT SPG/28. The Group was informed that there were still some misuse of the 12-tone SELCAL code operational procedures when use by aircraft was made of duplicated 12-tone SELCAL codes in areas not designated for such use. A case was reported when three aircraft, having the same SELCAL code, were operating simultaneously in the same area. This situation was unacceptable and had safety implications. In this context, the observer for IAOPA indicated that he would address this matter within his organization in order to reduce SELCAL duplication. To try and resolve this problem, the Group considered that:

a) aeronautical stations should continue to report all instances of SELCAL code duplication;

b) aircraft operators should follow the correct procedures (as defined by this and previous meetings); and

c) the Registrar should take direct action with aircraft operators to resolve any identified duplication.

HF and GP/VHF data collection

2.3.14 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. Since the HF family NAT-F had only been operating since the beginning of 1993, its impact on loading could not yet be fully assessed. To evaluate the loading of the NAT HF network and to be able to generally better manage that network, it was agreed to coordinate the statistical data to be collected so that the interpretation of the results would be more meaningful and useful. Therefore, it was agreed that on the 4th and 15th of each month the HF and GP/VHF data collection, to be reviewed at NAT SPG/30, would be carried out by each State concerned on the basis of the example contained in **Appendix B** to this part of the report. The results of the data collection would be sent to Portugal for consolidation and presentation to NAT SPG/30 in accordance with the procedures to be indicated directly to States concerned by Portugal. It was further agreed that States concerned should also present individually to NAT SPG/30 information on the busiest day based on the example contained in **Appendix C** to this part of the report. In addition, the total number of NAT flights worked in the respective OACs should be provided by States concerned.

CONCLUSION 29/13 - HIGH FREQUENCY (HF) DATA COLLECTION

That:

a) States concerned present to NAT SPG/30 the results of HF data collection exercises, prepared on the basis of the example contained in Appendix B to the Report on Agenda Item 2, to be conducted on the 4th and 15th of each month;

b) the results be sent to Portugal for consolidation and presentation to NAT SPG/30;

c) Portugal inform States concerned directly on the procedures to follow in presenting to it the results for consolidation in one document; and

d) States concerned present to NAT SPG/30 information on the busiest day based on the example contained in Appendix C to the Report on Agenda Item 2.

NAT message intercept procedures

2.3.15 The Group recalled the provisions of Annex 10 related to the intercept of HF messages by stations which serve locations where the information intercepted was required. Whilst it was recognized that an element of increased workload was present due to the intercept procedure, nevertheless this practice enhanced safety in ensuring that flight information was available to all locations in good time and also strengthened the awareness of personnel at the stations to handle traffic more efficiently. The Group agreed that this intercept procedure should continue but that States concerned should make an assessment of the workload caused at the stations and what advantages/disadvantages would be evidenced if the intercept procedure were discontinued. In recognizing the problem of duplication of messages, the Group noted that two States had resolved that problem using a simple computer programme. It was agreed that the Group, at its next meeting, would review the results of the assessment made and decide on any possible modifications to the procedure.

CONCLUSION 29/14 - NAT MESSAGE INTERCEPT PROCEDURES

That States concerned:

a) make an assessment of the workload caused at the stations and what advantages/disadvantages would be evidenced if the intercept procedure were discontinued; and

b) report their findings to NAT SPG/30.

Harmful interference to NAT HF operations

2.3.16 The Group reviewed reports from States on harmful HF interference. The reports were provided in response to NAT SPG Conclusion 28/11. The general conclusion derived from these reports was that, while the interference encountered was annoying and sometimes made communications difficult, the interference was not of such a nature as to endanger safety of the air/ground communications system. It was agreed that the monitoring should again be continued and reported to the next meeting. This would ensure that any serious problems would be detected and that timely remedial action could be taken.

Other matters related to communications operations

2.3.17 The Group was informed that Mr. Dick Covell, from the United States, would be retiring after serving the NAT SPG continuously since 1972. The Group expressed its sincere appreciation to Mr. Covell for the 21 years of outstanding service and wished him and his family a happy retirement.

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

2.4.1 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 Observer for IAOPA on the distribution of traffic in Shanwick FIR. This information had been broken down into types of operation, the relationship of the operations vis-à-vis the MNPS airspace and flight level occupancy.

- - - - - - - - - - - - - - - - -

APPENDIX A - TABLE ATS 2 - HF VOLMET BROADCASTS

(Paragraph 2.2.11 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 - 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 CHICAGO CINCINATTI	BANGOR PITTSBURGH CHARLOTTE	NEW YORK/JFK NEWARK BOSTON	BERMUDA MIAMI ATLANTA	MONTREAL/ MIRABEL Intl TORONTO OTTAWA	WINNIPEG EDMONTON (CALGARY)
Cleveland Niagara Falls Milwaukee	Windsor Locks St. Louis Minneapolis	New York Newark Boston Baltimore Philadelphia Washington/IAD	Bermuda Miami Nassau Tampa Atlanta	Montréal/ Mirabel Intl Gander Goose Halifax	St Johns Iqaluit (Søndrestrøm)
30-35	35-40	40-45	45-50	50-55	55-60
	SIGMET (New York Oceanic)		SIGMET (New York Oceanic)		SIGMET (1)
NIAGARA FALLS MILWAUKEE INDIANAPOLIS	WINDSOR LOCKS ST. LOUIS MINNEAPOLIS	BALTIMORE PHILADELPHIA WASHINGTON	NASSAU FREEPORT	GANDER GOOSE HALIFAX	ST JOHNS FROBISHER (SØNDRESTRØM)
Detroit Chicago Cleveland Niagara Falls Bermuda	Bangor Pittsburgh Charlotte	New York Newark Boston Baltimore Philadelphia Washington/IAD	Bermuda Miami Nassau Freeport Tampa West Palm Beach Atlanta	Montréal/ Mirabel Intl Toronto Ottawa Gander Goose Halifax	St Johns Iqaluit Winnipeg Edmonton (Søndrestrøm)

NOTES

1. SIGMET information included 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 Gander broadcasts to provide broadcasting time for the inclusion of SIGMET messages.

SHANNON
FREQUENCIES - FREQUENCES - 3413, 5640, 89571, 13264 kHz

00-05	05-10	10-15	15-20	20-25
SIGMET BRUXELLES/NATIONAL HAMBURG Glasgow Frankfurt Köln-Bonn Düsseldorf München	 SHANNON PRESTWICK LONDON/HEATHROW Shannon Prestwick London/Heathrow Amsterdam/Schiphol Manchester London/Gatwick	SIGMET DUBLIN GLASGOW København/Kastrup Stockholm/Arlanda Göteborg/Landvetter Bergen Oslo/Fornebu Helsinki/Vantaa Dublin Barcelona	 MADRID/BARAJAS LISBOA PARIS/ORLY Lisboa Santa Maria Paris/Charles-de- Gaulle Lyon/Satolas Stanstead	SIGMET ROMA/FIUMICINO MILANO/MALPENS A Keflavik Zürich Genève Torino
30-35	35-40	40-45	45-50	50-55
SIGMET FRANKFURT KOLN/BONN Bruxelles/National Hamburg Düsseldorf München	 AMSTERDAM/SCHIPHOL MANCHESTER LONDON/GATWICK Shannon Prestwick London/Heathrow Amsterdam/Schiphol Manchester London/Gatwick	SIGMET STANSTEAD OSLO/FORNEBU HELSINKI/VANTAA København/Kastrup Stockholm/Arlanda Göteborg/Landvetter Bergen Dublin	 SANTA MARIA PARIS/CHARLES- DE GAULLE Madrid/Barajas Lisboa Santa Maria Paris/Orly Paris/Charles-de Gaulle	SIGMET ZURICH GENEVE Keflavik Roma/Fiumicino Milano/Malpensa Zürich Genève Torino

NAT	
Unassigned frequency Fréquence non attribuée	13276 kHz

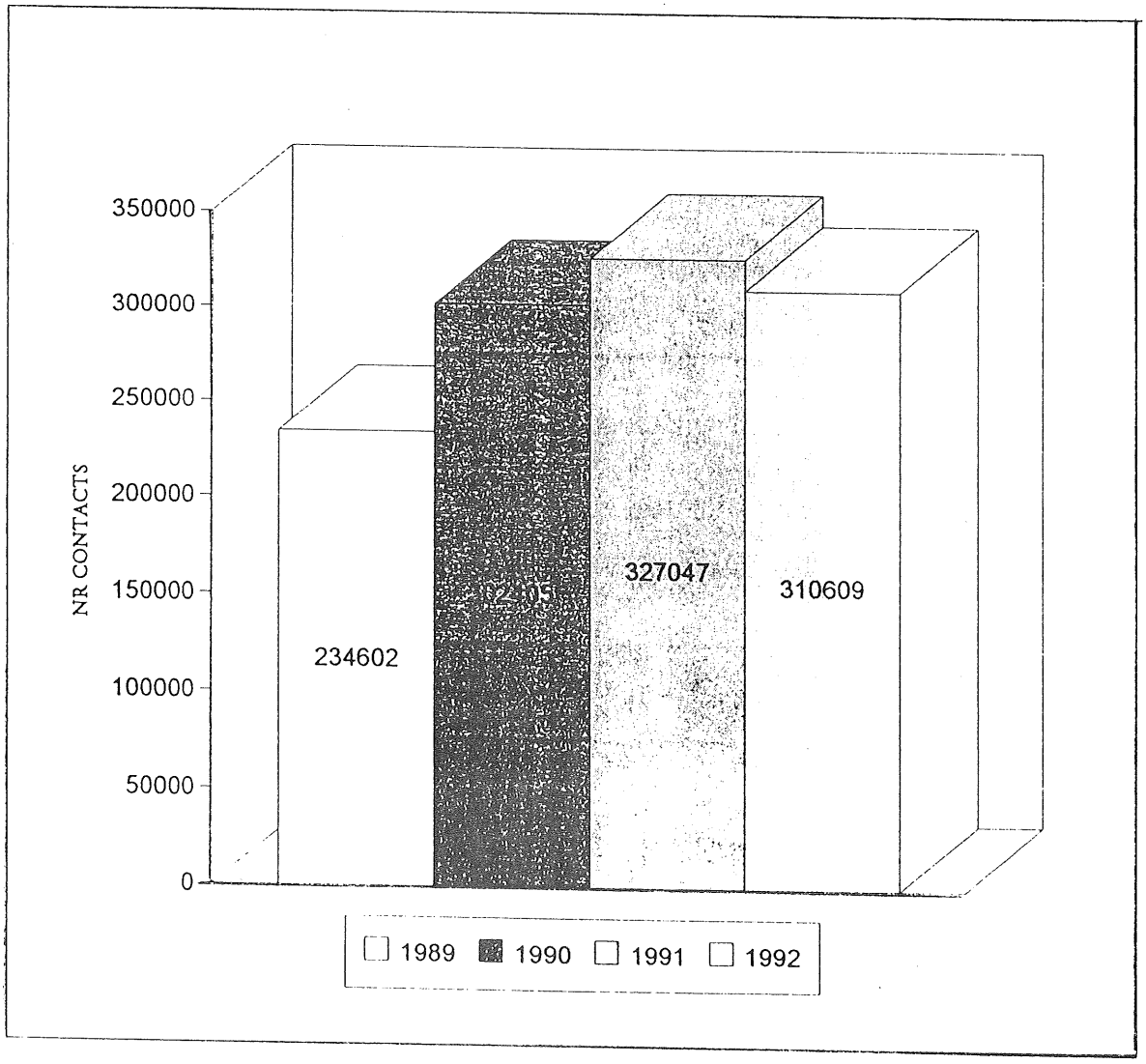
- - - - - - - - - - - - - - - -

APPENDIX B - STATION NAME
EXAMPLE OF HF AND GP/VHF DATA COLLECTION

(Paragraph 2.3.14 refers)

HF/RTF AND GP/VHF CONTACTS SUMMARY

MONTH / YEAR	1989	1990	1991	1992
JANUARY	17872	16881	41346	23462
FEBRUARY	17840	16018	33263	21211
MARCH	18020	17249	36810	22847
APRIL	18609	18834	24703	21814
MAY	18325	19945	24215	24167
JUNE	18897	17066	23075	24761
JULY	22090	21276	26539	29381
AUGUST	23566	31507	25990	31656
SEPTEMBER	21100	38786	24409	26354
OCTOBER	19971	32779	22431	25701
NOVEMBER	19230	32106	21508	24077
DECEMBER	19082	39958	22758	35178
TOTAL	234 602	302 405	327 047	310 609



1992

HF/RT CONTACTS BY FREQUENCY AND NAT FAMILY

FREQ / MONTH	QA	TA	VA	VA	YA	ZA	QC	RM	HA	I6	I6	LL	JK	
	3016	5598	*(8825)	**(8825)	13306	17946	2962	3476	6628	*(8906)	**(8906)	11309	127.9	TOTALS
JANUARY	2543	4016	5801		1750	6		730	1826	3330		2793	667	23462
FEBRUARY	1475	3267	5365		2399	34		132	1654	2667		3699	519	21211
MARCH	1925	2883	6427		2345	0		82	1337	3496		3792	560	22847
APRIL	1308	2480	6795		1953	14		50	932	4243		3497	542	21814
MAY	1151	3371	7196		2422	1		95	1846	4203		3222	660	24167
JUNE	1279	3323	7391		2106	1		132	1989	4483		3451	606	24761
JULY	716	4900	8616		2687	3		34	1937	4702		4563	1223	29381
AUGUST	960	5231	9242		2962	0		292	2187	4928		4388	1466	31656
SEPTEMBER	1774	4021	7392		1956	0		844	2400	4780		2385	802	26354
OCTOBER	1946	4445	7080		1676	0		596	2475	3976		2794	713	25701
NOVEMBER	1598	4448	2168	3263	2185	0	46	105	1974	1659	3411	2693	527	24077
DECEMBER	4384	7493		5288	2494	1	541		4112		6774	3606	485	35178
TOTALS	21059	49878	73473	8551	26935	60	587	3092	24669	42467	10185	40883	8770	310609
PERCENT	6,78%	16,058%	23,654%	2,753%	8,672%	0.019%	0,189%	0,995%	7,942%	13,672%	3,279%	13,162%	2,823%	100%

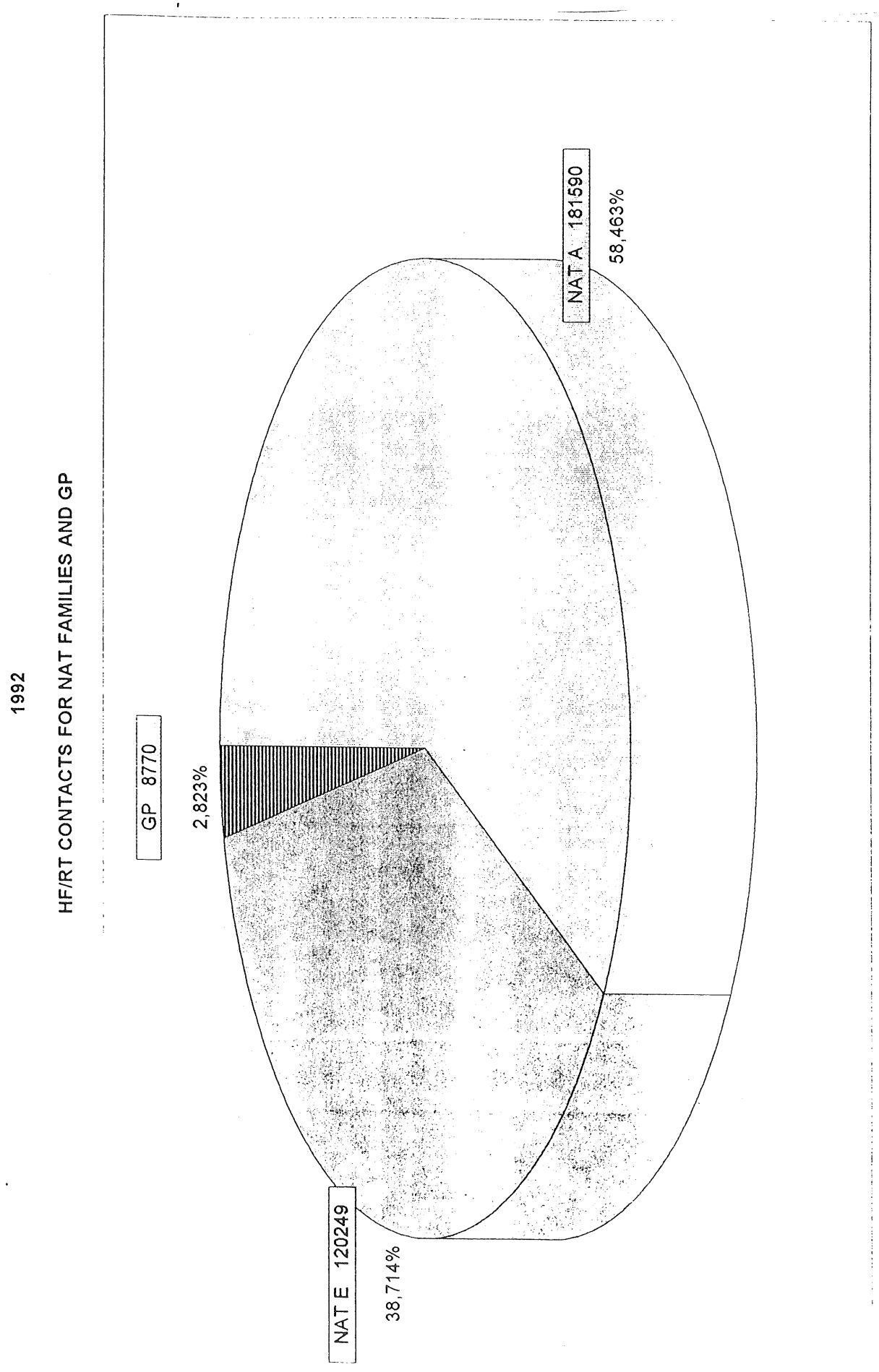
NAT A		
QA	21059	6,78%
TA	49878	16,058%
VA(*)	73473	23,654%
I6(**)	10185	3,279%
YA	26935	8,672%
ZA	60	0,019%
TOTAL	181590	58,463%

