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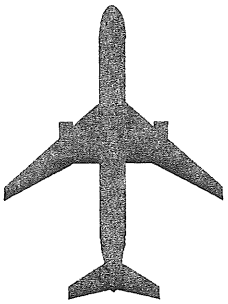
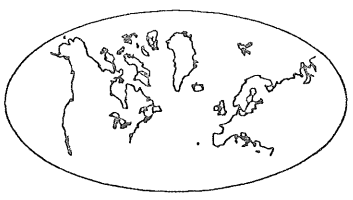
NAT SPG/27



NORTH ATLANTIC SYSTEMS PLANNING GROUP

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

Paris, 10 - 21 June 1991



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LIST OF ABBREVIATIONS

AAC	Aeronautical Administrative Correspondence
ACAS	Airborne Collision Avoidance System
ACARS	Aircraft Communications Addressing and Reporting System
ADS	Automatic Dependent Surveillance
ADSP	Automatic Dependent Surveillance Panel
AES	Aeronautical Earth Station
AFTN	Aeronautical Fixed Telecommunications Network
AMCP	Aeronautical Mobile Communications Panel
AMSS	Aeronautical Mobile Satellite Services
AOC	Aeronautical Operational Control
APC	Aeronautical Passenger Communication
ATSC	Air Traffic Services Communications
ATFM	Air Traffic Flow Management
ATN	Aeronautical Telecommunications Network
CMA	Central Monitoring Agency
CNS	Communications-Navigation Surveillance
CRM	Collision Risk Model
CTA/FIR	Control Area/Flight Information Region
DOTS	Dynamic Ocean Track System
ETOPS	Extended-range twin-engined aircraft operations
FDPS	Flight Data Processing System
GAATS	Gander Automated Air Traffic System
GES	Ground Earth Station
GLONASS	Global Orbiting Satellite System
GNE	Gross Navigation Error
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HMU	Height Monitoring Unit
ICD	Interface Control Document
IFSS	International Flight Service Station
IGA	International General Aviation
INMARSAT	International Maritime Satellite Organisation
INS	Inertial Navigation System
MASPS	Minimum Aircraft System Performance Specifications
MNPS	Minimum Navigation Performance Specification
MWARA	Major World Air Route Area
NAT ID	North Atlantic Regiona Implementation Document

OAC	Oceanic Area Control Centre
OCA	Oceanic Control Area
ODAPS	Oceanic Display and Planning System
OLDI	On-Line Date-Interchange
OTS	Organized Track Structure
RDARA	Regional Domestic Air Route Area
RGCSP	Review of the General Concept of Separation Panel
RNP	Required Navigation Performance
RNAV	Area Navigation
SATCOM	Satellite Communications
SD	Standard Deviation
SICASP	SSR Improvements and Collision Avoidance System Panel
SOTA	Shannon Oceanic Transition Area
TLS	Target Level of Safety
VSM	Vertical Separation Minimum

INTRODUCTION

1. The Twenty-Seventh Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in Paris from 10 to 21 June 1991. The meeting was chaired by Mr. G. Matthiasson, the Member from Iceland.

2. In addition to IAOPA, IATA, IFALPA and Inmarsat, the Group had, as usual, also invited Norway, Spain and the Union of Soviet Socialist Republics to attend this meeting. A list of participants is at page 5.

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. E.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. S. Gravesen of Denmark acted as Rapporteur;

c) a sub-group to consider the mathematical-statistical aspects of separation minima in the NAT Region, of which Mr. A. Sharpe 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.

4. Mr. Christian Eigl, ICAO Representative, European Office was Secretary of the meeting and was assisted by Messrs Jacques Vanier and Daniel Oudin, RAC/SAR Technical Officers, Vitali Oustinovitch, COM Technical Officer and Bo Barrefors, MET Technical Officer, from the European Office of ICAO. Mr. R. Heitmeyer, Chief of the Joint Financing and Facility Management Branch, also attended part of the meeting.

5. The Secretary addressed the Group on specific ICAO matters at the opening of the meeting. He explained the changes that have taken place in the European Office and reafirmed the Office's strong commitment to provide the required services to the NAT SPG.

6. In his opening remarks, the Chairman welcomed Denmark as a member State of the NAT SPG as well as Mr. Karsten Theil (Denmark), Mr. Jack Butt (Canada), Mr. Jacques Dopagne (France), Mr. Frank Price (United States) and Peter Georg, the newly appointed Observer from IFALPA. The Chairman emphasized that this would be a watershed meeting in view of the importance of some of the material that the Group would have to discuss and the decisions that would have to be made.

LIST OF CONCLUSIONS

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INMARSAT
- Fintan RYAN

ICAO
- Christian EIGL (Secretary)
- Daniel OUDIN
- Jacques VANIER
- Vitali OUSTINOVITCH
- Bo G.B. BARREFORS
- Rod HEITMEYER

* Member

AGENDA ITEM 1: AIR NAVIGATION SYSTEM SAFETY PERFORMANCE REVIEW

1.0 Introduction

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

a) navigation performance achieved in the NAT Region; and

b) mathematical/statistical aspects of the NAT Minimum Navigation Performance Specifications (MNPS) collision risk

1.1 Navigation Performance achieved in the NAT Region

1.1.0 The Group considered the following matters related to navigation performance:

a) the navigation performance accuracy achieved in the NAT Region during the period 1 March 1990 to 28 February 1991;

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

c) consideration of methods of improving the current monitoring procedures.