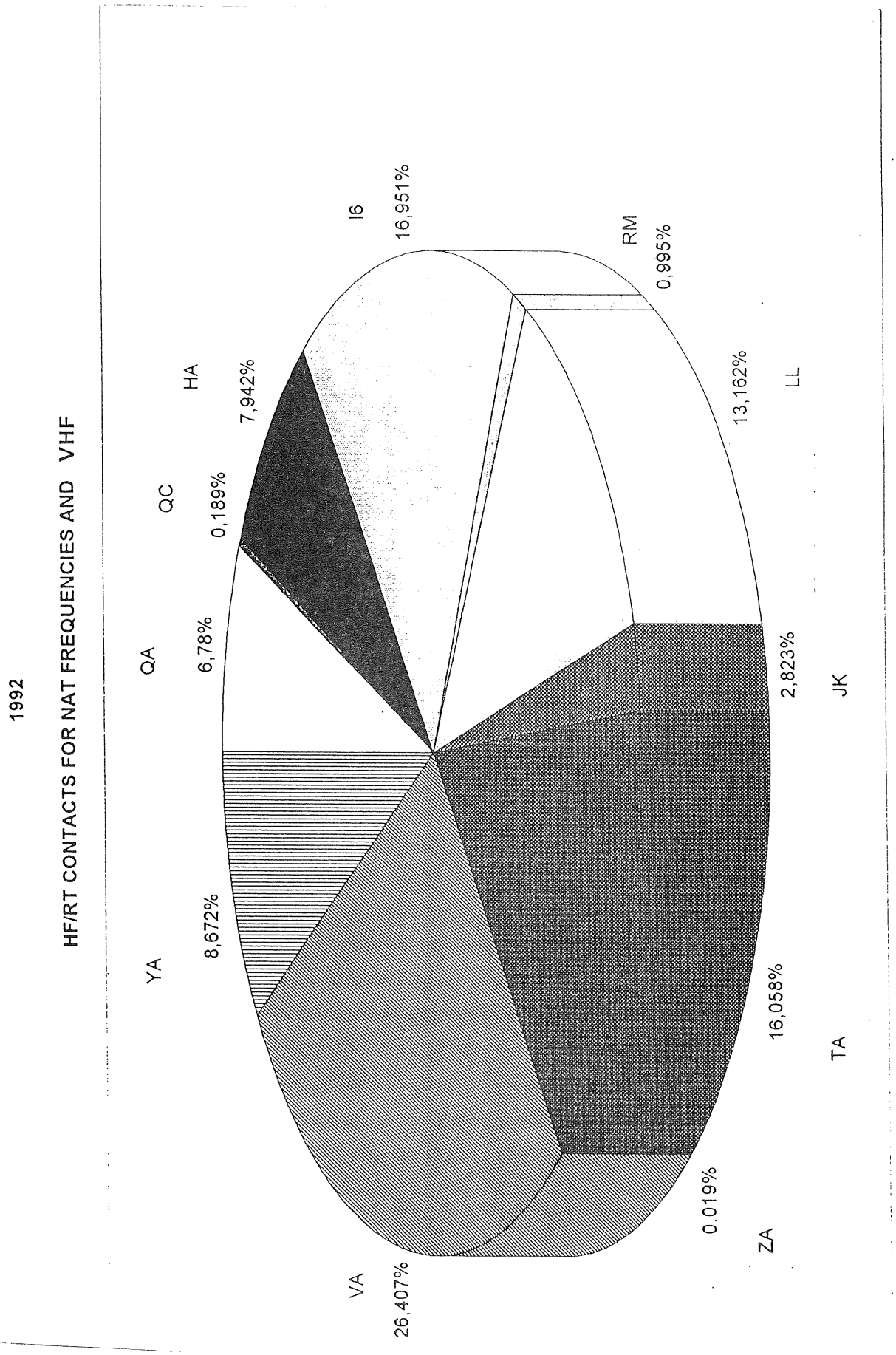
NAT E		
QC	587	0,189%
RM	3092	0,995%
HA	24669	7,942%
I6(*)	42467	13,672%
VA(**)	8551	2,753%
LL	40883	13,162%
TOTAL	120249	38,714%

GP		
JK	8770	2,823%
TOTAL	8770	2,823%

* - CONTACTS FROM 92/01/01 - 92/11/11

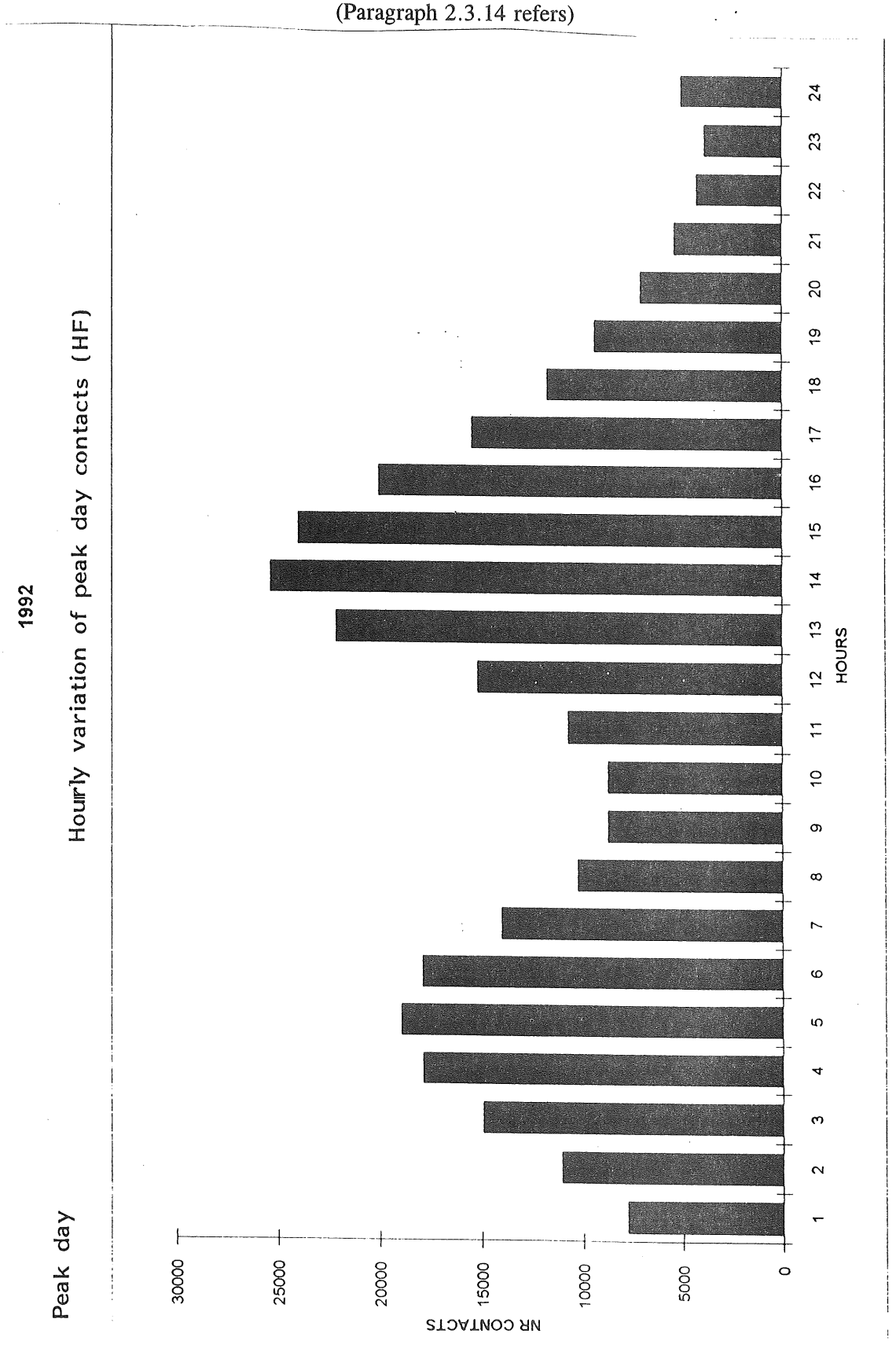
** - CONTACTS FROM 92/11/12 - 92/12/31


1992
HF/RT CONTACTS FOR NAT FAMILIES AND GP
GP 8770
2,823%
NAT A 181590
58,463%
NAT E 120249
38,714%


HF/RT CONTACTS FOR NAT FREQUENCIES AND VHF
1992
I6
16,951%
RM
0,995%
LL
13,162%
JK
2,823%
TA
16,058%
ZA
0.019%
VA
26,407%
YA
8,672%
QA
6,78%
QC
0,189%
HA
7,942%

APPENDIX C - EXAMPLE OF STATISTICS ON PEAK DAY

(Paragraph 2.3.14 refers)



AGENDA ITEM 3: TECHNOLOGICAL DEVELOPMENTS OF INTEREST IN THE NAT REGION

3.1 Introduction

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

a) ATC automation and traffic display systems in Oceanic Area Control Centres;

b) developments in Global Navigation Satellite Systems;

c) data link developments; and

d) other technological developments of relevance to the NAT Region.

3.2 ATC automation and traffic display systems in oceanic area control centres

3.2.1 The Member for Canada provided the Group with an update concerning the Gander Automated Air Traffic System (GAATS) following the re-hosting of software enhancements carried out in 1991. The installation of an additional software package would expand the capabilities of the system and provide Gander OAC staff with a tool to help them keep a more up-to-date traffic picture. It would also offer the possibility to be linked to various systems and agencies and to automatically exchange information in an accurate and timely manner.

3.2.2 The Member for Iceland informed the Group of progress made with the modernisation programme engaged by the Icelandic Civil Aviation Administration (CAA), details of which were given during the last meeting of the Group (NAT SPG/28-report, paragraphs 3.1.5 to 3.1.9 refer). It was indicated that some delay had been introduced in the development programme and that acceptance testing should start during the summer of 1993. Final installation should start early 1994 in the new building. However, taking into account that a significant period of time was necessary for the training of ATC personnel, full operation of the system would be available only for the 1995 summer season.

3.2.3 The Member for Portugal updated the Group in respect of the information concerning the long term development plans for the Portuguese oceanic ATS system which had been presented to NAT SPG/27 (NAT SPG/27-report, paragraphs 3.1.1 to 3.1.5 refer). The contract for the installation of the oceanic air traffic control service in Lisbon (currently operating in Santa Maria) had been signed and was foreseen that the OAC would become operational in 1995.

3.2.4 In the context of ATC automation development, the United States raised a number of issues requiring increased attention in order to ensure harmonization in the NAT Region. This was of particular importance in the case of the use of a standard coordinate system on which ATC algorithms were based in order to avoid differences in the calculation of route conversion, fix time estimation, tracking and conformance monitoring. In this connection, the Group was made aware that the international civil aviation community had taken a commitment to align to the World Geodetic System (WGS) 1984 Earth Model and that conversion to this system should be completed by 1998. Another step towards harmonization would be met by the provision of standardized wind data for the calculation of estimates and for the application of separation standards. It was noted that some of these aspects were already being addressed by the NAT OLDI group and that the wind modelling

issue, in as much as it related to ATM harmonization, should be addressed in the context of that group.

3.3 Developments in global navigation satellite systems

3.3.1 The observer from Inmarsat informed the Group of the latest developments within his Organization, which it was recalled, was actively involved in identifying navigation applications that would make use of the capabilities of its third generation satellites (Inmarsat III) to enhance the service provided by other satellite navigation systems such as the GPS and the Global Orbiting Satellite Navigation Systems (GLONASS).

3.3.2 Inmarsat foresaw the production of four Inmarsat III satellites initially, delivery of the first one being scheduled for July 1994. Navigation applications involved would cover integrity transmissions concerning the operational status of the GPS and GLONASS constellation, would provide data for position corrections and would provide a global overlay to augment signals transmitted by the two systems.

3.3.3 It was noted that the avionics required on aircraft to be able to communicate via satellite (aircraft earth station - AES) commissioned by Inmarsat amounted, at that time, to a total of 240. It was anticipated that about 350 aircraft would be equipped by the end of 1993 and about 1000 by 1995.

3.4 Data link developments

3.4.1 The Group was presented with a proposal to modify the message format for oceanic clearance delivery by VHF data link. In this context, the Group recalled that in NAT SPG/27, Conclusion 27/16, it was agreed to standardize the format of the message for delivering oceanic clearances by VHF data link. NAT SPG/28 agreed to Conclusion 28/14 which incorporated minor changes to the clearance format to bring it in line with the NAT standard phraseology (Conclusion 28/29 refers). The Member for the United Kingdom advised the Group that, subsequent to NAT SPG/28, the United Kingdom had commenced the process of implementing an operational system for issuing oceanic clearances via VHF data link. As a result, four changes had been proposed to the format of the clearance message as follows:

a) that the "ATC" line be modified to reflect a more logical order of information;

b) that the "ATC" line contain a clearance number;

c) that the route expansion of the cleared organized track be included; and,

d) that, if a reclearance is issued, this be specified in the message by the word RECLEARANCE together with its sequence number.

Accordingly, the Group agreed on a revised format for the clearance message, which is at **Appendix A** to this part of the report, and to amend the format as agreed to in NAT SPG/28, Conclusion 28/14.

CONCLUSION 29/15 - COMMON MESSAGE FORMAT FOR THE DELIVERY OF OCEANIC CLEARANCES BY VERY HIGH FREQUENCY (VHF) DATA LINK

That the message format shown in Appendix A to the report on Agenda Item 3 be used for the delivery of oceanic air traffic control clearances via VHF data link.

3.4.2 In the same context, the Group recognized that the ICAO Automatic Dependent Surveillance Panel (ADSP) was developing a new air/ground data link message set for global utilization which included clearance requests and clearance messages. The Group recognized the importance of these new message sets as they would play a major role in future ATC systems that were based on the ICAO communications, navigation and surveillance/air traffic management (CNS/ATM) system. They were also intended for bit-oriented usage in the future CNS/ATM environment. Although the current NAT clearance request and clearance messages were similar in function to the ones being developed by the ADSP, they were not compatible with them and the Group felt that all message set developments should conform to the emerging ICAO Standards And Recommended Practices (SARPs).

3.4.3 The Group was presented with information on possible ways of improving and automating the distribution of MET information to aircraft in the NAT Region. The suggestion was based on the possibility of developing an automated VOLMET ground system which would automatically select routinely distributed aeronautical weather information from Aeronautical Fixed Service (AFS) circuits. It was further suggested that avionics systems could automatically make inquiries into a file created in a MET data bank that would be developed using the acquired information. If States that provided VOLMET broadcasts automated the functions of data collection and broadcast information preparation, this could lead to a more reliable and cost-effective service.

3.5 Other technological developments of relevance to the NAT Region

3.5.1 The Group was presented with background information on the elements and functionality of Airborne Collision Avoidance Systems (ACAS) which included a discussion of ACAS surveillance and warning capabilities. The Member for the United Kingdom pointed out that the operational problems experienced with the current Traffic Collision Avoidance Systems (TCAS) II required increasing levels of human resources to be committed. Nevertheless, the United Kingdom intended to begin a preliminary research effort which it felt was required in order to quantify the effects of ACAS on the risk of mid-air collision in the NAT Region and to explore possible additional uses of ACAS. In this context, the United Kingdom welcomed comments and suggestions for the efficient dispatch of their work programme and indicated their desire to collaborate with other States in their continuing research efforts.

3.5.2 The Group was also presented with information detailing ACAS alerts in or around NAT MNPS airspace known to the United Kingdom during operational evaluations. The Group noted that the majority of events had been due to altitude station keeping problems which had been attributed to either the weather conditions within the NAT Region or out of tolerance Performance Management Systems on board aircraft. The Group further noted that all the Resolutions Advisories (RA) in the United Kingdom reports were categorised as either false or nuisance alerts.

3.5.3 In light of the above and in order to advance the integrity of the evaluation being carried out by the United Kingdom, States had been requested to forward a copy of any reports concerning events, related to ACAS, to the United Kingdom. In this context, States had also been requested to encourage pilots to report ACAS RA which occur in the NAT Region. The Group noted that the establishment of a database consisting of ACAS related events would enable many of the

operational implications of the system to be assessed, as an increasing number of aircraft flying within the NAT Region became equipped with this equipment.

3.5.4 The Member for the United States presented the Group with information outlining the limitations and safety benefits of ACAS. The Group noted that other fora had already addressed the issue of operational use of transponders and collision avoidance systems over the high seas and was made aware of the fact that the United States had been and continued to collect reports of events where ACAS was a factor. The Group agreed that aircraft operating in the NAT Region have been equipping with ACAS and will continue to equip in increasing numbers as the deadline for equipage in United States airspace approaches and that the implications along with the possibilities of the carriage of this equipment needed to be further studied. In this context, the Group recalled LIM NAT RAN (1992) Meeting, Conclusion 2/19 which required that the NAT SPG, in light of emerging provisions relating to ACAS for world-wide applicability, evaluate the need for NAT procedures and guidance material concerning the operation of ACAS as a means of enhancing flight safety in the NAT Region.

CONCLUSION 29/16 - OPERATION OF AIRBORNE COLLISION AVOIDANCE SYSTEMS (ACAS)

That, in light of emerging provisions relating to ACAS for world-wide applicability, the newly formed Reduced Separation Standards Implementation Group (RSSIG) of the NAT SPG evaluate the need for NAT procedures and guidance material concerning the operation of ACAS.

- - - - - - - - - - - - - - - - -

APPENDIX A - COMMON MESSAGE FORMAT FOR THE DELIVERY OF OCEANIC CLEARANCES BY VHF DATA LINK

(Paragraph 3.4.1 refers)

[PRIORITY][DESTINATION ADDRESS][COPY ADDRESSES]

.[ORIGIN ADDRESS]

[MESSAGE LABEL]

AN[AIRCRAFT NUMBER]/FI[FLIGHT ID]

-//[TIME][DATA(yymmdd)][ATCC IDENTIFIER] CLRNCE[CLEARANCE NUMBER (001-999)]

[FLIGHT ID] CLRD TO [DESTINATION] VIA [ENTRY POINT]

[ROUTE DETAILS]

FM [ENTRY POINT/TIME]MNTN [FLIGHT LEVEL] [SPEED]

ATC/[ATC FIELD]

RECLEARANCE [NUMBER (1-7)]

Note 1 The ATC/[ATC FIELD] line will only be present if there are ATC FIELDS in the FDPS OCM to be expanded

Note 2 RECLEARANCE will only be present if more than one clearance has been issued

The following is an example of this format

QU QXSXMXS CPYXXXX PIKCOXS LONTOXS

.PIKCOXS

AGM

AN N606UA/FI UAL915

-//1254 930331 EGGX CLRNCE 103

UAL915 CLRD TO KIAD VIA 53N015W

NAT FOXTROT

53/15 53/20 51/40 50/50 YQX

FM 53N015W/1335 MNTN F370 M080

ATC/LEVEL CHANGE

RECLEARANCE 1

AGENDA ITEM 4: PLANNING AND IMPLEMENTATION IN THE NAT REGION

4.1 Introduction

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

a) air navigation systems planning and production of supporting statistical data on future traffic demand;

b) reports of the implementation sub-groups;

c) management of the North Atlantic Regional Implementation Document (NAT ID);

d) follow-up action from the Limited NAT Regional Air Navigation Meeting (1992); and

e) implementation of radar in Greenland.

4.2 Air navigation systems planning and production of supporting statistical data on future traffic demand

4.2.1 The Group was presented with a report summarizing the work of the NAT TFG and other related issues. The Group noted that, pursuant to Conclusion 28/15 requiring that forecasts be made available for its discussions, the NAT TFG had held its 27th meeting in May 1993. The final report was circulated on 1 June 1993. The major task of the NAT TFG was to up-date the NAT annual and peak period forecasts for the 1993 to 1998 period. To this end, estimates of 1992 data concerning passengers and flights in the NAT Region were used as the base for the preparation of annual forecasts. The July and November 1992 sample data supplied by the OACs served as the base period for its peak period forecasts. In response to the NAT SPG request, forecasts were also prepared on the traffic flow between North America and the Caribbean.

4.2.2 The Group noted that the NAT TFG had identified a dramatic increase in traffic on the EUR-MIDWEST route in 1992. This increase was confirmed by data from the Official Airline Guide (OAG) and reflected the expansion of the route network by the major airlines. This route expansion was anticipated by the NAT TFG but not on such a dramatic scale.

4.2.3 The forecasts of both passengers and aircraft movements were higher than those presented in 1992. The 1997 passenger forecast was 6.6 percent higher (50.0 versus 46.9 million) while the aircraft movement forecast was 6.0 percent higher (294,300 versus 277,600). This upward revision was due, in large part, to an underestimate of the base year passengers in 1991.

4.2.4 In actual terms, the forecast was for the number of passengers to increase by just over 14 million between 1992 (estimated at 39.0 million) and 1998 (53.2 million), an average annual growth rate of 5.3 percent. The equivalent increase in the number of flights was just over 84,000 (5.4 percent annually), from an estimated 228,200 in 1992 to 312,500 in 1998. In the pessimistic scenario, the average annual growth rates for passengers and flights were 3.4 percent and 3.8 percent, respectively. For the optimistic case, the equivalent figures were 6.5 percent annually for passengers and 6.2 percent annually for aircraft movements. The range between the 1998 optimistic and pessimistic forecasts was 9.3 million passengers and 41,700 flights (approximately 12-13 aircraft in each direction for the busy hour).

4.2.5 General aviation activity in the NAT Region increased by 47.0 percent in 1991. It was believed that this growth reflected a large shift in business travellers from commercial flights to corporate or private aircraft especially during the first half of 1991. General aviation activity (approximately 9,000 flights) fell somewhat in 1992 but still remained almost 30 percent above the 1990 level. It was assumed that general aviation activity would remain constant at the 1992 level until 1998.

4.2.6 All-cargo flights (approximately 12,600) were estimated to have remained constant in 1992, largely reflecting the weak economies in both North America and Europe. Cargo growth of only 1.0 percent was projected for 1993. However, it was forecasted that the number of all-cargo flights would increase by approximately 3.0 percent per annum thereafter.

4.2.7 At its 25th meeting (June 1990), the NAT TFG had updated its long-term annual forecasts for the years 2000, 2005, and 2010 and developed city-pair forecasts. In summary, the base cases for passenger and flight forecasts for the year 2010 were as follows:

a) the number of passengers was expected to almost double (up 90.7 percent) between 1992 and 2010, going from 39.0 million to 74.4 million; and

b) the number of flights was expected to grow by 76.8 percent over the same time period, from 228,200 to 403,500.

4.2.8 Although the NAT TFG was not scheduled to prepare long-term forecasts, a comparison had been made between its revised medium term forecasts and those in its current long term projections. It was clear that the base forecast for the number of passengers was tending to be more in line with the long term high, while the low was more or less in line with the long term base case. Of more serious concern, however, was that the baseline forecast prepared this year for the number of flights was marginally above the trend indicated in the optimistic long term forecast prepared three years ago. This strongly suggested that the long term forecasts should be reviewed in 1994. It appeared that the factors underlying the higher forecasts had changed, e.g., the altered competitive strategies adopted by the major airlines now seemed permanent. In this context, the NAT TFG intended to update the long-term city-pair forecasts when revising its long-term annual forecasts in 1994 and every four years thereafter.

4.2.9 Figures showing the actual and projected traffic growth from 1972 and 1976 to 1998, for both passengers and movements, are contained in **Appendix A** of this part of the Report. Tabulations of these medium-term forecasts - up to 1998 - and the long-term forecasts - up to the year 2010 are as follows:

FORECASTS OF AIRCRAFT MOVEMENTS IN THE ICAO NORTH ATLANTIC REGION
(THOUSANDS)

	ACTUAL					FORECAST					
SCENARIO	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
OPTIMISTIC						244.6	256.6	273.9	290.2	307.7	326.8
BASELINE	175.7	182.5	207.1	213.0	228.2	238.0	249.5	263.3	278.9	294.3	312.5
PESSIMISTIC						234.3	242.0	252.9	263.7	274.2	285.1

LONG-TERM FORECASTS OF AIRCRAFT MOVEMENTS IN THE ICAO NORTH ATLANTIC REGION (THOUSANDS)

	ACTUAL	FORECAST			
SCENARIO	1992	1995	2000	2005	2010
OPTIMISTIC		273.9	322.8	380.4	437.6
BASELINE	228.2	263.3	306.2	356.4	403.5
PESSIMISTIC		252.9	260.0	286.5	307.5

4.2.10 The Group noted that the actual rise in traffic had consistently been closer to the optimistic rather than the baseline forecast. However, the Group agreed that pending the NAT TFG's revision of the long-term forecasts in 1994, planning should remain based on the assumption that traffic in the NAT Region in 2010 would be at least double that of 1988.

4.2.11 When reviewing the above, the Group expressed its satisfaction at the response of the NAT TFG to its requirements and emphasized that continued provision of such information would be essential for the development of the air navigation infrastructure in the NAT Region. The Group also felt that it would be of interest in the future to have some indication of the comparison of forecasts of the previous year. It was agreed that such a request should be conveyed to the NAT TFG.

4.2.12 The Group noted two specific problems raised by the NAT TFG in carrying out its work. One was the lack of important information which, in the past (up to 1989) had been produced by IATA and concerned annual data (NAT traffic statistics and mid NAT traffic statistics) on passengers, flights, load factors and aircraft size for scheduled, non-scheduled and cargo operations. For the last four years this data collection had been discontinued since previous alternative airline requirements for this data no longer existed. The NAT TFG had therefore to produce its own estimates for this information on the basis of other, not totally comparable data sources. In view of this situation, it was the opinion of the Group that it would be desirable that an input from airlines, similar to the data collection carried out by IATA until 1989, be re-instated for use by the NAT TFG. The Group suggested that the Chairman of the NAT TFG be requested to approach IATA formally in order to find the best way to overcome this difficulty.

4.2.13 The second problem addressed concerned the continued participation of both the Canadian and United States members in the work of the NAT TFG which, due to severe budgetary constraints in their respective administrations, was in question. The NAT TFG had discussed this issue with deep concern, considering the increased requirement for NAT TFG products as expressed by both the NAT SPG and the LIM NAT RAN (1992) Meeting. In this context, calculations had been made on costs involved for each delegation as well as considerations of the duration of the meetings and the frequency at which the NAT TFG could meet.

4.2.14 It was the view of the Group that a less frequent meeting rate of the NAT TFG would imply a significant lack of continuity and introduce an unacceptable degree of error in the forecasts if the NAT TFG were to meet at 2 or 3-year intervals. According to the figures presented, the margin of error of the forecasts would be more than double if the NAT TFG were to meet biennially to produce estimates, and would more than double again (4 times the original forecast error) if they were to meet triennially. It was pointed out that while the forecast error applied to the current year estimates, considerable use was made of the outyear estimates when contemplating long-term planning. As the forecast error was amplified greatly in outyear projections, it was necessary to obtain information which was as accurate as possible; therefore, it was agreed that the NAT TFG should continue to meet annually and that forecasts should be made available regularly for the benefit of the NAT SPG.

4.2.15 It was agreed that each National Administration involved in supporting the work of the NAT TFG should undertake to ensure that appropriate resources were allocated to support continued work of the NAT TFG in response to the requirements of the NAT SPG. The Group noted the tentative plans of the NAT TFG to hold its next meeting in Paris from 28 April to 6 May 1994.

CONCLUSION 29/17 - ACTIVITIES OF THE NORTH ATLANTIC TRAFFIC FORECASTING GROUP (NAT TFG)

That:

a) 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 SPG and the LIM NAT RAN (1992) Meeting; and

b) the Chairman of the NAT TFG undertake to approach IATA formally in order to explore ways to make available NAT air traffic data similar to that produced prior to 1989 for use by the NAT TFG.

4.2.16 The Group was made aware of the action by the Air Navigation Commission (ANC) and Council on the LIM NAT RAN (1992) Meeting concerning North Atlantic Air Traffic Forecasts (Recommendation 6/2) and in particular its relation to Recommendation 6/1 concerning the new NAT ANP and the FASID. It also noted that the Council, when reviewing the results of the Third Asia Pacific (ASIA/PAC/3) RAN Meeting (April-May 1993), will examine the question of establishing a FASID for the ASIA/PAC Regions along the same lines as formulated in LIM NAT RAN Recommendation 6/1 for the NAT Region. Therefore, the requirement to include the annual forecasts in the NAT FASID in the future was indeed foreseeable.

4.3 Reports of the implementation sub-groups

REPORT OF THE NAT AIR TRAFFIC MANAGEMENT GROUP (ATMG)

4.3.1 The Group noted that the ATMG had met once since NAT SPG/28 and that, in follow up to NAT SPG/28 Conclusion 28/12 c), it had dealt with issues relating to ATFM as well as other matters stemming from the Lines of Action assigned to it in the NAT ID. Exceptionally, the ATMG had also considered short term airspace capacity problems with a view to proposing solutions for implementation in the summer of 1993. These issues have been reported under Agenda Item 2.

Air traffic flow management matters related to the NAT Region

4.3.2 The Group noted that the ATMG had created an ATFM working group to deal with ATFM related matters. The establishment of the working group had been coordinated by the United Kingdom in order to minimise costs and maximise liaison with the members of the ATMG. In addition to follow-up action from Conclusion 28/12 c), the working group had also been tasked with examining all issues relating to ATFM in the NAT Region. The deliberations of the ATFM working group had been reviewed and endorsed by the NAT ATMG as a whole.

4.3.3 It was recognized that a significant problem in ATFM planning was the lack of adequate shared information of known or anticipated changes in airspace capacity and traffic demand which could result in the application of restrictions beyond neighbouring FIR boundaries. The Group agreed that with sufficient advanced information and joint planning, alternatives could be developed between all affected FIRs and aircraft operators thus lessening the negative consequences of reduced airspace capacity and provide an opportunity to take advantage of under-utilized airspace.

4.3.4 The Group recognized that the PRM, in its current format, was being used as a source of strategic planning data for ATM both within the NAT Region and also in adjacent domestic airspace. Appropriate elements of the data were essential for the efficient planning of the twice daily OTS.

CONCLUSION 29/18 - PROVISION OF INFORMATION ON PLANNED FLIGHT OPERATIONS BY AIRCRAFT OPERATORS

That aircraft operators:

a) make available to relevant area control centres and Air Traffic Flow Management units preferred route information in a format and in a time frame sufficient for its use in the formulation of the NAT organized track systems;

b) file flight plans at a sufficiently early time to permit their use in pre-tactical planning of air traffic management resources; and

c) include track route and altitude alternatives, as an interim measure, in field 18 on the flight plan.

4.3.5 Furthermore, the Group recommended that States responsible for the provision of ATM to NAT flights, both within the NAT Region and in adjacent domestic airspace, should be encouraged to rectify identified shortcomings or incompatibilities in the current systems as quickly as possible. As progress was made in these areas, it should be possible to eliminate the need for certain elements of the data currently provided by operators and permit a more tactical management of the NAT traffic.

4.3.6 The Group agreed that States should be requested to determine, in conjunction with other relevant NAM, NAT, EUR and CAR provider States, ATM information requirements and functional relationships necessary for the integrated planning and execution of traffic management measures applicable to NAT traffic. In this context, it was also agreed that the NAT Region was not a suitable environment to implement inter-continental ATFM restrictions as a result of problems in other regions.

4.3.7 It was agreed that, when developing procedures for the integration of the interfaces between regions, the interface between New York and Santa Maria OACs with States in the CAR Region should be included and that the ICAO EUR/NAT Office should be requested to carry out the necessary co-ordination with the ICAO Offices serving the relevant regions. As regards the interface between the NAT/NAM/EUR Regions, it was agreed that ATFM applied within the OAC/ACCs concerned should operate only in conjunction with associated executive flow units except when ATFM situations have an impact solely within the NAT Region. Accordingly, the Group recommended that ATFM executive units in the States concerned establish functional and communications links to co-ordinate appropriate ATFM measures in support of the NAT ATM and that the ICAO EUR/NAT Office be requested to carry out the necessary coordination.

CONCLUSION 29/19 - AIR TRAFFIC FLOW MANAGEMENT (ATFM) IN THE NAT REGION

That:

a) States concerned be requested to establish functional and communications links to coordinate appropriate ATFM measures in view of their impact on NAT air traffic management;

b) the interface between New York and Santa Maria Oceanic Area Control Centres with States in the CAR Region be taken into account; and

c) the ICAO EUR/NAT Office be requested to carry out the necessary coordination with the other ICAO Offices serving the relevant regions.

4.3.8 The Group noted the review of tasks emanating from the NAT ID which had been carried out by the ATMG. On the basis of the review, it agreed that the references to ATFM cells in the NAT ID (Line of Action 8.1 refers) led to confusion concerning the role of ATFM in the NAT Region and that all references to ATFM cells should therefore be replaced by "links and expertise".

CONCLUSION 29/20 - DELETION OF ALL REFERENCES TO AIR TRAFFIC FLOW MANAGEMENT (ATFM) CELLS FROM THE NAT IMPLEMENTATION DOCUMENT

That all references to ATFM cells in the NAT Implementation Document be replaced by the term "links and expertise".

4.3.9 In order to meet the objectives outlined in paragraph 4.3.7 above, a common message set would be required. Recalling NAT SPG/28 Conclusion 28/22, the Group noted that the ATMG had requested the NAT OLDI group to prepare such a set of messages. In a similar vein, the Group agreed that all NAT provider States should use the Flow Notification Message (FNM) for all traffic operating at or above FL 280 in the NAT Region and should disseminate the information to all concerned.

CONCLUSION 29/21 - USE OF THE FLOW NOTIFICATION MESSAGE (FNM)

That all NAT provider States use the FNM message for all traffic operating at or above FL 280 in the NAT Region and disseminate the information to adjacent regions.

Individual flight plans from this point (IFPFP) procedures

4.3.10 In follow-up to NAT SPG Conclusion 28/16, the Group was informed that the thirteenth NAT Altitude Reservation Coordination meeting, held in Lisbon from 7-11 December 1992, had discussed the use of the IFPFP procedures; furthermore, it was noted that the NAT Chiefs had discussed the use of IFPFP in NAT oceanic airspace and that they had considered that it no longer be used in that airspace. The Group was also informed that some users at the Altitude Reservation Coordination meeting had expressed concern regarding the decision to discontinue the use of IFPFP, as they felt that this could have a major impact on their operations.

4.3.11 In the ensuing discussion, it was noted that Shanwick OAC was the only ATC unit which did not allow IFPFP routing in its area of responsibility unless aircraft entered the airspace already on an IFPFP routing and in receipt of an ATC clearance. In this context, some provider States indicated that they could continue to use the procedure but that they would prefer it to be applied in radar coverage. In addition, it was stressed that an IFPFP flight plan did not constitute an ATC clearance and that possible misinterpretations of the above could lead to difficulties.

Common procedures for radio communications failure

4.3.12 In follow-up to NAT SPG Conclusion 28/18, the Group endorsed common procedures to be used in the event of communications failure. These procedures, which had been developed by the ATMG, only addressed flights to/from the NAT Region. Furthermore, the procedures, which are reproduced in **Appendix B**, were intended to complement and not supersede State procedures/regulations. It was agreed that the common radio communications failure procedures be included in relevant AIPs as well as in the next amendments to the NAT Guidance Material and in the next editions of the MNPS Airspace Operations Manual and the International General Aviation Manual.

CONCLUSION 29/22 - COMMON PROCEDURES FOR RADIO COMMUNICATIONS FAILURE

That the radio communications procedures found at Appendix B to the Report on Agenda Item 4 be:

a) promulgated by all NAT provider States; and

b) incorporated into the next amendments or editions of the NAT Guidance Material, the Minimum Navigation Performance Specifications (MNPS) Airspace Operations Manual and the International General Aviation Manual.

Operational requirements for airspace management (ASM) messages

4.3.13 The Group noted that, in follow-up to NAT SPG Conclusion 28/22, the ATMG had developed a basic set of draft operational requirements for ASM messages, and to expedite the processing of this matter, they had been sent directly to the OLDI group.

Standardized phraseology

4.3.14 The Group was informed that, in follow-up to NAT SPG Conclusion 28/29, the ATMG had reviewed the status of implementation of the agreed phraseology. It noted that some States had encountered difficulties with regard to implementation, whereas others had been endeavouring to implement the phraseology by 1 April 1993. In this context, a proposal to modify the phraseology agreed to at NAT SPG/28 was presented. In view of the difficulties that States were already having in implementing the agreed phraseology, the Group decided to refer the proposal to the ATMG for consideration when it again reviewed this question.

Review of the planned reductions in separation standards in the NAT Region

4.3.15 It was noted that the ATMG had been informed of the results of the second meeting of the NAT ADSDG and of the fourth meeting of the NAT Vertical Separation Implementation Group (VSIG/4). However, since the reports of these meetings had not been received in sufficient time to be adequately reviewed by the ATMG, it had not been possible to take specific action on ATM related

items. Nevertheless, the ATMG had concurred with the finding of the ADSDG that simulations were necessary prior to the implementation and use of ADS and wished to associate itself with the ADSDG's recommendation to NAT SPG to request States to make available the required simulation slots (Conclusion 29/23 also refers).

Future work programme and terms of reference of the NAT ATMG

4.3.16 The Group agreed that the ATMG would require two meetings before NAT SPG/30 - one in December and the other at the end of the second quarter of 1994. In agreeing to the foregoing, the Group noted the requirement to have sufficient time between the various implementation working group meetings in order to facilitate coordination. It was noted that the ATMG had carried out an examination of its terms of reference as well as its work programme. Action taken by the Group on this matter has been reported under Agenda Item 6.

4.3.17 The member for Ireland pointed out that since the disbandment of the ATMG of the European Air Navigation Planning Group (EANPG), no ICAO group was monitoring the criteria and procedures by which RVSM transition areas would operate at the interface between the EUR and NAT Regions. Accordingly, it was agreed that this task be included in the revised terms of reference of the NAT ATMG.

REPORT OF THE NAT AUTOMATIC DEPENDENT SURVEILLANCE DEVELOPMENT GROUP

Review of ADS trials

4.3.18 The Group was informed that various trials were being carried out by the NAT provider States and that these trials addressed a variety of domains including helicopters operating in the North Sea area, the use of HF as a data link medium, ADS trials in the Mediterranean area and the Pacific Engineering Trials. On the basis of the information presented, it was noted that only France and Ireland had, to some extent, coordinated their trials. In this context, it was recalled that the ADSDG's principal task, as laid down in its terms of reference, was to coordinate all NAT trials and to oversee the work related to the implementation of ADS. It was agreed that it was imperative that all NAT provider States engaged in trials should coordinate their activities much more closely than had been done in the past. The Group noted that, to facilitate this, a small trial coordination sub-group, composed of one person from each administration, had been established by the ADSDG. In addition to coordinating trials, this sub-group would also identify means by which those States with limited resources could benefit from ongoing activities.

Simulation studies and inter-group liaison

4.3.19 It was noted that very little work was being carried out in the area of simulations or computer modelling relating to the effect of ADS on ATM. In this context, the Group was informed that it would be necessary to carry out such studies concerning the following:

a) interface between radar and ADS airspace;

b) transition between oceanic and domestic airspace; and

c) various ADS-ATC scenarios in order to develop optimum procedures.

Simulations would also address two other important aspects - the need for hands-on ATC experience, keeping in mind the significant change in the operating environment, and the requirement to validate the selected operating procedures.