1.1.1 Navigation performance accuracy achieved in the NAT Region during the period 1 March 1990 to 28 February 1991

1.1.1.1 The group completed a scrutiny of observed Gross Navigation Errors (GNE) in the NAT Region and found that a total of 52(76)* errors were reported during the period under review. 22(31)* of these errors occurred outside MNPS airspace and were classified as Table 'CHARLIE' errors. Of the remaining 30(45)* errors, 8(21)* 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 paragraphs 1.1.1.8 to 1.1.1.10. The remaining 22(24)* errors which form the basis of detailed scrutiny were classified as Table 'ALPHA' errors.

1.1.1.2 A breakdown of the 22 errors is given at Attachment A. The format was in accordance with established procedures, as in the previous summaries. The number of errors which can be tolerated by collision risk models have been shown.

1.1.1.3 The Group noted the similarity in the overall number of Table 'ALPHA' errors with the previous year (22, to 24 in the 1989/90 monitoring year), in conjunction with a 16% rise in observed traffic. The Group also noted that it was the reduction in Table 'BRAVO' errors (from 21 to 8) and the reduction in Table 'CHARLIE' errors(from 31 to 22) which caused the overall reduction in errors reported within the NAT Region (from 76 to 52).

* For comparison purposes, corresponding figures for the last monitoring period (1989 - 90) are shown in brackets.

1.1.1.4 From Attachment A, the breakdown of the 22(24)* Table 'ALPHA' errors showed three main aspects, namely:

a) the number of errors [4(11)*] in classification 'A' (aircraft not certified for MNPS operations) showed an encouraging decrease;

b) the combined number of errors [6(4)*] in classification C1 (equipment control error, including waypoint insertion error) and [4(2)*] in classification C2 (waypoint insertion due to to the correct entry of incorrect position) showed a disturbing increase; and

c) both the Model 1 (unweighted) and the Model 2 (weighted) error rates for Random traffic exceeded the rate of 1.3×10^{-4} tolerated by MNPS requirements, with the Model 1 (unweighted) error rate marginally below the 'action required' level of 1.95×10^{-4}.

The Table 'ALPHA' errors in other classifications were very similar, in number, to those shown in the previous monitoring period (1989-1990).

1.1.1.5 The Group was pleased to note the reduction to 4(11)* of errors attributed to aircraft flying in MNPS airspace without approval (classification 'A'). Considerations on monitoring of approval status are discussed in greater detail in para 1.1.2.4 below.

1.1.1.6 The Group was disturbed to note the increase in waypoint insertion errors as shown above. It was noted that of the total of 10 combined C1 and C2 errors, 4 were attributed to Military operated aircraft. The Group felt that this situation could have been exacerbated by the increase of traffic associated with the 'Gulf war'.

1.1.1.7 The Group noted that of the remaining 7(6)* errors which were caused by some failure and/or malfunction of the navigation equipment, 3(3)* were INS equipped, 3(3)* were equipped with Omega and 1(o) with a combination of INS and Omega. The Group noted with concern that, of the Omega equipped aircraft, 2 suffered degradation of signals due to "Polar Cap Disturbances" details of which were available in NOTAM. The Group felt that the operator could have had due regard to this situation. The Group further noted with concern that of the 7 errors, 3(4)* were given classification 'F' [navigation errors including equipment failure of which notification was not received by Air Traffic Control (ATC)].

1.1.1.8 In reviewing the 8(21)* Table 'BRAVO' errors the Group noted, yet again, a continued variability in the number of these errors compared with previous years. The totals, including the previous four years, are shown in the following table:

Monitoring Year	Number of Trable 'BRAVO' errors
1986 - 1987	26
1987 - 1988	17
1988 - 1989	13
1989 - 1990	21
1990 - 1991	8

The average over the five years is 17 which makes the year under review a much better than average year.

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

Error Classification	Number of errors
A	1(7)
B	2(0)
C1	3(8)
C2	0(4)
D	0(1)
E	0(0)
F	2(1)
Unclassified	0(0)
Total	8(21)

1.1.1.10 The Group was pleased to note, as in Table 'ALPHA', an encouraging reduction in classification 'A' (aircraft not certified for operation in MNPS airspace). The Group also noted that, although a reduction from the previous monitoring year, the errors listed under C1 still comprised 37.5% of the total Table 'BRAVO' errors.

1.1.1.11 The Group then considered Table 'CHARLIE' errors, and were pleased to note that the number of errors (22) reported outside MNPS airspace showed a reduction for the fourth year in a row:

63 in the year 1987-88
40 in the year 1988-89
31 in the year 1989-90
22 in the year 1990-91

1.1.1.12 The Group noted that of the 22 errors, 3 occurred above MNPS airspace and 19 below. The trend of previous years remained, in that the majority of Table 'CHARLIE' errors occur below MNPS airspace.