4.3.20 It was also recognized that, before simulations could be successfully carried out, it would be necessary to clarify many ATM issues. Some of the issues were considered to be relatively easy to resolve whereas others were more complex as they could have an impact on airspace policy. The following non exhaustive list of ATM issues and simulation objectives were identified:

a) the need to agree on the size of areas of common interest;

b) the need to agree on whether the airspace would be of an 'exclusive' nature, that is the carriage of ADS would be mandatory;

c) the separation minima that would be applied and the underlying philosophy used to determine them;

d) common tracking of ADS and radar data;

e) impact of ADS on controller workload;

f) data transfer between ADS and "procedural" environments;

g) validation/refinement of ICAO SARPs and Procedures for Air Navigation Services (PANS);

h) definition of appropriate ADS reporting rates for various traffic scenarios;

i) definition of appropriate rates for periodic down linking of optional ADS report blocks;

j) standardization of the most commonly used ADS contracts;

k) use of data link Direct Controller Pilot Communications (DCPC) in an oceanic environment;

l) development of new flexible ATC intervention mechanisms based on the availability of ADS; and

m) development of emergency/contingency procedures.

4.3.21 Delays in carrying out such studies and simulations could result in implementation delays with the consequential postponement to the realization of benefits that may accrue to aircraft that had equipped at an early date. In this context, the difficulties that the reduced vertical separation programme had encountered because of a lack of simulation slots were recalled. Accordingly, it was agreed that all States concerned be urged to undertake the necessary studies and make available simulation slots at the earliest possible time.

CONCLUSION 29/23 - NEED FOR STATES TO MAKE AVAILABLE SLOTS FOR THE SIMULATION OF THE IMPLEMENTATION OF AUTOMATIC DEPENDENT SURVEILLANCE (ADS) IN THE NAT REGION

That States concerned make arrangements within their respective administrations to allocate simulation slots to address ADS implementation issues so as not to delay the implementation of ADS.

4.3.22 To be able to clarify the points listed in paragraph 4.3.20 above, the Group felt that very close coordination would be required between all the implementation working groups and in particular the ATMG. To this end, it was agreed that the list of ATM related matters identified above should be given to the ATMG for their comment. Furthermore, it was considered essential that the activities of the various ICAO Panels as well as the work being carried out in other fora be closely monitored, particularly at the early stages of implementation as no SARPs existed.

Certification of aircraft and operators

4.3.23 It was recognized that aircraft and systems certification could be on the critical path of the implementation schedule of an operational ADS-ATC system. All matters related to certification would have to be satisfactorily resolved before proceeding to full operations. In this context, it was felt that the higher the criticality of the application, the more stringent the certification requirements. The Group agreed that certification, from an end-to-end system point of view, including avionics certification, was considered to be just one part of this process and that airworthiness and aircraft operations would also have to be considered. Accordingly, it was agreed that the ADSDG would require, at some stage, to address, inter alia, the following issues:

a) end-to-end system communications, including avionics;

b) airworthiness matters;

c) aircraft operations, including crew training;

d) aircraft and system maintenance; and

e) ATC and support personnel training.

NAT ATM evolution

4.3.24 Detailed proposals for the development of a NAT ADS-ATC system implementation plan, which took into account the work of the second meeting of the ICAO ADS Panel and the contents of the NAT ANP, which had been agreed to at the LIM NAT RAN (1992) Meeting, were examined. On the basis of the discussions, it was agreed that an evolutionary approach was required in order to take advantage of new technologies as they became available and that it would be necessary to provide some benefits to the airspace users as soon as possible in order to encourage them to equip their aircraft.

4.3.25 Using the above basic philosophy, it was agreed that the implementation of a full ADS-ATC system should be in two main phases. The first would provide the path from the existing HF voice based position reporting procedure to one using ADS and data link based DCPC or, the beginning of an ADS-ATC system. The second would provide the path to the full implementation of an ADS-ATC system in the NAT Region, or Phase III of the NAT ID. However, only the first path was addressed in detail at that stage.

4.3.26 To support transition planning for the first phase, a matrix, which is at **Appendix C** to this part of the report, indicating the advantages and the issues to be resolved for each step in the evolutionary progression towards the implementation of ADS was developed by the ADSDG. Particular attention had been paid to identifying the advantages that airspace users would receive at each step as a result of the early equipage of aircraft. In such a way, it was anticipated that it would be possible to identify, at an early stage, issues that could cause delays in aircraft equipage, in avionics development or ground systems development and therefore impede implementation.

4.3.27 As regards the question of airspace user benefits, the Group agreed that the first significant benefits could be expected with the automatic transmission of the basic ADS and projected profile blocks (as depicted in Step (4) of the matrix at Appendix C). The availability of this data, which are required to carry out the clearance compliance function, would reduce the occurrences of lateral GNEs, a pre-requisite for the reduction of horizontal separation minima. Furthermore, it was expected that few modifications to the ground systems, particularly the FDPS, would be required to fully implement Step (4). In this context, it was pointed out that the avionics manufacturers had decided that the projected profile block, the one containing the data elements which could be used to reduce GNEs, would probably not be included in the first ADS avionics packages as changes to the flight management system (FMS)[1] would be required. In other words, Step (6) was likely to be implemented before Step (4). This caused some concern as it would be necessary for enhanced FDPSs to be operational before full benefits could be derived from the periodic ADS reports [Step (6)], the Step at which the benefits of full conformance monitoring would be obtained. The Group agreed that this matter be brought to the attention of administrations and airspace users in order that they be made aware of the implications in delaying the availability of the projected profile feature of ADS.

4.3.28 Another matter considered by the Group, relating to airspace user benefits, concerned the possible delay in progressing the implementation of ADS from its earliest stages, when few benefits would accrue to the users, to full implementation of the NAT ADS-ATC because of the users reluctance to equip. Although it was expected that the successful implementation of RVSM would provide a substantial increase in airspace capacity required to meet the expected rise in demand, RVSM alone may not be sufficient in itself and the lack of a satisfactorily mature ADS-ATC system could impose constraints and therefore economic penalties on airspace users. It may therefore be necessary to develop scenarios whereby users who equip at an early date receive some benefit in order to encourage all users to equip.

4.3.29 The Group agreed that the steps required to achieve a tactically orientated ADS-ATC service included features which had been identified by the ICAO ADS Panel but had not been adopted into the ARINC 745 specification. These included the **extended projected profile** block which was expected to be used for the automation of the oceanic clearance delivery procedure and the **short-term intent** block which was expected to be used for tactical ATC - a stated goal of Phase III of the NAT ID.

CONCLUSION 29/24 - EARLY IMPLEMENTATION OF ALL AUTOMATIC DEPENDENT SURVEILLANCE (ADS) PANEL DEFINED ADS DATA BLOCKS

That:

a) States developing ADS-ATC systems use the ADS report format as defined by the ICAO ADS Panel;

b) in order to provide users with benefits as soon as possible, every effort be made to include the projected profile block in early releases of ADS avionics packages; and

c) every effort be made to ensure that all ADS data blocks, as defined by the ICAO ADS Panel, be included in future ADS avionics packages.

---

[1] Current FMSs cannot construct a projected profile message block nor can they output the information to construct such a message (which includes altitude and estimated time of arrival) on a suitable bus.

Evolution of engineering considerations

4.3.30 It was recognized that the final system, which would be based on the emerging ICAO SARPs, would take some time to achieve and that some transitionary steps were needed. For the NAT Region, this would mean that the various trials, both current and planned, would need to adhere to some common set of core specifications in order to converge to the final system. Accordingly, the Group agreed on such specifications taking into account that the Radio Technical Commission for Aeronautics (RTCA) Special Committee (SC)-170 [Minimum Operational Performance Standards (MOPS) for ADS] and SC-169 [MOPS for ATC two-way data link DCPC] appeared to provide a suitable basis to meet these requirements. Both SC-169 and SC-170 defined bit-oriented formats and as such met the end state requirements. Adoption of these formats would eliminate the need for future application changes whilst allowing the communications system to evolve. The Group therefore agreed that no new character-oriented formats were needed and that the above MOPS be used for the NAT trials. The set of common core requirements and the means for implementing them included:

a) a common set of applications (i.e. RTCA SC-170 and RTCA SC-169);

b) ground communication facilities to enable sharing of data (e.g. X.25 links); and

c) a means for transferring the bit-oriented applications data through air/ground communication systems (e.g. Airlines Electronic Engineering Committee [AEEC] 622 to enable transmission through Aircraft Communications Addressing and Reporting System (ACARS) networks).

4.3.31 During discussions of aircraft equipage for participation in trials, it was brought to the attention of the Group that functions under development in trials could be contained in a separate unit from the operational avionics. It was noted that modifications to FMSs, for example, were very expensive and had certification implications. A common avionics unit used by all aircraft participating in trials had some obvious benefits; however, in the absence of a common avionics unit, the ones used in the trials should meet the following requirements:

a) data should be from the system in control of the aircraft;

b) data should be error-protected on the aircraft; and

c) an accurate source of time, referenced to UTC, should be available.

4.3.32 A proposal was made to use a pro-forma to record details of participating aircraft. The information contained on the form included aircraft registration, 24-bit ICAO identification, applications supported avionics equipage and typical flights. It was agreed that this would indeed be useful information. It was therefore agreed that this pro-forma, which is at **Appendix D** to this part of the report, should be used in the future as aircraft join the trial.

CONCLUSION 29/25 - USE OF COMMON APPLICATIONS AND MEANS IN AUTOMATIC DEPENDENT SURVEILLANCE (ADS) TRIALS

That:

a) all participants in the NAT ADS trials adhere to the following:

i) a common set of applications - Radio Technical Commission for Aeronautics Special Committee (RTCA SC)-170 and RTCA SC-169;

ii) ground communication facilities to enable sharing of data (e.g. X.25 links); and

iii) **a means for transferring the bit-oriented applications data through air/ground communication systems (e.g. Airlines Electronic Engineering Committee [AEEC] 622 to enable transmission through Aircraft Communications Addressing and Reporting System (ACARS) networks;**

b) all aircraft participating in the NAT ADS trials adhere to the following:

i) data should be from the system in control of the aircraft;

ii) data should be error-protected on the aircraft; and

iii) an accurate source of time, referenced to UTC, should be available; and

c) all aircraft participating in the air traffic control data link trials be recorded using the pro-forma which is at Appendix D to the Report on Agenda Item 4.

NAT ADS-ATC system implementation plan

4.3.33 The Group was presented with information concerning the merit of preparing an ADS development plan or whether it would be more appropriate to review in greater detail the relevant Lines of Action from the NAT ID and to expand the amount of information contained therein. In this context, it was recognized that a plan would be valuable for airlines, service providers, and CAAs in order to map the evolution towards the full ICAO CNS/ATM systems and would provide additional detail which could augment the current Lines of Action. Accordingly, the Group agreed that the ADSDG continue its work on preparing a NAT ADS-ATC system implementation plan which would be used in conjunction with the NAT ID.

4.3.34 The Group was informed that it would be necessary to find a way to try and converge the various national implementation plans so that a realistic coherent overall implementation plan could be drawn up. It was noted that it would be necessary to uncover areas where no work was being done or where it was being duplicated. Also, it was felt that information on planned or on-going studies by the States on subjects of global interest and applicable to the NAT Region should be made available to all concerned and in particular to the ADSDG. In the same vein, it was noted that a number of detailed technical issues that needed to be defined in proposed transition steps had been discussed by the ADSDG and, as a result of these discussions, it had become clear that there was a complex interrelationship between application, technology, and benefits at transitionary points.

4.3.35 To capture all of the above, three tables had been developed, in the form of questionnaires, and had been sent to all States concerned. States had been requested to complete the forms and return them to the ICAO EUR/NAT Office for processing. The information received would be used to confirm or amend the relevant Lines of Action and as a basic input to the ADS-ATC implementation plan. The Group endorsed the above initiative and felt that all States should fully participate.

Institutional matters

4.3.36 The important issue of institutional arrangements, which needed to be resolved, preferably sooner than later, was brought to the attention of the Group who were cognizant of Conclusion 6/3 of the LIM NAT RAN (1992) Meeting concerning this matter. It was felt that it was still too early to provide clear instructions to the ADSDG; nevertheless, the Group felt that this matter would have to receive high priority and that it may be necessary to make some form of arrangements to develop basic guidelines to be used in the implementation of the ICAO CNS/ATM systems.

Future work

4.3.37 The Group noted the ADSDG work programme and agreed that its priority task had to be the coordination of trials and the identification and resolution of issues which could have an effect on transition planning. It was also noted that it would be necessary to convene meetings at closer intervals (approximately every six to eight months) in order to progress the work in a timely manner. In this context, it was noted that the next meeting of the ADSDG was scheduled to be held in September 1993 (the Report on Agenda Item 6 also refers).

REPORT OF THE NAT ON-LINE DATA INTERCHANGE GROUP

4.3.38 It was noted that the NAT OLDI group had held one meeting since NAT SPG/28 and that its principal tasks had been to review the common coordination ICD, to finalise the development of an ICD for air-ground communications, to establish the framework for the migration to the Aeronautical Telecommunications Network (ATN), to examine the operational requirements to support ATFM and ASM messages and to examine its future work programme taking into account the results of the LIM NAT RAN (1992) Meeting.

Air traffic services coordination messages in the common coordination ICD

4.3.39 The Group was informed that an in-depth examination of Version 1.0.2 of the common coordination ICD had been carried out and, in so doing, all outstanding issues had been resolved. In this context, it was noted that no significant changes had been required to the ICD; however, as regards the editorial presentation, it was noted that attachments were considered to be informational and that they were therefore not subject to configuration management. Accordingly, flow diagrams and other information that were considered to be useful to better understand the operational requirements were included in an attachment to the ICD. Similarly, information related to the interfaces between various OAC/ACCs were included in an attachment to the ICD. Because of the changes in the presentation of the material, the Group noted that the ICD had been re-numbered Version 1.1.

4.3.40 In follow-up to NAT SPG/28 request to study the possibility of amending the message related to the promulgation of the NAT OTS (report of NAT SPG/28, paragraph 4.2.3.5 refers), it was noted that, due to the significantly different requirements of the NAT and PAC Regions, it was not possible to develop a common message format. Therefore, no further action was required on this matter.

4.3.41 The Group agreed that the ATS coordination section of the ICD was complete and therefore requested the ICAO European and North Atlantic Office to publish the ICD on behalf of the NAT SPG.

CONCLUSION 29/26 - MANAGEMENT AND PUBLICATION OF THE NAT COMMON COORDINATION INTERFACE CONTROL DOCUMENT (ICD)

That the:

a) NAT common coordination ICD be considered under configuration management and that all changes to it be subject to agreement between all concerned; and

b) ICAO EUR/NAT Office publish, on behalf of the NAT SPG, the NAT common coordination ICD.

4.3.42 The Group was informed that the way field 15 of the current flight plan (CPL) was being used in NAT OLDI messages was not included in the *Procedures for Air Navigation Services - Rules of the Air and Air Traffic Services* (PANS RAC Doc 4444). In this context, the Group was presented with a proposal to amend Doc 4444 in order to include the procedures used in the NAT Region. The Group endorsed the proposal and agreed that the United States should take appropriate measures to process this matter. In doing so, the Group agreed that the amendment should stress that the route included in field 15 of the CPL message was the **ATC cleared route** as compared to the flight plan route in the filed flight plan (FPL) message. The proposed amendment is at **Appendix E** to this part of the report.

CONCLUSION 29/27 - AMENDMENT TO THE PROCEDURES FOR AIR NAVIGATION SERVICES AND RULES OF THE AIR AND AIR TRAFFIC SERVICES (PANS RAC, DOC 4444)

That the Member for the United States make arrangements within his administration to initiate a proposal to have Appendix A to the *Procedures for Air Navigation Services - Rules of the Air and Air Traffic Services* (PANS RAC, Doc 4444) amended to take account of the procedures used by the NAT provider States relating to the use of field 15 of CPL messages in accordance with contents of Appendix F to the report on the agenda item 4.

Air traffic flow management and airspace management messages

4.3.43 In follow-up to NAT SPG Conclusion 28/22, it was noted that the OLDI group would develop a set of ATFM messages taking into account existing messages and present them to the ATMG for their evaluation. In the same context, the OLDI group would develop a set of ASM messages on the basis of the operational requirements defined by the ATMG as well as existing messages.

Review of the common Aeradio Interface Control Document

4.3.44 The Group was informed that work on the common Aeradio ICD was sufficiently mature to be issued as Version 1.0 and that it was considered to be under configuration management by the OLDI group in accordance with the procedures laid down in the document, a final version would be presented to NAT SPG/30 for endorsement.

Review of the contents and structure of the common data base

4.3.45 In follow-up to NAT SPG Conclusion 28/23, the Group was informed that the OLDI group had reviewed the proposed structure of the common data base and, because implementation had not yet been at an advanced stage, some minor changes were made to facilitate the eventual use of the data base. It was noted that the WGS/84 Earth Model was taken into account and that a decision on the coordinate system was still pending (paragraph 3.2.4 also refers). In order to speed up the development of the data base, a dBase IV input routine, based on the agreed structure, had been distributed on a diskette to all concerned. It was noted that work on this matter should be completed by NAT SPG/30.

Migration to the Aeronautical Telecommunications Network

4.3.46 It was recalled that the LIM NAT RAN (1992) Meeting had recommended that the ATN be used for ground-ground communications in the future. With the foregoing in mind, issues relating to the migration from the current system to the ATN were examined. In this context, the

Group was provided with information on a proposal which was based on the assumption that the addition of OLDI data formats to the PANS RAC (Doc 4444) would occur in due course. From the information presented, the following two issues were considered to be important for the use of OLDI data formats in ATC automation:

a) separation of data processing functions from communications functions; and

b) the ability to exchange the data over a variety of communications paths.

4.3.47 The first issue identified above could be addressed by distinguishing the elements in the OLDI data formats which conveyed information which would normally be part of an International Standards Organization (ISO) protocol specification and by making suggestions for changes to the OLDI data elements. The second issue could be addressed by adopting a common message header for OLDI data messages thus providing application transparency for the underlying communications circuits. It was postulated that following the above approach would allow the initial organization of OLDI applications to be Open System Interconnection (OSI) consistent and would simplify the transition to the ATN from a variety of existing AFS circuit configurations.

4.3.48 On the basis of the above, it was proposed to modify the header of OLDI data messages in such a way that field 3 data would be included in the header and not within the "application" portion of the message. In this context, a proposal to amend parts of the ICD had been put forward; however, the Group felt that these were technical issues that should be dealt with by the OLDI group itself who could make appropriate recommendations to the NAT SPG. Therefore, the matter was referred to the OLDI group for review.

4.3.49 The Group noted the following ATN transition implementation issues which had been identified by the OLDI group and which required further investigation before detailed planning could proceed:

a) ATN performance and quality of service;

b) the definition of a transition period;

c) the possibility of establishing a NAT sub-network to support OLDI as well as to assist in the research of potential problems in the transition to the full ATN;

d) what data should be considered as appropriate for the application level and what data should be excluded from that level;

e) the ATN addressing schemes for ground-ground communications;

f) how any transition plan for the NAT Region would fit in with the strategies being developed in the CAR, EUR and NAM Regions; and

g) AFTN/ATN gateway procedures.

4.3.50 It was noted that considerable work would be required on transition issues and that the OLDI group should shift its emphasis from the development of ICDs to ATN transition matters and ATC systems harmonization issues. Questions relating to the terms of reference of the OLDI group are covered in the Report on Agenda Item 6.