1.1.1.13 In accordance with monitoring procedures follow-up action was taken with any reported error in excess of 50 NM. The Group noted that 2 of the errors above MNPS airspace and 13 below were in this category. The Group found that of the 2 errors above MNPS airspace, one involved the failure of the aircraft's Omega long range navigation equipment and one involved an aircraft which was fitted with short range navigation aids only and was unable to pick up a critical Non Directional Beacon (NDB). Of those errors, which occurred below MNPS airspace and which required follow-up action, 5 involved the failure of navigation equipment, 2 involved incorrect Dead Reckoning using forecast winds, one was attributed to a waypoint insertion error, and 5 were as yet unresolved.

1.1.1.14 The Group expressed concern over some reports of table 'CHARLIE' errors in which aircraft undertook long over-the-ocean legs whilst equipped with only short range navigation aids and then expressed surprise when faced with a GNE after using forecast winds which proved to be inaccurate. The Group wondered if such navigation aids constituted "suitable navigation equipment appropriate to the route to be flown" in accordance with the meaning of ICAO Annex 2 and Annex 6. It agreed to examine this matter at NAT SPG/28.

1.1.1.15 The Group expressed concern over the number of Table 'CHARLIE' errors which remained unresolved and considered that there may be less urgency to resolve errors which occur outside MNPS airspace.

1.1.1.16 The Group noted that a core sample of navigation performance of eastbound aircraft leaving MNPS airspace had been completed. The sample consisted of 382 aircraft crossing 10°W between 56N and 61N. The Standard Deviation (SD) of the track keeping accuracy was found to be 3.968nms. The Group noted that this core sample had examined aircraft at all levels, but that an SD of 3.967nms for MNPS levels had also been calculated which is well within the SD of 6.3nms required for MNPS operations. This figure was very similar to that of 3.358nms calculated for MNPS levels during a similar core sample completed in the previous year. The Group also noted details of a core sample of westbound aircraft leaving MNPS airspace. The sample comprised 2128 flights at MNPS levels, 100 flights above FL400, and 9 flights between FL200 and FL275. The Group noted that an SD of 2.05 nms was recorded for MNPS airspace traffic which is again well within the SD of 6.3 nms required for MNPS operations. SDs of 2.11 nms for the traffic above FL400 and 3.74 nms for the traffic between FL200 and FL275 were recorded. The Group felt that the distances flown may have had some bearing on the differences between the SDs. The Group agreed that such core samples were useful in maintaining an overall view of the Region and also agreed that similar samples be continued and that an attempt be made to examine as similar a number of aircraft in both samples as possible.

1.1.1.17 The Group noted that a review had been completed of navigation accuracy of non MNPS approved airspace traffic in Shanwick Oceanic Control Area (OCA), and that the review had drawn comparisons with the navigation accuracy of MNPS airspace traffic. The review had considered the accuracy of International General Aviation (IGA), Public Transport, and Military aircraft both above and below MNPS airspace. The Group noted that, as with previous such reviews, IGA aircraft performed less well than other categories. The Group recognized, in making such a statement, that general aviation aircraft now embraced a wide spectrum of navigation capabilities and interests, and that some organisations are making positive approaches to improve the standards of general aviation operations. The Group noted that established principles regarding the calculation of error rates had been applied, but suggested that the results may give a slightly false picture because of the different separation standards applied outside MNPS airspace. Nevertheless, the Group felt that the review helped in giving a good overall picture of the navigation performance in the NAT Region as a whole, and that further such reviews together with core samples be completed. The Group agreed that appropriate operator/aircraft divisions within the overall general aviation category, for example new generation, high technology equipped business aircraft, be considered when carrying out future reviews.

CONCLUSION 27/1 - STUDIES OF NAVIGATION ACCURACY

That States concerned undertake studies in the form of core samples to further evaluate the navigation accuracy of aircraft operating outside Minimum Navigation Performance Specifications (MNPS) airspace compared with those operating in MNPS airspace.

1.1.1.18 With respect to the continued application of the ten minutes longitudinal separation in MNPS airspace, the Group were pleased to note that no reports of erosion of longitudinal separation had been received by the Central Monitoring Agency (CMA) during the monitoring year.

1.1.1.19 In accordance with agreements reached at NAT SPG/23, the Group reviewed reports of altitude deviations of 300 feet or more from assigned level in the NAT Region. There were 7 such reports during the period under review. The Group found that in 4 of these, the pilots claimed they had been so cleared, 1 in which there was confusion between the ATC unit and the aircraft concerning the level to cross certain longitudes, 1 in which the aircraft flew at its flight plan level because it had been unable to contact ATC for a level change request and 1 in which the aircraft changed level because it experienced strong winds and icing at its cleared level. The Group noted that one report of a spurious Mode 'C' readout had been received.

1.1.1.20 In examining the information on altitude deviations collected by the CMA, the Group noted that reports both of altitude deviations and spurious Mode 'C' reports had only been initiated by certain Oceanic Area Control Centres (OAC) within the NAT Region. The Group felt that it was possible that other similar incidents may have occurred in the Region.