Common rules related to the application of separation minima

4.3.51 The Group recalled that, after having been informed of the difficulties encountered by the NAT ATMG in developing one document (*Application of Separation Minima*) for two different audiences, it had agreed that a new Line of Action addressing the requirements of software engineers be incorporated into the NAT ID and that the OLDI group be named as the group of primary interest (NAT SPG/28 report paragraph 4.2.5.2 refers). Line of Action - 5.16 was duly developed and has been included in amendment No. 1 to the NAT ID. It was noted that the work would be based on the third edition of the *Application of Separation Minima* Document and that the new document should be written as a set of rules. In this context, it was considered imperative that the application of the rules should produce the same result in all OAC/ACCs. To achieve the foregoing aim, it would be necessary to define the implementation philosophy as well as the rules themselves. By following the above procedure, the new document would complement the third edition of the *Application of Separation Minima* Document. The first draft of the document was expected to be available for presentation to NAT SPG/30.

Future work programme

4.3.52 The OLDI group's work programme was reviewed and it was noted that, except for ATFM and ASM messages, most of its work concerning ICDs and the common data base was complete and that short term efforts would be primarily directed at developing the common rules for the Application of Separation Minima Document and at addressing ATN transition issues. The OLDI group's next meeting was scheduled to be held in Oslo from 18 to 22 October 1993.

REPORT OF THE NAT VERTICAL SEPARATION IMPLEMENTATION GROUP

4.3.53 The NAT VSIG had met twice since NAT SPG/28, once before the LIM NAT RAN (1992) Meeting and once after. The objective of the first meeting was to prepare documentation for the LIM NAT RAN (1992) Meeting and the second meeting was to initiate follow-up action on relevant Recommendations and Conclusions.

Requirements for system monitoring

4.3.54 The Group was informed that the VSIG had examined two methods of system monitoring; the first was based on sequential sampling techniques and the second was based on the direct estimation of risk from the observed parameters of the system. Direct estimation provided a method for the monitoring of the health of the system whilst sequential sampling provided a statistically rigorous method for assessing the system acceptability initially and then for monitoring the ongoing conformance to established safety levels. These two methodologies were considered to be complementary and detailed descriptions of a full assessment programme for application during the verification, trial, implementation and operational phases of RVSM in the NAT Region would be presented to NAT SPG/30.

4.3.55 One aspect of the direct estimation technique which was noted was the estimation of the risk associated with contingency events. In this context, a method for estimating this risk, based on the number of levels crossed before turning off the track, was presented. Application of this method under one set of assumptions indicated that passing through a single level before the aircraft was able to follow the established contingency procedure and turn away from its assigned track could contribute as much as 0.5% of the TLS. The Group noted that the methodology would be reviewed.

4.3.56 The Group noted the information on the potential siting of Height Monitoring Units (HMU) in the Northern and Southern areas of the NAT Region which was based on an analysis of

traffic data for the first week of July 1992. A location on ATS route UB47 (in Portugal) between DIRMA and BARDI reporting points had been identified as the preferred site for the monitoring of traffic in the Southern part of the NAT Region. For Northern traffic, the preferred site had been Prins Christians Sund (OZN) in Greenland. Both sites were selected solely on the basis of the number of aircraft that might have been seen.

4.3.57 Six sites (three in Canada and three in the United Kingdom) had previously been chosen on the basis of a study of the representativeness of the potential sample performed by the FAA. As regards Goose Bay, one of the originally selected sites, it was noted that very few flights were routed via that point. In this connection, the Group was informed that this was the result of changes in Canadian domestic routing and that traffic would be re-routed over Goose Bay once the HMUs were installed. From the preceding, it was noted that the effect of such changes in domestic routings highlighted the importance of involving, at the earliest opportunity, ATC authorities in the HMU site selection process.

4.3.58 The traffic passing over the eight selected sites comprised approximately 40% of all the flights in the week's traffic sample. Of the 6733 flights recorded in the full week's data sample only 254 flights (3.8%) were made by operators which never passed over any of the eight sites and 159 flights (2.4%) by aircraft types which never passed over any of the eight sites. The proportion of flights made by these un-recorded categories was expected to reduce if data for longer than one week had been analyzed. However, it would be very likely that some operators and aircraft types would not be monitored by the HMUs at the selected sites.

4.3.59 On the basis of information presented to the Group, it was agreed that further analysis of the optimum sites for HMUs should be performed by the individual States concerned who would be best placed to take local conditions and ATC practices into consideration. It was considered to be very important that the sample measured be representative of the full aircraft population and that this should continue to be a criterion when choosing HMU sites. It was also agreed that the marginal benefits of implementing the Southern and Northern (seventh and eighth) HMUs should be considered as well. In this connection, it was suggested that any further analysis should, where possible, use data for the 4th and 15th day of each month and record the callsign, aircraft type, origin and destination and time for each flight which could be monitored in level flight at each site. Similar information on all other aircraft operating in the region on the sample days should also be collected. This information could then be collated to assess the overall benefit of each site within a monitoring system. The observer from IATA suggested that if minor rerouteings of aircraft were required for monitoring purposes, the cost of such rerouteings should be addressed. Further, in IATA's view, any major rerouteing for such purposes would be unacceptable and that an alternative method of obtaining missed data would be needed.

CONCLUSION 29/28 - SITING OF HEIGHT MONITORING UNITS (HMU)

That:

a) States concerned carry out an analysis of the optimum sites for HMUs taking into account local conditions;

b) the Mathematicians working group carry out an analysis of the benefits of implementing a Southern and a Northern HMU; and

c) the results of a) and b) above be reported to the Special NAT SPG Meeting (January 1994).

Matters related to airspace monitoring

4.3.60 The Group reviewed matters relating to airspace monitoring and in particular issues relating to the requirement for States to set up data bases of MNPS approved aircraft and developments in the use of the GPS for height monitoring purposes. As regards the requirement for state data bases for MNPS certified aircraft, LIM NAT RAN (1992) Recommendation 2/15 was recalled and it was noted that it would be necessary to develop appropriate guidelines and circulate them to all States concerned.

4.3.61 The Group noted the research being carried out in follow-up to LIM NAT RAN (1992) Conclusion 2/13 c) concerning the use of a GNSS based method of monitoring the application of RVSM in the NAT Region. It was noted that the VSIG had agreed that it was pre-mature to decide on the best system to use and therefore, that the HMU development plan should continue and that the need for a pre-production HMU remained as an important milestone in the RVSM implementation strategy. In the context of using GPS for height monitoring, the Group noted that many logistics and other institutional issues were being addressed by the United States.

4.3.62 The Group was informed that one corner-stone of the proposal for use of GPS for RVSM monitoring was the assumption of long-term constancy of Altimetry System Error (ASE). Should this be proven, it would materially effect the assumption used to date in the HMU requirement studies of the statistical independence of repeated measurements of an individual airframe's height keeping performance over a series of flights. As a consequence, notwithstanding the outcome of the study into the feasibility and efficacity of a GPS monitoring system, the optimum number and associated siting of HMUs would need to be re-evaluated. Data presented by the United States to a recent meeting of the VSIG airspace monitoring sub-group appeared to corroborate the assumption of ASE constancy. Therefore it was agreed that studies should urgently proceed on this issue to obviate any possible delay to the implementation of RVSM in the NAT Region, pending a need to re-evaluate the required HMU configuration. It was noted that such work would also support decisions on a hybrid GPS/HMU system that might be suggested as a result of the current evaluation of the GPS system and should therefore be taken into account when carrying out the analysis in follow-up to Conclusion 29/28 above.

4.3.63 It was recalled that the detailed RVSM implementation plan agreed to at the LIM NAT RAN (1992) Meeting indicated that a decision on the type of height monitoring required (HMU vs GNSS) should be made by June 1994. However, in the context of the cost sharing discussions, LIM NAT RAN (1992) Meeting Conclusion 6/7 refers, the financial experts had indicated that a decision on this issue was required by the end of 1993 or at the very latest in early 1994. So as not to delay the programme, the Group agreed that the two dates needed to be reconciled and, on the basis of the information available, agreed that the decision on the monitoring system be made in early 1994. To meet the deadline, it was agreed that the Reduced Separation Standards Implementation Group (RSSIG - formerly the VSIG) should concentrate its efforts on this issue. The precise details on the work plan to achieve the objective are detailed in paragraphs 4.3.79, 4.3.80, 4.3.81 and 6.5.1.

Amendment to the NAT Regional Supplementary Procedures

4.3.64 In follow-up to LIM NAT RAN (1992) Conclusion 2/13 d), the Group examined a draft amendment proposal to the ICAO *Regional Supplementary Procedures* (SUPPs, Doc. 7030). In its review, it agreed that the SUPPs should only contain information relating to the required performance of aircraft for operations in the MNPS airspace, or information derived from the RGCSP global requirements on which the Minimum Aircraft System Performance Specification (MASPS) had been based. The proposed amendment to Doc 7030 is included at **Appendix F** to this part of the report. It was also agreed that it was not necessary to start processing the amendment proposal

immediately because other changes might arise and that an omnibus amendment should be prepared in due course.

CONCLUSION 29/29 - PROPOSAL FOR AMENDMENT TO THE NAT REGIONAL SUPPLEMENTARY PROCEDURES

That:

a) the NAT SPG endorse the amendment proposal to the ICAO Regional Supplementary Procedures (Doc 7030/4 - NAT) contained in Appendix F to the Report on Agenda Item 4; and

b) the ICAO EUR/NAT Office process the amendment proposal on behalf of the United Kingdom when appropriate.

Airplane/operator approval

4.3.65 The Group noted the Operations/Airworthiness (OPS/AIR) programme to publish Advisory Circular (AC) material concerning the implementation of RVSM. In this connection, it was informed of an airworthiness meeting which had been held in Seattle in the second quarter of 1993. The prime objective of the meeting had been to coordinate the activities of the FAA, the aircraft manufacturers and the United States' operators with regard to their roles and responsibilities in the approval of aircraft for RVSM operations and to inform them of the overall progress towards RVSM implementation. At the invitation of the FAA, representatives from other CAAs and non United States operators participated in the discussion.

4.3.66 The importance of holding such meetings was recognized and it was therefore agreed that a similar meeting should be convened in the EUR Region in order to explain and discuss with operators from NAT user States the implications of the implementation of RVSM in the NAT Region. Accordingly, it was requested that ICAO should organize such a meeting at the earliest possible opportunity in the EUR/NAT area.

CONCLUSION 29/30 - WORKSHOP ON THE AIRWORTHINESS REQUIREMENTS FOR THE IMPLEMENTATION OF REDUCED VERTICAL SEPARATION MINIMUM (RVSM) IN THE NAT REGION

That ICAO be requested to organize a workshop, following the Special NAT SPG Meeting (January 1994), for civil aviation authorities, aircraft manufacturers and operators to explain their roles and responsibilities in the approval of aircraft for RVSM operations and to inform them of the overall progress towards RVSM implementation in the NAT Region.

4.3.67 In the same context, the Group was informed that issues relating to aircraft equipage, and in particular the altitude-keeping limits specified in the *Manual on Implementation of a 300 M (1000 ft) Vertical Separation Minimum between FL 290 and FL 410 inclusive* (ICAO Doc 9574), had been examined by the VSIG. It was agreed that the automatic altitude hold limit be expanded to 65 feet for hard altitude hold, instead of 50 feet as specified in Doc 9574, because it was economical to use such a threshold and because the change had no effect on the collision risk nor on the ASE. For the same reasons, it was agreed that the altitude alert limit of ± 300 feet was acceptable for current aircraft; however, it was also agreed that aircraft receiving a type certification after 1 January 1996 must meet the ± 200 foot requirement. This information would be included in the RVSM Guidance Material.

4.3.68 The Group was provided with an update on the FAA's plans to publish an AC for airplane operator approval and in particular the steps that remained in the process. These activities would culminate in a meeting to be held in September 1993 at which time a final draft for interim guidance would be established. The time table should enable those concerned to commence work on airplane approval data packages at that time. Publication of the final rule was expected in July 1994. The Group noted that, as a follow-up to LIM NAT RAN (1992) Recommendation 2/12, the ICAO EUR/NAT Office would circulate the final draft version of the AC to all concerned and that States would be requested to use the material contained therein to develop their state procedures and programmes for MASPS approval.

Cost/benefit analysis

4.3.69 As regards cost/benefit analysis, the Group noted Conclusion 6/5 of the LIM NAT RAN (1992) Meeting, which had not foreseen any requirement to update the cost/benefit analysis unless major changes occurred. With the foregoing in mind, it was recalled that aircraft approval costs had not been included in the previous estimates. The Group was informed that the latest studies, which included aircraft approval costs, had been reviewed by the VSIG and that they had noted that the benefit-to-cost ratio still remained positive.

Updates to the Guidance Material

4.3.70 The Group was informed that the draft Guidance Material on the implementation of 1000 ft vertical separation minimum in the NAT MNPS airspace had been reviewed by the VSIG. It was noted that the draft AC would be included in the Guidance Material as an appendix. When agreeing to the foregoing, it was noted that some sections of the Guidance Material would have to be further amended to take into account the draft AC. Because of these decisions, a final version would not be ready for formal endorsement before NAT SPG/30. Nevertheless, it was agreed that the material should be circulated, as draft material, before NAT SPG endorsement in order to keep all NAT Region users informed of developments.

CONCLUSION 29/31 - GUIDANCE MATERIAL ON THE IMPLEMENTATION OF REDUCED VERTICAL SEPARATION IN THE NAT REGION

That:

a) the Advisory Circular developed by the Federal Aviation Administration be included in the draft guidance material;

b) the ICAO EUR/NAT Office be requested to circulate the draft guidance material to all concerned as advance information; and

c) the guidance material be presented to NAT SPG/30 for endorsement.

Effects of turbulence on collision risk

4.3.71 In follow-up to LIM NAT RAN (1992) Conclusion 6/5 a) concerning the need to address the effects that turbulence may have on risk, as well as the need to develop procedures to mitigate any risk that may exist, the Group reviewed data that had been collected by IFALPA and analyzed by the FAA. The preliminary results of the analysis had indicated that a formal study was required in order to be able to develop recommendations on this matter. It was pointed out that the study which had been carried out appeared to have been based on subjective data which was not easily quantifiable. The observer from IATA stressed the need to obtain data that could be easily quantified,

such as read-outs from the digital flight data recorders in order to carry out a sound analysis. He also indicated that IATA would be prepared to encourage airlines to participate in the study. However, before proceeding with the study, it would be necessary to resolve logistics problems such as who would be the focal point for the collected data and who would carry out the analysis. The Group noted the foregoing as well as the forms developed by IFALPA and it agreed that the RSSIG (formerly the VSIG) should be the focal point. It was also noted that the United Kingdom had undertaken to examine the practicability of obtaining from Bracknell data on air-report (AIREP) specials relating to turbulence.

CONCLUSION 29/32 - SURVEY ON THE EFFECTS OF TURBULENCE ON OPERATIONS IN THE NORTH ATLANTIC MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS AIRSPACE

That:

a) data, which should be as quantifiable as possible, on the effects of turbulence in the NAT Region be collected with the assistance of IATA and IFALPA; and

b) the Reduced Separation Standard Implementation Group (formerly the Vertical Separation Implementation Group) be the focal point for the analysis of the data collected.

Non-approved aircraft climbing or descending through MNPS airspace

4.3.72 This issue was examined taking into account the amendment to the NAT SUPPs proposed by the LIM NAT RAN (1992) Meeting and subsequently approved by the Council. It was noted that this problem only arose as a result of aircraft wishing to climb or descend through MNPS airspace when close to the boundaries of MNPS airspace. Because radar and other facilities were normally available at the locations concerned, no problem was envisioned as the application of reduced separation minima could be used in accordance with *The Procedures for Air Navigation Services - Rules of the Air and Air Traffic Services* (Doc 4444) Part III Chapters 8 and 9. Accordingly, it was agreed that no further work was required on this matter.

Future role of the VSIG and work programme

4.3.73 The question of expanding the terms of reference of the VSIG to include reductions in horizontal separation minima was discussed, taking into account the decisions of the ad hoc NAT SPG meeting which had been held in November 1992 in Cascais Portugal. In this context, it was agreed that the VSIG be replaced by another working group called the Reduced Separation Standards Implementation Group (RSSIG) and that it be constituted along the same lines as the VSIG, that is a main coordinating group assisted by specialized sub-groups. It was further agreed that the RSSIG should decide on the terms of reference of its sub-groups. It was also agreed that work relating to the vertical dimension was not complete and that this would have to be taken into account. In the same context, the Group agreed that the issues relating to the introduction of ACAS and the need to develop a collision risk model appropriate to the implementation of CNS/ATM systems be coordinated through the RSSIG. The terms of reference for the RSSIG are specified in the Report on Agenda Item 6.

4.3.74 As regards the work programme, it was agreed that it should be developed at the first meeting of the RSSIG and that close cooperation would be required between the RSSIG and the ATMG for elements related to the introduction of reduced separation minima. However, bearing in mind the agreement that a decision on the type of height monitoring system was required by January

1994, (paragraph 4.3.63 refers) the Group agreed that the RSSIG efforts should be directed at achieving that objective. Accordingly, meetings of the RSSIG's airspace monitoring sub-group and of the mathematicians would be required in the fall of 1993 so that the RSSIG could meet at the beginning of December 1993.

4.3.75 The Group noted that an overall implementation tracking plan should be developed in order to facilitate the decision making process and to provide an overview of RVSM activities, especially as many interrelated matters appeared to be influencing implementation dates. This tracking plan would be presented to NAT SPG/30.

Height monitoring units - cost sharing

4.3.76 The Group noted that a second meeting of financial experts on arrangements for HMU planning and cost sharing, required for the implementation of RVSM, had been held in Ottawa in April 1993 in response to LIM NAT RAN (1992) Conclusion 6/7. It was noted that the meeting had agreed in principle to recommend to the NAT SPG that the second option being considered was the simplest. Under this arrangement, the six NAT provider States with OACs/ACCs serving NAT FIRs (Canada, Iceland, Ireland, Portugal, the United Kingdom and the United States) would share the capital expenditures for the 8 HMUs at the time of purchase, in accordance with the volume of NAT traffic controlled by their OACs/ACCs. Each provider State operating the HMUs (and the State operating the Regional Monitoring Agency (RMA) - the United Kingdom) would bear the other costs incurred in their State (operating, maintenance and other related costs). Any other State invited to operate an HMU would be reimbursed the full costs involved under this arrangement.

4.3.77 The Group was informed that the cost sharing arrangements were based on participation by all NAT provider States operating OACs/ACCs serving NAT FIRs. After careful consideration, all the States which were represented at the financial experts meeting, except the United States, agreed that it was essential for all the NAT provider States, including the United States, to participate in the arrangements. They considered that the implementation of RVSM in the NAT Region was vital to the interests of all the provider States to efficiently and safely handle the projected volume of air traffic in the region in the time-frame under consideration.

4.3.78 The Member for the United States informed the Group that, despite the expressed need for all States to participate in the cost sharing arrangements, his administration could not do so for various policy reasons. The Group expressed its profound disappointment with the decision by the United States. Accordingly, it agreed that it would not be possible to move forward on this matter until the question of United States participation was resolved.

4.3.79 The Group noted that the implementation timescales were reviewed by the financial experts taking into account their requirements and that they had developed a list of implementation dates for the financial elements necessary to support the HMU project as scheduled. It was considered essential that these dates be met, in order that the HMUs could be financed and become operational in accordance with the RVSM schedule. In this context, it was recalled that some of the implementation dates developed at the LIM NAT RAN (1992) Meeting needed to be adjusted to take into account the requirements of the financial experts (paragraph 4.3.63 also refers). The critical dates noted to by the Group were as follows:

SUGGESTED IMPLEMENTATION DATES FOR FINANCIAL ELEMENTS

1. **June 1993** - Decision by NAT SPG/29 on total number of HMUs and locations required in order to satisfy airspace monitoring requirement.