1.1.1.21 The Group noted details of recorded contingencies within the Shanwick, Gander and Reykjavik OCAs, and considered that it was essential such information be available, even more so now that plans were progressing for the implementation of reduced Vertical Separation Minimum (VSM) between FL290 and FL410 inclusive in the Region. The Group agreed that the format of the information should be standardised and that subsequent action/remarks should be included. The Group further agreed that it would be useful if similar information from all OACs within the Region would be made available.

CONCLUSION 27/2 - RECORD OF IN-FLIGHT CONTINGENCIES

That:

a) all NAT provider States make available information concerning in-flight contingencies to the NAT SPG; and

b) the format, as used in the existing Canadian/UK reports, including details of subsequent actions/remarks be used.

1.1.2 Methods of improving the observed standard of navigation performance

1.1.2.1 0In 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 paragraph 1.1.1 above;

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

1.1.2.2 A major concern of the Group was the increase in the number Table 'ALPHA' errors involving waypoint insertions, and the Group noted that 4 of the 10 errors included in this classification involved Military aircraft. The Group agreed that the situation required a continual close scrutiny by the CMA and that, if the situation continued, consideration would need to be given to actions to safeguard the concept of the MNPS airspace.

1.1.2.3 The Group noted the results of spot checks of MNPS approvals, together with checks carried out on the compilation of flight plans. The Group noted the poor responses to queries raised in the checks which had been carried out, and considered that such checks no longer represented a valid method of attempting to resolve the problem of non-approved users of MNPS airspace. Therefore, the Group considered that tactical monitoring constituted a more valid method to achieve the result.

1.1.2.4 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 the trend showing a reduction in the number af aircraft which were not able to confirm their approval status, indicated that the exercise was beginning to take effect. Notwithstanding this conclusion the Group found that non-approved operators were still attempting to use MNPS levels, and was of the opinion that such a situation would prevail in the future. The Group noted that differences still remained between provider States concerning subesequent issuing of ATC clearances after an aircraft was unable to confirm an approval status. The Group agreed that tactical monitoring of the MNPS approval status of selected operators be continued and also agreed that the pattern of the monitoring process be common throughout the NAT Region in that a pilot, or operator, unable to confirm his approval status, be issued with an Oceanic clearance to operate outside MNPS airspace. The Group also agreed to the format of the letters to be used by the CMA in communications with States which are shown at Attachments B-1 and B-2 to the report on Agenda Item 1.

1.1.2.5 The Group agreed that the "MNPS airspace reminder" on the daily organized track message from Gander and Shanwick was achieving good results and should continue to be published.

CONCLUSION 27/3 - MONITORING OF THE MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) APPROVAL STATUS

That:

a) NAT provider States continue to apply tactical monitoring of the MNPS approval status of selected operators;

b) an Oceanic clearance outside MNPS airspace be issued in those cases where aircraft/operator is unable to confirm an approval status; and

c) the procedure of publishing the MNPS airspace requirements reminder on the organized track message be continued.

1.1.2.6 The Group considered the matter of the use of back-up navigation systems to maintain a full MNPS capability. It was noted that the existing guidance given in both "NAT Doc 001, T 13.5N/5" and the "North Atlantic MNPS Airspace Operations Manual" covered the requirements for equipment to ensure compliance with the MNPS navigation capability and that it was the task of a certificating State Authority to satisfy itself that any additional system met MNPS navigation requirements. It was further noted that the list of equipment requirements contained in these documents were given as mere examples of navigation fits on board aircraft.

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

1.1.2.8 Within the period of the monitoring year, Gander OAC advised the CMA of a total of 20(79)* occasions when mistakes were noted and action taken by ATC to prevent a GNE. The causes of these mistakes were broken down as follows:

a) 9 instances in which no explanation was offered for an incorrect forward estimated position;

b) 2 instances in which the aircraft stated that they had been so cleared by other ATC units;

c) 2 instances in which the aircraft admitted that a mistake had been made on the flight deck;

d) 2 instances in which clearance information passed from one ATC unit to another had not been passed on to the aircraft;

e) 2 instances involving aircraft from the same company in which crews were new to NAT ATC procedures;

f) 1 instance in which the crew stated that progress information had been misread;

g) 1 instance in which the aircraft claimed that a reclearance had not been received from a previous ATC unit; and

h) 1 instance in which the acknowledgment of the message containing the incorrect forward position, by the ATC unit, was mistaken by the aircraft as a reclearance.

1.1.2.9 The Group considered that such interventions were invaluable in preventing GNEs, but noted that only one OAC had passed the details of interventions to the CMA. The group felt that similar interventions could have occurred in other areas and agreed that details of all such incidents be forwarded to the CMA (Para 1.2.3 of Appendix E, NAT Doc 001, T 13.5N/5 refers).

1.1.3 Methods of improving the current monitoring procedures

1.1.3.1 In view of the development work being completed on the proposed reduced VSM in the NAT Region, the Group considered it to be important that the CMA receives reports of all incidents involving altitude deviations in excess of 300ft from all OACs in the NAT Region, in order that details may be brought rapidly to the attention of the NAT Vertical Separation Implementation Group (VSIG) (paragraph 1.1.1.21 and Conclusion 27/23 also refer).

1.1.3.2 The Group was aware that occasionally, incidents occurred within the NAT Region which did not immediately fall within the confines of the existing reports required by the CMA. The Group felt that details of such incidents should be passed to the CMA who would then be able to keep any existing subgroup aware of incidents in which it had an interest.

1.1.3.3 The Group considered the current practice of obtaining traffic counts and error data from the Gander and Shanwick OACs. This practice is self-consistent, in that the samples of error and of traffic are taken from the same airspace. However, the expansion of Icelandic radar coverage should allow the collection of navigation error data from Reykjavik OAC and, provided corresponding traffic counts can be obtained, the resulting information should provide a more comprehensive picture of system performance. The Group agreed to explore the possibility of including large error reports from Reykjavik OAC in the collision risk assessment.

1.1.3.3 In concluding its work on navigation performance, the NAT SPG was aware that reports involving the use of Airborne Collision Avoidance System (ACAS) in the Region were being compiled. In the discussions on how such reports might be collected and what value such reports would offer, the Group noted that, in accordance with the Future NAT ATS System Concept Description, Part III, paragraph 2.2.5.7, and further deliberations of this meeting, the United States were prepared to maintain an ACAS events data base and to report its findings at NAT SPG meetings. The Member from the United States invited all States having aircraft that experienced such events to forward that information in a form similar to their report on results of operational evaluations of ACAS, as recommended by the Secondary Surveillance Radar (SSR) Improvements and Collision Avoidance System Panel (SICASP) - (State letter AN 7/11.12 - 91/11 of 13 February 1991, Appendix 3 to the Attachment refers). A sample copy of the ACAS evaluation form for ATS is at Attachment C to the Report on Agenda Item 1.

CONCLUSION 27/4 - REPORTING OF AIRBORNE COLLISION AVOIDANCE SYSTEM (ACAS) EVENTS IN THE NAT REGION

That NAT provider States forward ACAS reports experienced during en-route operations over the North Atlantic Region, in the format used for the ICAO SICASP international operational evaluation, to the following address:

Federal Aviation Administration
AFS-430
800 Independence Avenue, SW
Washington DC 20591
Tlx: 892462
Fax: 202-2675120 (AFS-430)

1.2 Mathematical/statistical aspects of the NAT MNPS collision risk

1.2.0 The Group considered the following matters related to mathematical issues and other aspects of the NAT MNPS collision risk:

a) 1990 collision risk estimation;

b) consideration of new parameter values;

c) review of the MNPS criteria;

d) core navigation performance;

e) future system;

f) factors affecting Collision Risk; and

g) work programme.

1.2.1 1990 Collision Risk Estimation

Occupancy

1.2.1.1 Estimates of lateral occupancy were derived by Canada for 30°W and 40°W, and by the United Kingdom for 20°W and 30°W. As agreed at NAT SPG/26, two changes were made to the process of estimating occupancy.

1.2.1.2 First, the period over which occupancy was estimated, instead of being the calendar year 1990, was 1st March 1990 - 28th February 1991, coinciding with the monitoring year over which the CMA has reported GNEs. The Group agreed that this change had been beneficial from the standpoint of consistency. Moreover, the Group noted that the occupancy estimated over the monitoring year was very similar to that estimated over the Calendar year 1990.

1.2.1.3 The second change was in the number of days' data used to estimate the occupancy. In addition to the 15th of each month, the 4th of each month was also used, so that a total of 24 days' data were employed. (In the United Kingdom, data from 3 days were corrupted, so only 21 days were available). The Group noted that the increased quantity of data was beneficial in increasing statistical confidence in the estimate of occupancy.

Table 2 - Occupancy Estimates for 1990 (1989 in brackets)

	OTS		Random		Total	
Eastbound	1.167	(1.17)	0.356	(0.40)	0.818	(0.81)
Westbound	0.879	(0.83)	0.210	(0.18)	0.590	(0.57)
Total Same	1.031	(0.99)	0.287	(0.30)	0.710	(0.70)
Total Opposite	0.002	(0.004)	0.006	(0.007)	0.004	(0.005)

1.2.1.4 As had been noted in previous years, eastbound same-direction occupancy was substantially higher than westbound. This was largely because westbound aircraft are trying to avoid the jetstream, so that those track structures are in general more spread out than for the eastbound case, and therefore there are more tracks. Again, as in previous years, the Group observed a slight increase in the occupancy from 20°W to 40°W, probably because tracks tend in general to be more spread out at the eastern side of the ocean. However, there is some evidence to suggest that this phenomenon is less pronounced this year than has previously been the case; this may have been due to the Route Orientation Scheme (ROS) constraining the spread of tracks at 20°W.

1.2.1.5 Same direction occupancy was very similar overall to that found in 1989, with a slight increase in the Oceanic Track Structure (OTS) and a slight reduction for random tracks. Estimates of opposite direction occupancy are given for the last 4 years in Table 3.