   (Note: Decision date changed to January 1994)

2. **January 1994** - Formalization of cost sharing agreement, subject to availability of funding.

3. **May 1994** - Confirmation by participating States of availability of funds required.

4. **June 1994** - HMU contract to competitive tender by the United Kingdom on behalf of States concerned to facilitate and expedite contractual arrangements.

5. **July 1994** - Implementation of agreement.

6. **April 1995** - HMU contract award with payment of deposits by participating States to follow.

4.3.80 Keeping in mind the implementation dates agreed to above and the agreement to bring forward the decision date on the type of monitoring to be used (HMU vs GNSS based monitoring), the Group agreed that efforts should be made by all concerned to stay within the final implementation dates agreed to at the LIM NAT RAN (1992) Meeting. In this context, it was felt that critical elements 1, 2 and 3 above could be converged to one common date in January 1994. To this effect, it was agreed that the financial experts group should meet before the end of the year in order to revise the cost sharing proposal to include the following:

a) the participation of the United States;

b) the non-participation of the United States;

c) the approximate unit cost per crossing per FIR; and

d) a comparison between cost sharing for HMU's and GNSS based height monitoring.

4.3.81 To accomplish d) above, the Member for the United States indicated that his administration could provide cost estimates for a GPS based monitoring system in the next 90 days. In the same context, it was agreed that the RSSIG would provide the financial experts with a project description for GPS based height monitoring and that it would finalize work on the number of HMUs required. Finally, it was agreed that work on this matter had to be completed during December 1993.

Cost recovery

4.3.82 As regards cost recovery, the NAT provider States would recover their share of the costs through their existing user charge/cost recovery arrangements or as appropriate, with the cost share of Iceland needing to be recovered at 100 percent through the user charges levied on NAT flights under the Icelandic Joint Financing Agreement.

4.3.83 The observer from IATA expressed concern that whatever cost sharing mechanism was adopted, the proposed cost recovery through separately levied FIR charges would result in total per flight charges being dependent upon the route flown (i.e. the FIRs transited). Since the benefits

of RVSM were perceived as effectively constant throughout the NAT MNPS airspace, IATA was of the view that a single per crossing charge would be equitable and hence appropriate. IATA also considered that large variations in charges to flights, depending on routes flown would be wholly inappropriate. The Group agreed that the financial experts be requested to forecast approximate charges per flight for transit of each NAT FIR for the consideration of the users.

CONCLUSION 29/33 - COST SHARING FOR HEIGHT MONITORING IN THE NAT REGION

That:

a) the financial experts meet during 1993 to draw up cost sharing proposals based on the following:

i) the participation of the United States;

ii) the non-participation of the United States;

iii) the approximate unit charge per crossing per FIR; and

iv) a comparison between cost sharing for height monitoring unit (HMU) and global positioning system (GPS) based height monitoring; and

b) the RSSIG provide the financial experts with the number of HMUs required as well as a project description of a GPS based height monitoring system;

c) the United States provide the financial experts with costs data on a GPS based height monitoring system; and

d) the Reduced Separation Standard Implementation Group (RSSIG) make recommendations to the special meeting of the NAT SPG, planned for January 1994.

4.4 Management of the NAT Implementation Document

4.4.1 The Group recalled that the ICAO EUR/NAT Office, in response to the request made at NAT SPG/27, had been invited to manage the NAT ID in accordance with the guidelines established at that time and revised at NAT SPG/28 in order to ensure that the NAT ID was kept up to date. In this context, the Group noted that the first amendment to the NAT ID, dated 22 December 1992, was sent to all concerned on 2 February 1993.

4.4.2 The Group was informed that several States, in response to the attached letter to the first amendment, had provided suggestions for updating the NAT ID. In particular it was suggested that all references to CIDIN be replaced by ATN as CIDIN was considered to be a sub-network of the ATN. It was also suggested that NAT SPG/29 review the Phase I timescale of 1990-1995. In this context the Group agreed that 1995 would be a more appropriate date for the start of Phase I.

4.4.3 In addition to the above, the Group agreed that all the timescales in the Implementation Plan (Part II of the NAT ID) needed to be adjusted in order to be more realistic and that new start dates and timescales should be adjusted in order to take into account the lapse of time since the adoption of the NAT ID. Furthermore, it was considered that it was time to start addressing some of the Phase II issues which may have to be included in the Implementation Plan itself.

4.4.4 The Group noted that the ADSDG had suggested that more information concerning States' development plans should be included in the NAT ID; furthermore, it agreed that more detailed information, such as agreed implementation timetables, should also be included.

4.4.5 With the pending introduction of the FASID, some confusion could exist between the intent of the FASID and of the NAT ID as they were both called "Implementation Documents". Accordingly, it was agreed that the NAT ID be renamed the "NAT Implementation Programme Document (NAT IPD)".

4.4.6 In light of the above suggestions, the Group agreed that a substantial number of changes would be necessary to bring the NAT IPD up to date to ensure that it continued to be a useful planning tool which met the requirements of the providers and users alike. Accordingly, it agreed that a second edition should be published.

CONCLUSION 29/34 - UPDATING OF THE NAT IMPLEMENTATION DOCUMENT (NAT ID)

That:

a) an in-depth review of the contents of the NAT ID (not its basic structure) including all the timescales and phases, be carried out with the objective of publishing a second edition by the end of 1993;

b) to expedite the process, the final approval be obtained by correspondence; and

c) the name of the NAT ID be changed to the "NAT Implementation Programme Document (NAT IPD)".

4.5 Follow-up action from the Limited NAT Regional Air Navigation Meeting 1992

4.5.1 The Group was provided with information on the action taken by the ANC and the Council in respect of the LIM NAT RAN (1992) Meeting. With the exception of Recommendation 6/1, action by the Council and ANC had been completed on all Recommendations. It was noted that, in accordance with the directives to RAN Meetings contained in Doc 8144, neither the Council nor the ANC took action on RAN meeting Conclusions. (Doc 8144, Appendix 2 refers). Accordingly, it was the responsibility of the NAT SPG or others to take appropriate follow-up action. In this respect, the NAT SPG had, in many instances, been identified as the body responsible for such action. In the same context, it was also considered appropriate to assign follow-up responsibility to the NAT SPG on relevant Recommendations of the LIM NAT RAN Meeting.

4.5.2 Concerning those Recommendations or Conclusions requiring NAT SPG follow-up action and which were related to the NAT ID, the Group agreed to assign each Recommendation or Conclusion to a specific Line of Action and therefore to a specific working group. The Group also noted that some new Lines of Action might be necessary to address some of the Recommendations or Conclusions. The following areas appeared obvious: height monitoring system; the transition to the ATN; and the role of ACAS. Details on the identification of Lines of Action and their allocation to the various working groups are covered in the Report on Agenda Item 6.

4.5.3 The Group noted the information presented concerning follow-up action for all relevant LIM NAT RAN (1992) Meeting Recommendations and Conclusions. In view of the decision taken to create an Implementation Planning Coordination Team (IPCT) (Agenda Item 6 Conclusion 29/37 refers), the Group agreed that the Secretary should inform the IPCT of the information and that they should take appropriate follow-up action as required.

4.6 Possible radar coverage over Greenland

4.6.1 The Group was presented with the results of a technical study undertaken by Iceland and Denmark on the feasibility of establishing radar in Greenland and transferring the data to ATC facilities in Iceland. This study had been undertaken and the results had been presented in accordance with NAT SPG Conclusion 28/17.

4.6.2 The Group welcomed the detailed study and noted the estimated yearly costs of making data from one, two and three radar stations in Greenland available to Reykjavik ACC. It was noted, however, that a determination of benefit/savings to the operators had not been undertaken as part of the study and that States had not yet taken steps to ensure the availability of funds. It was therefore suggested that steps be taken to initiate further cost/benefit analyses together with a determination as to the financial/institutional arrangements necessary to support a final decision on the expansion of radar coverage in the Northern part of the NAT Region and report to NAT SPG/30. It was agreed that this analysis was of particular importance in light of the fact that ADS might be fully operational by the time a full amortization of the radar installations was realized, although it was agreed that ADS was as yet, not a fully known technology and that it would be difficult to include it in the study.

4.6.3 The Group agreed that the cost/benefit analysis should encompass a combination of radar stations at Sofia Fjeld on the East cost, Prince Christian Sund and Cape Desolation on the South coast, and Qaqatoqaq on the West coast, in order to ascertain the cost/benefit of having full radar coverage.

4.6.4 The Group had identified additional outstanding issues that still needed to be resolved, such as the type of financing method for cost recovery and whether or not costing tables of the study should include payment by all flights operating North of 45° North or just those operating through the radar coverage area. In light of the unresolved issues the Group agreed that it could not move forward until a cost/benefit analysis had been carried out.

4.6.5 It was suggested that a benefit model, developed by the United Kingdom for FANS Committee studies, might assist in progressing these studies. The member for the United Kingdom agreed to ascertain whether the model might be made available.

CONCLUSION 29/35 - COST/BENEFIT MODEL OF EXPANDED RADAR COVERAGE IN GANDER AND REYKJAVIK OCEANIC CONTROL AREAS

That:

a) Denmark, Iceland and IATA extend the study of expanded radar coverage in Gander and Reykjavik oceanic control areas so as to identify a cost/benefit model to be used in order to determine the feasibility of establishing radar stations in Greenland;

b) the study be completed before the end of 1993;

c) the United Kingdom and Canada supply the necessary data for the analysis;

d) Denmark and Iceland report on the findings of the study to NAT Air Traffic Management Group (ATMG), for their consideration; and

e) the NAT ATMG make appropriate recommendations with respect to operational aspects to NAT SPG/30.

- - - - - - - - - - - - - - - - -

APPENDIX A - NORTH ATLANTIC TRAFFIC FORECASTS

(Paragraph 4.2.9 refers)

FIGURE 1 - ANNUAL PASSENGERS: 1971 - 1998

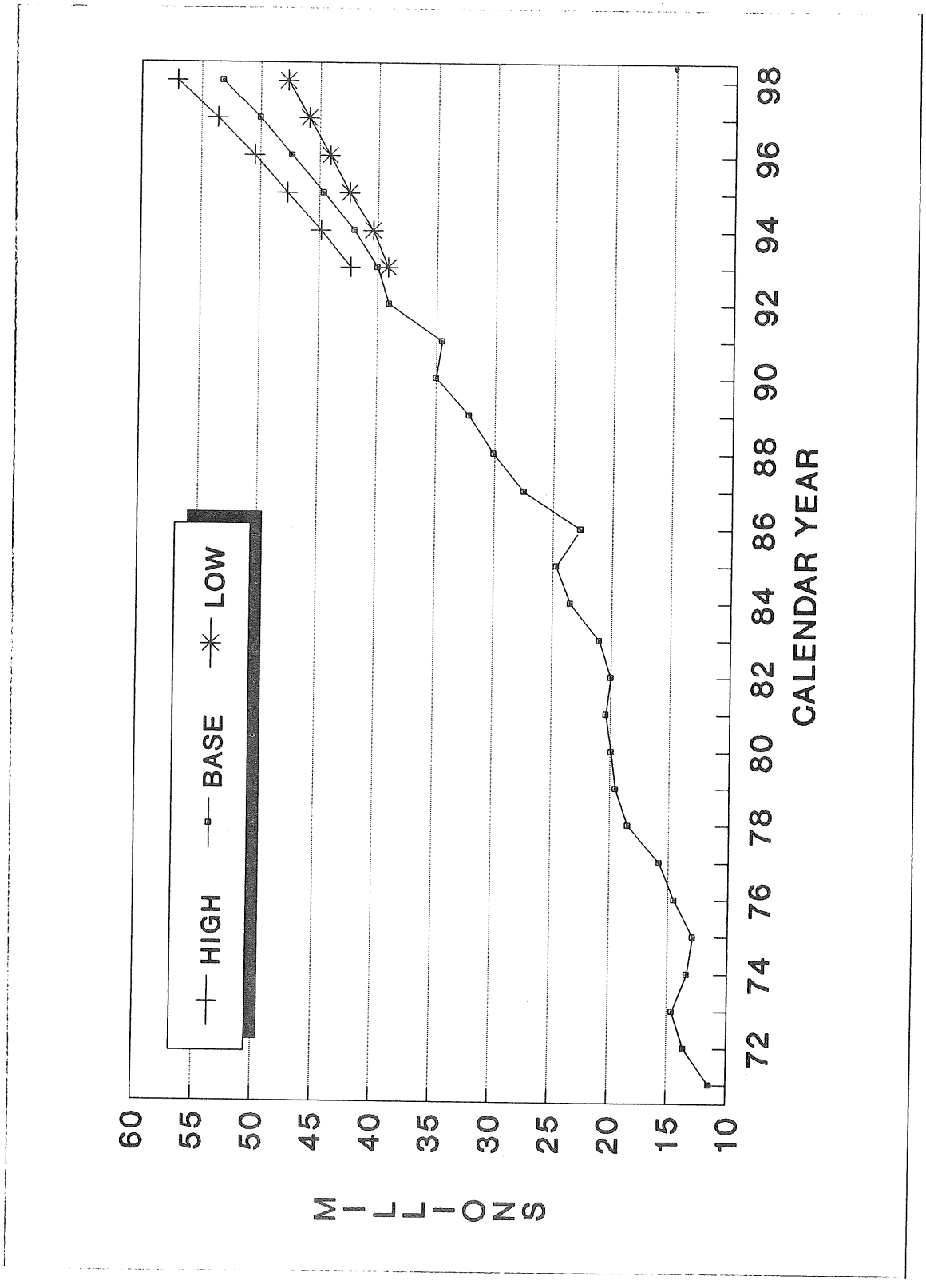
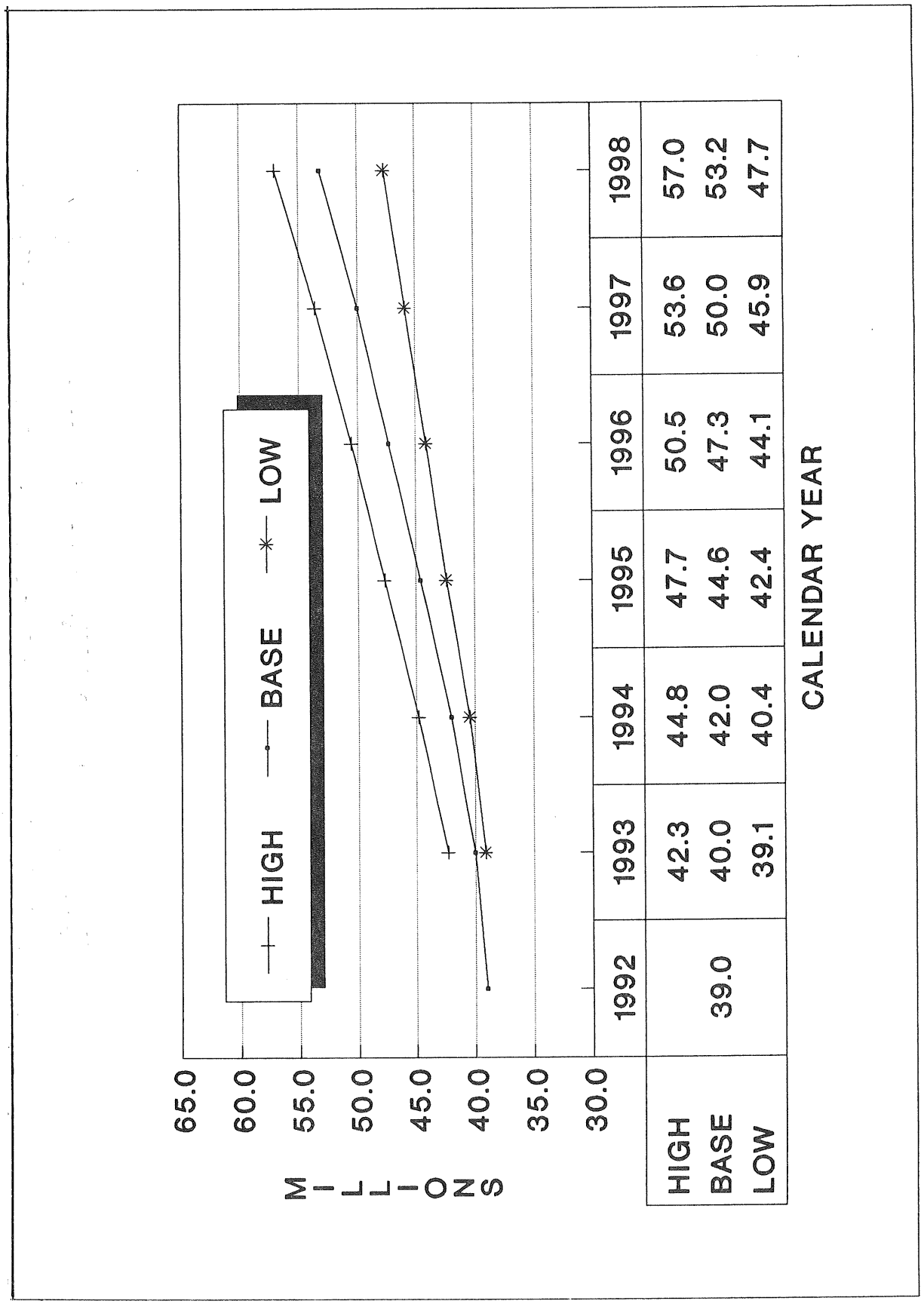


FIGURE 2 - ANNUAL PASSENGERS: 1992 - 1998



	1992	1993	1994	1995	1996	1997	1998
HIGH	39.0	42.3	44.8	47.7	50.5	53.6	57.0
BASE		40.0	42.0	44.6	47.3	50.0	53.2
LOW		39.1	40.4	42.4	44.1	45.9	47.7