Table 3 - Opposite Direction Occupancy 1987-1990

	1987	1988	1989	1990
OTS	0.002	0.007	0.004	0.002
Random	0.002	0.003	0.006	0.006
TOTAL	0.002	0.005	0.005	0.004

1.2.1.6 There was no change in the random opposite direction occupancy from the 1989 estimate. In the OTS, opposite direction occupancy showed a continuing reduction from the high figure of 0.007 in 1988. The reduction was probably due to the discontinuation of the practice, adopted in 1988, of publishing an OTS track for opposite direction traffic. However, as this practice had now resumed, the group considered that OTS opposite direction occupancy may be expected to increase again and will tend to increase the collision risk. The seriousness of the situation was exacerbated by the fact that the opposite direction OTS track tends to be used by aircraft whose navigation performance may be somewhat worse than the average for MNPS traffic, so that the number of GNEs in the OTS was likely to go up rather than down. The Group understood the need for the opposite direction OTS track; however, given the collision risk implications, some doubt was cast on the appropriateness of the solution. Similar operational benefits might be achieved by setting up an opposite direction track separated by 120 NM from other published tracks.

CONCLUSION 27/5 - OPPOSITE DIRECTION TRACK

That, when an opposite direction track is published to cater for a higher than average flow, the Oceanic Area Control Centre concerned should endaveour to plan the track at least two degrees away from the adjacent track in Minimum Navigation Performance Specifications airspace.

1.2.1.7 Occupancy ratios for random and OTS traffic and for the system as a whole were derived. (The occupancy ratio indicates the level of the measured occupancy relative to that assumed in the derivation of the MNPS.) These occupancy ratios are presented in Table 4, and the historical trend is shown in Table 5. The Group noted from Table 5 that the increase occupancy ratios observed over recent years have been maintained.

Table 4 - Occupancy Ratios - 1990

	OTS	Random	Total
Eastbound	1.71	0.64	1.25
Westbound	1.30	0.43	0.93
Both directions	1.52	0.54	1.10

Table 5 - Occupancy Ratios for 1985-90

	1985	1986	1987	1988	1989	1990
OTS	1.31	1.31	1.40	1.70	1.50	1.52
Random	0.46	0.34	0.26	0.30	0.56	0.54
TOTAL	0.97	0.91	0.83	1.03	1.10	1.10

Traffic Counts

1.2.1.8 The Group noted that the total traffic volume observed on radar and recorded by the CMA was 167,506, and that the conventional 60/40 split between the OTS and random tracks resulted in estimates of OTS and random traffic of 100,504 and 67,002 respectively. However, not all of the traffic flying on random routes was observed by radar monitoring, so the total of random traffic in MNPS airspace had to be estimated. This was done by reference to the NAT Traffic Forecasting Group (NAT TFG), who had estimated the total traffic in the NAT Region for 1990 to be 206,100. The estimate of OTS aircraft from the CMA is 100,504, so the total number of random aircraft in the NAT was estimated to be 105,596. From Canadian data, an estimate of random aircraft above and below MNPS airspace was derived to be 11,528; therefore, the estimate of random traffic in the MNPS airspace was 94,068.

1.2.1.9 On the basis of the above, the Group confirmed the method of employing the conventional 60/40 split of OTS/random traffic. However, an improved method of counting OTS traffic had recently become available at the Gander OAC. The Group agreed that (for the future) the possibility of using this count rather than the 60/40 split should be examined.

Gross Navigation Errors

1.2.1.10 According to the MNPS criteria, the maximum tolerable rate of occurrence of zeta errors between 50 NM and 70 NM, 110 NM and 130 NM, etc - is 1.3×10^{-4}. Given the OTS and random traffic counts of 100,504 and 67,002 aircraft respectively observed at the OCA boundary, the MNPS limit on the number of zeta errors is 13.07 for the OTS and 8.71 for random traffic.

1.2.1.11 The extent to which these criteria are being met was estimated differently depending on whether Model 1 or Model 2 (the original) is used. A revised version of Model 2 was developed as a result of the deliberations of the Scrutiny Group (Attachment A to the report on Agenda Item 1 and section 1.2.2 below refer). According to the assumptions of Model 1, the zeta error rate throughout the airspace was equal to that at the boundary, and was therefore equal to 2/100,504 (OTS) and 12/67,002 (random). Hence according to Model 1, the zeta error ratio - the ratio of the rate of occurrence of zeta errors to the rate tolerable according to the MNPS - was 2/13.07 = 0.153 for the OTS, and 12/8.71 = 1.378 for random traffic. Thus the MNPS criterion on the zeta error rate was being met for OTS traffic, but was exceeded for random traffic.

1.2.1.12 In Model 2 (original), some account was taken of the fact that, for waypoint insertion errors, the rate of occurrence of zeta errors at the boundary was greater than that which occurs on average elsewhere in Oceanic airspace, although this was partially offset by a higher lateral velocity for these errors than assumed under Model 1 with the original parameter values. The net effect is represented as a scaling down of the number of errors occurring at the boundary in order to calculate the zeta error rate. For the combination of errors observed in 1990, this resulted in a zeta error rate of 1.46/100,504 for the OTS and 8.76/67,002 for random traffic. According to Model 2 (original) the zeta error ratios were 0.112 (OTS) and 1.006 (random). Therefore, under Model 2 (original) the MNPS criterion was very close to being met for random traffic. The above discussion is summarized in Table 6.