FIGURE 3 - AIRCRAFT MOVEMENTS: 1976 - 1998

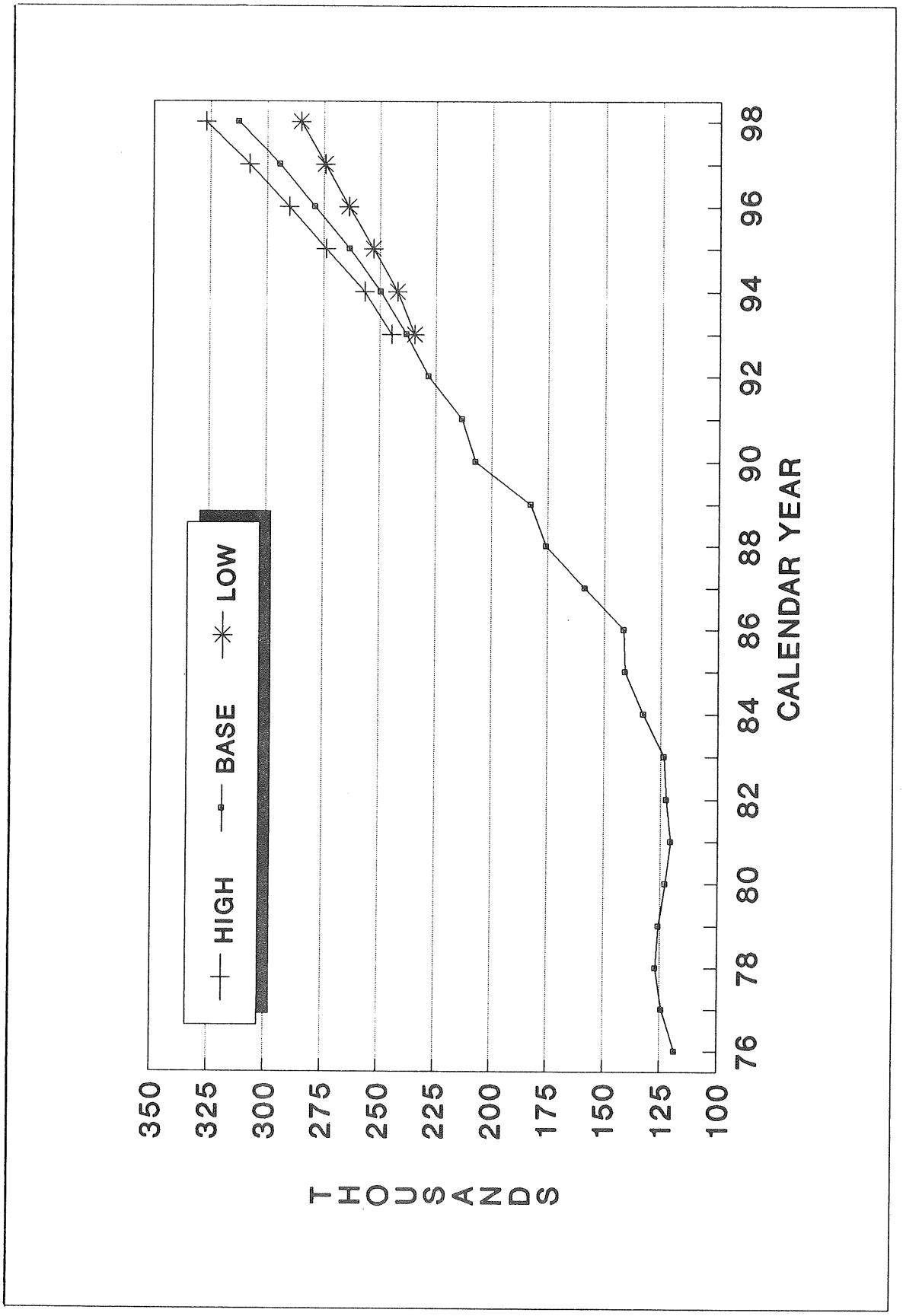
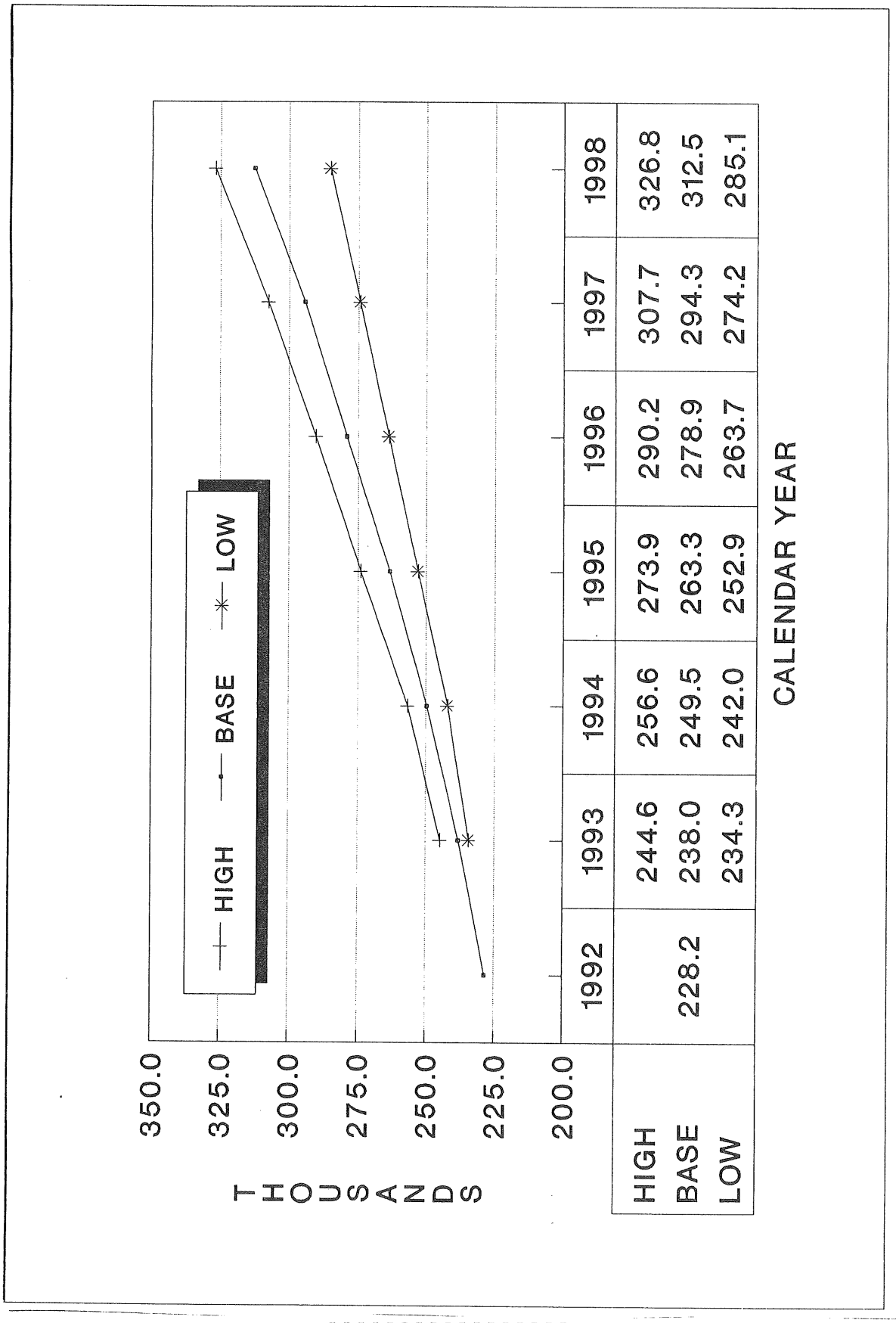


FIGURE 4 - AIRCRAFT MOVEMENTS: 1992 - 1998



	1992	1993	1994	1995	1996	1997	1998
HIGH		244.6	256.6	273.9	290.2	307.7	326.8
BASE	228.2	238.0	249.5	263.3	278.9	294.3	312.5
LOW		234.3	242.0	252.9	263.7	274.2	285.1

APPENDIX B - COMMON PROCEDURES FOR RADIO COMMUNICATIONS FAILURE OF OCEANIC AIRCRAFT OPERATING IN THE NAT REGION

(Paragraph 4.3.12 refers)

1. The following procedures are intended to provide general guidance for North Atlantic (NAT) aircraft experiencing a communications failure. These procedures are intended to complement and not supersede state procedures/regulations. It is not possible to provide guidance for all situations associated with a communications failure.

2. **General**

2.1 If so equipped, the pilot of an aircraft experiencing a two-way radio communications failure shall operate the secondary radar transponder on identity (Mode A) Code 7600 and Mode C.

2.2 The pilot shall also attempt to contact any ATC facility or another aircraft and inform them of the difficulty and request they relay information to the ATC facility with whom communications are intended.

3. **Communications failure prior to entering NAT oceanic airspace**

3.1 If operating ***with*** a received and acknowledged oceanic clearance, the pilot shall enter oceanic airspace at the cleared oceanic entry point, level and speed and proceed in accordance with the received and acknowledged oceanic clearance. Any level or speed changes required to comply with the oceanic clearance shall be completed within the vicinity of the oceanic entry point.

3.2 If operating ***without*** a received and acknowledged oceanic clearance, the pilot shall enter oceanic airspace at the first oceanic entry point, level and speed, as contained in the filed flight plan and proceed via the filed flight plan route to landfall. That first oceanic level and speed shall be maintained to landfall.

4. **Communications failure prior to exiting NAT oceanic airspace**

4.1 *Cleared* on flight plan route

4.1.1 The pilot shall proceed in accordance with the last received and acknowledged oceanic clearance to the last specified oceanic route point, normally landfall, then continue on the flight plan route. Maintain the last assigned oceanic level and speed to landfall. After passing the last specified oceanic route point, conform with the relevant State procedures/regulations.

4.2 *Cleared* on other than flight plan route

4.2.1 The pilot shall proceed in accordance with the last received and acknowledged oceanic clearance to the last specified oceanic route point, normally landfall. After passing this point, rejoin the filed flight plan route by proceeding directly to the next significant point ahead of the track of the aircraft as contained in the filed flight plan. Where possible use published ATS route structures, then continue on the flight plan route. Maintain the last assigned oceanic level and speed to the last specified oceanic route point. After passing this point conform with the relevant State procedures/regulations.

- - - - - - - - - - - - - - - - -

APPENDIX C - ADS-ATC EVOLUTION - PHASE 1
(Paragraph 4.3.26 refers)

	STEP	ADVANTAGES	ISSUES
MANUAL	- Current procedures (1)	- none	- increasing airspace congestion
	- Manually constructed POS messages (2)	- timeliness - reduced HF congestion - reduction in R/T errors - direct input to FDPS	- available technology - messages (definition) - certification
	- ATC messages via data link (3)	- same as for POS	- same as for POS - basic HMI - certification
LIMITED AUTOMATION	- Basic & projected profile at waypoints (4)	- same as for step (2) - reduction in GNEs - clearance compliance	- evolving SARPs (ARINC 745 & RTCA 170) - basic FDPS - systems modified to accept bit orientated messages - reductions in GNEs needed for reduction in horizontal separation - ATC simulations - certification
	- DCPC using data link (5)	- same as for step (3) - timely ATC/pilot intervention capability - reduction in message ambiguity	- evolving SARPs (RTCA 169) - enhanced HMI - certification
	- Periodic ADS reports (6)	- some tactical ATC - conformance monitoring - selective reductions in horizontal separation	- enhanced FDPS - ATC simulations - certification

APPENDIX D - AIRCRAFT PARTICIPATING IN THE ATC DATALINK TRIALS

(Paragraph 4.3.32 refers)

AIRCRAFT PARTICIPATING IN THE ATC DATALINK TRIALS

Airline name	Type of aircraft	Aircraft Registration	24 bit ICAO address (HEX)

Type of messages supported

POSITION REPORT ☐ METEO ☐ OTHER* ☐

ADS

Character oriented* ACARS ☐

Character oriented 622 ☐

Bit oriented 622 ☐

RTCA 170 ☐

* value 1 to 10 see description in appendix

DCPC ☐ OCM ☐ ATIS ☐

Character oriented ACARS ☐

Character oriented 622 ☐

Bit oriented 622 ☐

RTCA 169 ☐

add format in appendix if different from 169

* Description should be given in appendix

Data link capabilities :

Satellite : Data 1 ☐ Data 2 ☐ Data 3 ☐ voice : V1 ☐ V2 ☐

Mode S ☐ VHF : ACARS ☐ AVPAC ☐

Avionics on board : NAV : GNSS ☐ INS ☐ OMEGA ☐ OTHER ☐

ADSU : STAND–ALONE ☐ IN FMS ☐ OTHER ☐

· CONNECTION TO FMS ☐

Typical flight for this aircraft :

APPENDIX E - PROPOSED CHANGES TO ICAO PANS-RAC 4444

(Paragraph 4.3.42 refers)

The following definitions of ATS Field 15 (the route field) should be added to Appendix A of PANS-RAC, Doc 4444:

(c8) Cruising Speed and Cruising Level/Significant Point

CRUISING SPEED OR MACH NUMBER (as in element (a))
REQUESTED CRUISING LEVEL (as in element (b))
OBLIQUE STROKE
SIGNIFICANT POINT (as in element (c3)

(c9) Significant Point/Cruising Speed and Cruising Level/Significant Point

SIGNIFICANT POINT (as in element (c3)
OBLIQUE STROKE
CRUISING SPEED OR MACH NUMBER (as in element (a))
REQUESTED CRUISING LEVEL (as in element (b))
OBLIQUE STROKE
SIGNIFICANT POINT (as in element (c3)).

Note: *When used in a CPL message, the Field 15 route refers to "the ATC cleared route" and not to the filed flight plan (FPL) route.*

- - - - - - - - - - - - - - - - -

APPENDIX F - PROPOSED AMENDMENT TO DOC 7030

(Paragraph 4.3.64 refers)

2.1.1 Aircraft used to conduct flight within the volume of airspace specified in 2.2.1 shall;

1) (lateral as before)

2) have height-keeping performance capability such that:

a) the total vertical errors of a given type of aircraft shall have a mean no greater than 80 ft (24.4 m) in magnitude and shall have a standard deviation no greater than $92 - 0.004z^2$ for $0 \leq z \leq 80$ where z is the magnitude of the type's mean total vertical error in feet or $28 - 0.013z^2$ for $0 \leq z \leq 25$ when z is in metres; and, in addition, the components of total vertical error of a given type of aircraft must have the following characteristics:

i) The mean altimetry system error (ASE) of the type shall not exceed 80 feet (25m);

ii) the sum of the absolute value of the mean altimetry system error (ASE) for the type and three standard deviations of ASE within the group shall not exceed 245 ft (75 m);

iii) the difference between cleared flight level and the pressure altitude actually flown shall be symmetric about a mean of 0 ft, with a standard deviation no greater than 43.7 ft (13.3 m) and any rate of decay shall be at least exponential.

Note: The following characteristics of Total Vertical Error (TVE) for the airplane population were used to develop height-keeping performance requirements of 2.1.1 2) a) above:

1) the proportion of height-keeping errors beyond 300 ft (90 m) in magnitude is less than 2×10^{-3};

2) the proportion of height-keeping errors beyond 500 ft (152 m) in magnitude is less than 3.5×10^{-6}:

3) the proportion of height-keeping errors beyond than 650 ft (200 m) in magnitude is less than 1.6×10^{-7}; and

4) the proportion of height-keeping errors between 950 and 1050 ft (290 and 320 m) in magnitude is less than 1.7×10^{-8}

AGENDA ITEM 5: GENERAL MATTERS

5.1 Introduction

5.1.1 Under this item the Group discussed the updating of:

a) the NAT Consolidated Guidance Material;

b) the NAT Minimum Navigation Performance Specifications Airspace Operations Manual; and

c) the Manual on International General Aviation.

5.2 NAT Consolidated Guidance Material

5.2.1 The Group recalled that prior to NAT SPG/28, a draft copy of the Sixth Edition of the NAT Guidance Material had been circulated to all concerned. NAT SPG members, observers and participants had been invited to provide comments/additions, etc., to the draft Sixth Edition so that they could be incorporated into the final version. Several comments were provided and were reviewed by NAT SPG/28 and, for the most part, were included in the final version.

5.2.2 The Group noted that the final version of the Sixth Edition had been circulated to all concerned in October of 1992 along with a request for further comments. The Group agreed that the ICAO European and North Atlantic Office should initiate a review of the Guidance Material in light of the results of NAT SPG/29 and of the LIM NAT RAN (1992) Meeting and subsequently publish Amendment No. 1 to the Sixth Edition.

5.2.3 The Group wished to place on record its satisfaction with the final results of the work that had been carried out by all concerned in producing the Sixth Edition of the NAT Guidance Material and agreed that the document was now a better tool for planning and management in the NAT Region.

5.3 Minimum Navigation Performance Specifications Airspace Operations Manual

5.3.1 The Group was presented with a progress report on the development of the Sixth Edition of the MNPS Airspace Operations Manual. It was noted that external input to date had been very limited and that much of the contents of the document required specific expertise that was not readily available to the publishers.

5.3.2 In light of the above and taking into account a deadline of 20 August 1993 for final input from States and international organizations, the Group agreed that a small meeting should be convened in order to finalize work on the Sixth Edition of the document. In this context, all concerned were urged to review the Fifth Edition of the *NAT MNPS Airspace Operations Manual* and to forward all comments, additions, deletions, etc., to the United Kingdom by 20 August 1993.

5.3.3 The Group also agreed to incorporate LIM NAT RAN (1992) Conclusion 5/10 ("Amendment to the NAT MNPS Airspace Operations Manual") in the Sixth Edition of the document. The proposed amendment is at **Appendix A** to this part of the report.

5.4 Manual on International General Aviation

5.4.1 The Group was presented with the procedures that States should follow in order to provide updated information for inclusion in the next edition of the International General Aviation (IGA) Manual and agreed that the Second Edition of the IGA Manual should now be prepared and published. In this context, NAT provider States had been invited to prepare changes that they would like included and to forward them to the United States prior to 31 December 1993.

5.4.2 The observer from IAOPA expressed his concern with the radio communications failure procedures agreed to under Agenda Item 4 which were intended to be included in the Second Edition of the IGA Manual. These concerns dealt mainly with legal requirements. In this regard, the observer from IOAPA and the publisher of the document agreed to investigate the problem prior to publication of the procedures in the Second Edition.

- - - - - - - - - - - - - - - - -

APPENDIX A - PROPOSED AMENDMENT TO THE NAT MNPS AIRSPACE OPERATIONS MANUAL

(Paragraph 5.3.3 refers)

Insert following text after the paragraph dealing with "meteorological reports":

Pilots should make special aircraft observations whenever encountering/observing:

- severe turbulence or severe icing;
- moderate turbulence, hail or cumulonimbus clouds during transonic or supersonic flight;
- volcanic ash cloud;
- pre-eruption volcanic activity;
- a volcanic eruption; or
- other meteorological conditions which in the opinion of the pilot-in-command may affect the safety or markedly affect the efficiency of other aircraft operations.

In reports to ATS units with which they are in contact, pilots should identify special aircraft observations by using the words "SPECIAL REPORT".

AGENDA ITEM 6: FUTURE WORK

6.1 Introduction

6.1.1 Under this agenda item the Group considered the following items:

a) the need to convene a meeting of high level civil aviation managers of the NAT SPG Member States;

b) the establishment of an implementation programme coordination function within the NAT SPG;

c) organization of the communications aspects of the future work;

d) the Terms of Reference of the implementation sub-groups in relation to the management of the NAT Implementation Programme Document; and

e) organization of future work.

6.2 Need to convene a meeting of high level civil aviation managers of the NAT SPG Member States

6.2.1 In the light of the change in the nature of some of the decisions that needed to be made by the NAT SPG, such as institutional matters, financing and policy decisions concerning the implementation strategy of the ICAO CNS/ATM systems, the Group identified the need to resolve a number of these issues as a prerequisite for orderly implementation planning in the NAT Region. It was considered important that all States concerned should identify and commit to major milestones using a common timetable in order that maximum benefits were derived from the substantial investments that were and would continue to be required. Accordingly, it was agreed that an initial meeting of high level civil aviation managers of the NAT SPG Member States should be convened under the auspices of ICAO to address specific issues on which high level policy decisions would be required.

6.2.2 In order to ensure that the target dates for coordinated implementation of the many elements of the ICAO CNS/ATM systems in the NAT Region may be met and to enable the necessary resource commitments in a timely manner, the meeting referred to above should be held not later than January 1994.