Table 6 - Zeta Error Ratios

	OTS			Random		
	No. of errors	Tolerable No. of errors	Zeta Error Ratio	No. of errors	Tolerable No. of Errors	Zeta Error Ratio
Model 1	2	13.07	0.153	12	8.71	1.378
Model 2	1.46	13.07	0.112	8.76	8.71	1.006

1.2.1.13 The zeta error ratios (for Model 1) are an indication of the extent to which the MNPS zeta criterion is being met. They are tabulated below for the last 6 years. The Group noted that the ratio for the OTS shows an improvement over the last two years, while for random traffic it remains high.

Table 7 - Zeta Error Ratios 1985-90 (Model 1)

	1985	1986	1987	1988	1989	1990
OTS	0.92	0.11	0.1	0.37	0.27	0.15
Random	0.76	0.66	1.49	1.23	1.34	1.38
TOTAL	0.86	0.33	0.65	0.71	0.70	0.64

Collision Risk

1.2.1.14 The occupancy ratios and zeta error ratios are combined in Table 8 to produce the risk ratios for random traffic, for the OTS, and for the system as a whole. The risk ratios measure the extent to which the average risk of collision is within the Target Level of Safety (TLS): a risk ratio of less than 1.0 means that the TLS is being complied with. As can be seen from the table, the risk was indeed less than the TLS for both random traffic and the OTS. The risk estimates from Model 2 (original) were somewhat lower than those from Model 1, reflecting the slightly less conservative (and more accurate) assumptions on which Model 2 (original) were based. The risk ratios for the last few years are presented in Table 9 below. The Group noted that the risk ratio was less than 1.0 in all cases. Therefore the estimate of risk according to Model 1 or Model 2, with the original parameter values, was less than the TLS for the system as a whole and for random and OTS traffic separately.

Table 8 - Calculation of Risk Ratios for the NAT MNPS airspace 1990 Using Original Parameter Values

	1990 Traffic		Occupancy ratio		Zeta Ratio			Risk Ratio		
OTS	100,504	1.52	(1.49) x		0.153	(0.267)	=	0.23	(0.40)	Model 1
	(86,491)				0.112	(0.219)		0.17	(0.33)	Model 2
Random	94,068	0.54	(0.57) x		1.378	(1.334)	=	0.75	(0.77)	Model 1
	(97,642)				1.006	(1.118)		0.55	(0.64)	Model 2
Total	194,572						=	0.48	(0.59)	Model 1
	(184,133)							0.35	(0.49)	Model 2

Table 9 - Risk Ratios: 1985-90

	1985	1986	1987	1988	1989	1990
OTS (Model 1)	1.21	0.14	0.14	0.62	0.40	0.23
Random (Model 1)	0.35	0.22	0.46	0.37	0.75	0.75
Total (Model 1)	0.78	0.18	0.30	0.50	0.58	0.48
Total (Model 2)	0.62	0.19	0.21	0.36	0.44	0.35

1.2.2 Consideration of New Parameter Values

Background

1.2.2.1 New parameter values for the collision risk model were accepted by NAT SPG/26; the new values are presented alongside the original ones in Table 10. However, NAT SPG/26 also determined that the new parameter values could not be used to give the principal assessment of collision risk until the Collision Risk Model (CRM) itself had been reviewed. The review of the CRM is discussed in paragraphs 1.2.2.4 to 1.2.2.6, but since in the past, the new parameters had been used in conjunction with Model 1, for comparison purposes the Group determined that the same exercise should be performed again.

Table 10 - Collision Risk Model Parameter Values

Parameter Values	Original Value	Proposed Value
Sy	60 NM	60 NM
Sx	120 NM	120 NM
Pz(0)	0.25	0.39
Lambda x	0.033 NM	0.033 NM
Lambda y	0.033 NM	0.029 NM
Lambda z	0.0085 NM	0.009 NM
Delta V	13 kts	13 kts
V bar	480 kts	480 kts
y dot	47 kts	80 kts
z dot	1.0 kts	1.5 kts

Application of Model 1

1.2.2.2 The group calculated the collision risk according to Model 1 with the new parameter values and the occupancies and GNE rates derived in paragraphs 1.2.1.1 to 1.2.1.7 and 1.2.1.10 to 1.2.1.13 above. The risk ratios are shown below in Table 11. It was noted that the use of the new parameters with Model 1 had increased the risk estimate by a factor of about 2.2. The estimate of OTS risk was still below the TLS, but the estimate of risk to random traffic was well above the TLS; the combined result was an overall system risk which exceeded the TLS by a small margin.

Table 11 - Risk Ratios for New Parameter Values

	Model 1		
	OTS	Random	Total
Present Parameters	0.23	0.75	0.48
New Parameters	0.54	1.60	1.06
Proportional Increase	2.35	2.15	2.20

1.2.2.3 The Group recognised that these results did not indicate that the system risk is genuinely above the TLS. The extremely conservative nature of Model 1 ensures that the average risk will always be over-estimated if this method was applied in conjunction with valid parameter values.