CONCLUSION 29/36 - CONVENING OF A MEETING OF HIGH LEVEL CIVIL AVIATION MANAGERS FROM NAT SPG MEMBER STATES

That the ICAO Representative, European and North Atlantic Office, convene, not later than January 1994, an initial meeting of high level managers from the NAT SPG Member States to address specific problems dealing with institutional, financial and policy aspects of the implementation of the ICAO communications, navigation and surveillance/air traffic management (CNS/ATM) systems in the NAT Region.

6.3 Establishment of an implementation programme coordination function within the NAT SPG

6.3.1 The Group confirmed that the NAT IPD (formerly the NAT ID) constituted a suitable tool for managing the CNS/ATM systems implementation, and that the NAT SPG implementation sub-groups were the appropriate machinery to carry out the necessary preparatory work. However, the NAT SPG itself was not in the best position to perform the detailed coordination functions required for the implementation programme.

6.3.2 Therefore, the Group agreed to establish a small Implementation Programme Coordination Team (IPCT) consisting of the Rapporteurs of the implementation sub-groups and the Chairman and the Secretary of the NAT SPG. The latter was expected to ensure the required secretariat support for implementation programme coordination.

6.3.3 It was agreed that the responsibilities of the NAT IPCT would be:

a) to identify milestones and key events in projects undertaken outside the NAT Region and their relevance to the NAT IPD Lines-of-Action;

b) to identify inter-relations between the milestones of the NAT IPD Lines-of-Action allocated to the NAT implementation sub-groups;

c) to ensure that all relevant information was relayed to the NAT implementation sub-groups without delay;

d) to schedule the work of the NAT implementation sub-groups in such a way that the necessary interactions become possible and implementation target dates can be met;

e) to keep the NAT SPG informed on progress achieved; and

f) to propose, through the NAT SPG, the necessary amendments to the NAT IPD and eventually the NAT FASID in order to maintain these documents as a sound basis for implementation decision making by all concerned.

6.3.4 It was believed that the NAT IPCT would be able to carry out its work mostly by correspondence and meetings would therefore be kept to a minimum commensurate with furthering the work. To support the work of the Team, the function of Implementation Programme Coordinator was required at the ICAO secretariat level. The resources required were estimated at 0.5-1.0 person/year -initially for the next 5 to 6 years. Knowledge of the work already carried out on the CNS/ATM systems implementation within and outside the NAT Region was considered to be essential for that function. It was hoped that the European and North Atlantic Office of ICAO could manage, at least initially, from within available resources to carry out the support function for the NAT IPCT.

CONCLUSION 29/37 - ESTABLISHMENT OF A NAT IMPLEMENTATION PROGRAMME COORDINATION TEAM

That:

a) **a NAT Implementation Programme Coordination Team (IPCT) be established within the structure of the NAT SPG, composed of the Chairman and the Secretary of the NAT SPG and the Rapporteurs of the NAT implementation sub-groups;**

b) the terms of reference of the IPCT be:

i) to identify milestones and key events in projects undertaken outside the NAT Region and their relevance to the NAT Implementation Programme Document (IPD) Lines-of-Action;

ii) to identify inter-relations between the milestones of the NAT IPD Lines-of-Action allocated to the NAT implementation sub-groups;

iii) to ensure that all relevant information is relayed to the NAT implementation sub-groups without delay;

iv) to schedule the work of the NAT implementation sub-groups in such a way that the necessary interactions become possible and implementation target dates are met;

v) to propose, through the NAT SPG, the necessary amendments to the NAT IPD and the proposed NAT Facilities and Services Implementation Document (FASID) in order to maintain these documents as a sound basis for implementation decision making by all concerned;

vi) to keep the NAT SPG informed on progress achieved; and

c) the European and North Atlantic Office of ICAO provide the necessary professional and secretariat support to the NAT IPCT.

6.4 Organization of the communications aspects of the future work

6.4.1 The Group noted that the ADSD and OLDI groups were principally involved with the automation aspects of exchanging ATM information between ATS units serving the NAT Region as well as between ATS units and users. The application processes supporting this automation generated requirements for connectivity (an application data link), quality of service (data integrity, delay, priority, etc.) and transfer syntax. A very close relationship between the above requirements and the supporting communications requirements necessary to achieve them was noted.

6.4.2 It was also noted that upon approval of the new air navigation planning processes (LIM NAT RAN (1992) Meeting, Conclusion 6/1 refers), the Group would be closely involved in the maintenance of the proposed NAT FASID. This document would contain specific chapters and sections on Aeronautical Mobile Service (AMS), Aeronautical Mobile Satellite Service (AMSS), both voice and data, AFS, again both voice and data, the ATN, Radio Navigation Aids, Meteorology and CNS/ATM transition issues which were all related to several NAT IPD Lines of Action requiring communications expertise.

6.4.3 The Group noted that it would also be interested in various tests and trials that would be undertaken in the NAT Region in the foreseeable future. This would also require the involvement of communications experts versed in existing data transfer techniques such as AFTN, X.25 and the ATN technology. The Group therefore recognized the need for broader expertise to carry out the communications planning and implementation activities needed for the transition to the ICAO CNS/ATM systems.

6.4.4 Accordingly, the Group agreed to rationalise the way work in the communications field was carried out. Firstly, it noted that, although the role of HF communications operations was planned to gradually decline, the requirement to monitor communications would still be needed in accordance with the NAT SPG terms of reference. Notwithstanding the above, the Group felt that resource utilization should be directed at planning for future communications requirements rather than looking at past performance. It was therefore agreed that the OLDI group be changed to a "Communications and Automation Group (COMAG)" and that their terms of reference should be changed in accordance with the contents of **Appendix A** to this part of the report. It was further agreed that the COMAG should study how best to incorporate the work being carried out by the existing communications sub-group into their work programme bearing in mind the need to monitor the system. The COMAG should also report its findings to NAT SPG/30 for consideration.

CONCLUSION 29/38 - CHANGES TO THE ON-LINE DATA INTERCHANGE (OLDI) GROUP

That:

a) the OLDI group be renamed the Communications and Automation Group (COMAG) with the terms of reference as contained in Appendix A to the Report on Agenda Item 6;

b) the COMAG investigate how to incorporate the tasks being carried out by the existing communications sub-group into its work programme; and

c) the COMAG report their findings to NAT SPG/30.

6.5 Terms of reference for the implementation sub-groups in relation to the management of the NAT Implementation Programme Document

6.5.1 The Group carried out an initial review of all the terms of references of all the implementation sub-groups and adjusted them as required. In this context, it was agreed that the name of the VSIG should be changed to the "Reduced Separation Standards Implementation Group (RSSIG)" in order to reflect the change in its work programme which included reductions in horizontal as well as vertical separation minima. In addition, NAT IPD Lines of Action were reviewed and reassigned as appropriate.

CONCLUSION 29/39 - CHANGES TO THE TERMS OF REFERENCES AND WORK PROGRAMMES OF THE NAT SPG IMPLEMENTATION SUB-GROUPS

That the terms of reference and work programmes of the NAT SPG implementation sub-groups be in accordance with the contents of Appendix A to the Report on Agenda Item 6.

6.5.2 The Group recognized that it could not carry out an in-depth review of all the Lines of Action nor did it have time to agree on whether any new ones ought to be created. Accordingly, it agreed that the IPCT, as a priority item, should review the distribution of the Lines of Action to the various implementation sub-groups and propose changes as required.

6.5.3 The Group also agreed that the IPCT should immediately address the need to prepare for the meeting of high level civil aviation managers (paragraph 6.2.2 above refers). These preparations should include an outline of the NAT ANP as well as presentations on short to medium term issues that would require finance or policy decisions.

6.6 Organization of future work

SPECIAL NAT SPG MEETING IN JANUARY 1994

6.6.1 As indicated in the Report on Agenda Item 4, (paragraph 4.3.74 refers) there was a requirement to convene a special meeting of the NAT SPG in January 1994 to discuss two important items relating to the implementation of RVSM namely - to decide on the type of height monitoring system to be used for the implementation of RVSM in the NAT Region and to agree on a method of cost sharing. This meeting would only be two days long and delegations should be as small as possible. In addition, the meeting would have to review material for the meeting of the high level civil aviation managers which was planned to be held consecutively

MEETING OF HIGH LEVEL CIVIL AVIATION MANAGERS

6.6.2 As indicated above, it was felt that a meeting of high level civil aviation managers was important in order to progress the work of the NAT SPG. In this context, it was felt that such a meeting should be convened in order that it be held immediately after the special NAT SPG meeting scheduled for January 1994. This meeting of high level civil aviation managers would address some of the financial and policy issues that need to be resolved or agreed to in the short to medium term in order to ensure that planning activities of all States concerned were converging.

ORGANIZATION OF NAT SPG/30

6.6.3 The Group reviewed the results of having had the sub-groups (COM, Maths and Scrutiny) meet in advance of the main meeting. Although some benefits may have been realised, it was generally felt that it was more advantageous to have the appropriate experts available throughout the meeting. Accordingly, it was agreed that the entire Group would convene on the first day of the next regular meeting of the NAT SPG as had been done in the past. Nevertheless, the Group did agree that by re-structuring its agenda, some of the benefits of having had the sub-groups meet in advance could be retained. A copy of the draft new agenda is at **Appendix B** to this part of the report. Furthermore, on the basis of the experience gained as a result of having convened the sub-groups in advance, the Group agreed that the COM and Scrutiny sub-groups should plan to complete their work five days after the start of the meeting. Accordingly, it was agreed that such instructions would be given to the sub-groups at future meetings.

6.6.4 The Group agreed that its next meeting would be held in Paris from 6 to 17 June 1994.

- - - - - - - - - - - - - - - - -

6.5.3 The Group also agreed that the IPCT should immediately address the need to prepare for the meeting of high level civil aviation managers (paragraph 6.2.2 above refers). These preparations should include an outline of the NAT ANP as well as presentations on short to medium term issues that would require finance or policy decisions.

6.6 Organization of future work

SPECIAL NAT SPG MEETING IN JANUARY 1994

6.6.1 As indicated in the Report on Agenda Item 4, (paragraph 4.3.74 refers) there was a requirement to convene a special meeting of the NAT SPG in January 1994 to discuss two important items relating to the implementation of RVSM namely - to decide on the type of height monitoring system to be used for the implementation of RVSM in the NAT Region and to agree on a method of cost sharing. This meeting would only be two days long and delegations should be as small as possible. In addition, the meeting would have to review material for the meeting of the high level civil aviation managers which was planned to be held consecutively

MEETING OF HIGH LEVEL CIVIL AVIATION MANAGERS

6.6.2 As indicated above, it was felt that a meeting of high level civil aviation managers was important in order to progress the work of the NAT SPG. In this context, it was felt that such a meeting should be convened in order that it be held immediately after the special NAT SPG meeting scheduled for January 1994. This meeting of high level civil aviation managers would address some of the financial and policy issues that need to be resolved or agreed to in the short to medium term in order to ensure that planning activities of all States concerned were converging.

ORGANIZATION OF NAT SPG/30

6.6.3 The Group reviewed the results of having had the sub-groups (COM, Maths and Scrutiny) meet in advance of the main meeting. Although some benefits may have been realised, it was generally felt that it was more advantageous to have the appropriate experts available throughout the meeting. Accordingly, it was agreed that the entire Group would convene on the first day of the next regular meeting of the NAT SPG as had been done in the past. Nevertheless, the Group did agree that by re-structuring its agenda, some of the benefits of having had the sub-groups meet in advance could be retained. A copy of the draft new agenda is at **Appendix B** to this part of the report. Furthermore, on the basis of the experience gained as a result of having convened the sub-groups in advance, the Group agreed that the COM and Scrutiny sub-groups should plan to complete their work five days after the start of the meeting. Accordingly, it was agreed that such instructions would be given to the sub-groups at future meetings.

6.6.4 The Group agreed that its next meeting would be held in Paris from 6 to 17 June 1994.

- - - - - - - - - - - - - - - -

APPENDIX A - TERMS OF REFERENCE OF THE NAT IMPLEMENTATION SUB-GROUPS

(Paragraph 6.5.1 refers)

COMMUNICATIONS AND AUTOMATION GROUP (COMAG)

Rapporteur: United Kingdom
Secretary: European and North Atlantic Office of ICAO
Members: Canada, Denmark*, Iceland, Ireland, Norway, Portugal, United Kingdom, United States, IATA

TERMS OF REFERENCE

1. To monitor the common Interface Control Document (ICD) and progress changes as required.

2. To develop and subsequently monitor an ICD covering the relay of air ground information from aeradio stations to other than their parent oceanic area control centre (OAC)/area control centre (ACC).

3. To address the requirements for harmonization of data processing systems within the NAT Region (common data bases, wind modelling, application of separation standards, etc.).

4. To address the communications requirements of the NAT CNS/ATM systems including transition issues, especially in regards to the Aeronautical Telecommunications Network.

5. To report to NAT SPG.

Lines of action allocated to COMAG:

2.1	1.1	5.14
5.3	2.2	5.15
5.11	6.1	
5.12	7.3	
5.13		
5.16		

* Represented by Iceland

AUTOMATIC DEPENDENT SURVEILLANCE DEVELOPMENT GROUP (ADSDG)

Rapporteur:	Canada
Secretary:	European and North Atlantic Office of ICAO
Members:	Canada, Denmark*, France, Iceland, Ireland, Norway, Portugal, Russian Federation, United Kingdom, United States, IATA, IFALPA
Observers:	Inmarsat, ARINC/SITA Joint Venture

TERMS OF REFERENCE

1. To co-ordinate pre-operational engineering trials in the NAT Region and to oversee the work related to automatic dependent surveillance (ADS) which is specified in Chapter 4 of the NAT Implementation Programme Document.

2. To define requirements in terms of the possible carriage and use of ADS in the NAT Minimum Navigation Performance Specifications (MNPS) airspace.

3. To ensure standardization of data link messages to support NAT ADS trials.

4. To address ADS and other air/ground data link related issues as deemed necessary.

5. To report to NAT SPG.

Lines of action allocated to ADS Development Group

1.2	6.1
1.3	6.2
1.4	6.3
1.5	7.3
3.4	
4.2	
5.1	
5.2	

* Represented by Iceland

AIR TRAFFIC MANAGEMENT (ATM) GROUP

Rapporteur: United States
Secretary: European and North Atlantic Office of ICAO
Members: Canada, Denmark, France, Iceland, Ireland, Norway, Portugal, United Kingdom, United States, IATA, IFALPA

TERMS OF REFERENCE

1. To coordinate the operational implementation of the current edition of the "Application of Separation Minima (North Atlantic Region)" document.

2. To develop detailed operational requirements for on-line data interchange (OLDI) messages in support of ATM.

3. To address issues relating to Air Traffic Flow Management (ATFM) in the NAT Region taking into account ATFM developments in the CAR, EUR and NAM Regions.

4. To develop common procedures for airspace reservations in the NAT Region.

5. To examine the operational issues in relation to the separation of automatic dependent surveillance (ADS) equipped and non-ADS equipped aircraft in the NAT Region.

6. To take into account the results of the reduced vertical separation minima (RVSM) simulations, and determine ATM requirements for the NAT Region, in relation to the implementation of RVSM.

7. To address the issues regarding NAT operations relating to the RVSM oceanic/domestic interfaces and their associated transition areas.

8. To keep under review procedures for in-flight contingencies for a NAT RVSM environment.

9. To develop a plan for the implementation of, and procedures for, reduced horizontal separation in the NAT Region, based on the findings of the Reduced Separation Standards Implementation Group (RSSIG).

10. To address other ATM issues as deemed necessary.

11. To report to the NAT SPG.

Lines of action allocated to ATM Group

4.1	5.10	7.1
5.7		7.2
5.8		8.1
5.9		9.1
		10.1

REDUCED SEPARATION STANDARD IMPLEMENTATION GROUP (RSSIG)

Rapporteur: United Kingdom
Secretary: European and North Atlantic Office of ICAO
Members: OPS/AIR, airspace monitoring and mathematicians sub-group rapporteurs plus advisers as needed, Canada, Iceland, France, IATA and IFALPA

TERMS OF REFERENCE

1. To develop a work programme and timescales for the implementation of reductions in separation minima and to update the relevant Lines of Action from the NAT Implementation Programme Document (NAT IPD) accordingly.

2. To coordinate the activities of its two sub-groups - OPS/AIR, and airspace monitoring.

3. To determine whether, on the basis of current technology and the Target Level of Safety (TLS) of 2 x 10^{-8} fatal accidents per flight hour, applied in the lateral and longitudinal dimensions, it would be feasible and beneficial to reduce either element of the horizontal separation standard (60 NM/10 mins).

4. To recommend a TLS for use in evaluating reductions of separation in the horizontal plane which would be compatible with that used for the assessment of the reduced vertical separation minimum (RVSM).

5. To determine, on the basis of an agreed TLS, the communications navigation, surveillance requirements necessary to progressively reduce horizontal separation.

6. To develop a plan for the introduction of the Required Navigation Performance (RNP) concept in the NAT Region.

7. To develop a collision risk model (CRM) appropriate to the future NAT communications, navigation and surveillance (CNS)/ATM environment.

8. To develop a means of evaluating the operational effectiveness, use and future role of Aircraft Collision Avoidance System (ACAS) in the NAT Region.

9. To report to the NAT SPG.

Lines of action allocated to RSSI Group and sub-groups:

3.3	5.5
5.4	3.5
	5.6

RSSIG - OPS/AIR SUB-GROUP

Rapporteur: United States

Members: Canada, Ireland, Norway, United Kingdom, United States, Russian Federation, IATA, IFALPA

TERMS OF REFERENCE

To be determined by the RSSIG

AIRSPACE MONITORING SUB-GROUP

Rapporteur: United Kingdom

Members: Canada, United Kingdom, United States, EUROCONTROL, IATA, IFALPA

TERMS OF REFERENCE

To be determined by the RSSIG.

- - - - - - - - - - - - - - - - -

APPENDIX B - DRAFT AGENDA FOR NAT SPG/30

(Paragraph 6.6.3 refers)

The following is proposed as an agenda for future NAT SPG meetings:

Agenda Item 1: Developments

1.1 ICAO Panels and Committees
1.2 Adjacent Regions
1.3 NAT provider States
1.4 Technology

Agenda Item 2: Planning and implementation

2.1 Reports of working groups
2.2 Implementation planning (NAT IPD)
2.3 Other issues

Agenda Item 3: Air Navigation system Review

3.1 Review of system safety performance
Scrutiny matters
Mathematical matters

3.2 Review of systems operations
Air Traffic Management
Communications

Agenda Item 4: Documentation update

4.1 MNPS OPS manual
4.2 Guidance material, etc.

Agenda Item 5: Any other business

AGENDA ITEM 7: ANY OTHER BUSINESS

7.1 Participation in the work of NAT SPG

7.1.1 The Group was made aware that both the International Business Aircraft Council (IBAC) and the International Air Carrier Association (IACA) were prepared to put forward a formal request to participate in its work. After some discussion it was agreed that before considering the requests of these two organizations, they should be asked to provide the NAT SPG with appropriate substantiative material in order to justify the merit of their request which would then be examined in due course.

7.2 Farewell to Mr. J. O'Farrell

7.2.1 The Group was informed that Mr Jim O'Farrell, the Member for Ireland, would be retiring by the end of 1993 from his home Administration. Mr O'Farrell's outstanding contributions during the last four meetings were recalled and, the Group bade him farewell and wished him and his family an enjoyable future.

- END -