Revised Model 2

1.2.2.4 A review of the CRM had been performed, resulting in a revised version of Model 2. The main distinguishing feature of this model was that navigation errors are weighted according to the contribution they make to the risk; this applies to all types of error, the magnitude of the weighting varying with the cause and size of the error. The weighting values are presented in Table 12.

Table 12 - Error Weightings

	Type of Error		
Deviation	Waypoint insertion or ATC System Loop	Equipment Failure	Non-approved User (Short Range Nav)
1° (50-70 NM)	0.33	0.40	0.40
2° (70-130 NM)	0.58	0.55	0.58
3° (130-190 NM)	0.84	0.70	0.84
4° (190-250 NM)	1.09	0.85	1.09
5° (250-310 NM)	1.34	1.00	1.34
6° (310-370 NM)	1.59	1.15	1.59

1.2.2.5 It is possible that adjustments to the weighting values may become necessary in future if the ratio of opposite direction occupancy to same direction occupancy changes significantly. The estimate of system risk, obtained from the revised Model 2, should be more accurate than that obtained from Model 1 (or the original Model 2). The Group noted that the improvement in accuracy of Model 2 (revised) is due to the increased sensitivity with which 2 parameters are utilised:

a) the lateral velocity. The larger this parameter is, the larger is the estimate of risk represented by each error. In Model 1, with the new parameter values, the lateral velocity is taken to be 80 kts for each error. This is approximately correct for 1° waypoint insertion errors, but is much too large for most equipment failure errors. In Model 2 (revised) a different lateral velocity is used for each type of error. Although the values used in the case of equipment failure errors are still conservative, they are much more realistic -and therefore in most cases smaller- than the 80 kts used in Model 1; and

b) the lateral overlap probability. Again, the larger this parameter is, the higher is the estimate of risk. In both models, it is approximated by the rate of occurrence of zeta errors. In Model 1, for all types of error, the rate at which zeta errors occur at the boundary is assumed to be representative of the rate at which they occur throughout the ocean. In the revised Model 2, the same conservative assumption is made for equipment failure errors. However, for waypoint insertion errors the lateral overlap probability is reduced by a factor of 3 compared with that which would be estimated at the boundary (this can be shown to follow from an assessment of the typical path of an aircraft committing a waypoint insertion error).

1.2.2.6 On the basis of the above, the Group agreed to adopt the revised Model 2, together with the proposed parameter values shown in Table 10 as the principle means of assessing the risk. However, for purposes of continuity, it also agreed that Model 1, with the original parameter values, be run in parallel with this revised approach for a period of twelve months.

CONCLUSION 27/6 - ADOPTION OF REVISED MODEL 2 FOR RISK ASSESSMENT

That:

a) the revised Model 2 adopted by NAT SPG/27 together with the related parameter values be used as the principle means of assessing the risk; and

b) Model 1, with the original parameter values, be run in parallel for a period of twelve months.

1.2.2.7 The Group noted that the adoption of the revised Model 2 had the following implications for the recording and scrutiny of navigation errors:

a) slight modifications to the window at which errors are assessed were needed;

b) all larger errors, rather than only zeta errors, needed to be considered for inclusion in the risk assessment. In particular, errors which fall between zeta bands should be assessed as being within the upper band; and

c) errors due to aircraft not approved for MNPS operations were to be scrutinized as to exact cause, and allocated to appropriate subdivisions of Category A.

1.2.2.8 The Group noted the system risk for 1989 and 1990 which had been calculated using the revised Model 2. The results for 1990 may be summarised as follows:

Risk for OTS traffic	=	0.88×10^{-8}
Risk for Random traffic	=	1.60×10^{-8}
Overall Risk	=	1.37×10^{-8}

All 3 values are below the TLS, of 2×10^{-8}. Therefore, the application of the revised Model 2 using the new parameters confirmed that the system risk is below the TLS.

1.2.3 Review of the MNPS Criteria

1.2.3.1 The Group noted that the original purpose of the MNPS criteria was to define the navigation ability of the aircraft population such that the TLS is not exceeded. The criteria were derived using the CRM and its associated parameters, together with certain assumptions about the occupancy. However, if the three MNPS criteria were only just being satisfied by the population of aircraft in NAT MNPS airspace, the level of risk in the system would be above the TLS. Fortunately, as a result of changes that have taken place over the years since the MNPS were derived, navigation performance is in general much better than that defined by the MNPS, so the risk remains below the TLS. The Group recognised that the current situation - in which the navigation performance of the population of aircraft is effectively required to be significantly better than that defined by the MNPS - was somewhat illogical. The alternative criteria presented in Table 13 would rectify this situation.

Table 13 - Revised MNPS Requirements on the NAT Aircraft Population

	Current	Alternative
Core Standard Deviation	6.3 NM	≤4.0 NM
Eta Error Rate	5.3×10^{-4}	1.2×10^{-4}
Zeta Error Rate	1.3×10^{-4}	2.9×10^{-5}

1.2.3.2 The Group noted that the revised MNPS criteria are significantly more stringent than the original ones, and might in some cases be difficult to meet. For example, the zeta error rate of 2.9×10^{-5} is lower than that which currently tends to occur in NAT MNPS airspace. This did not mean that the risk was above the TLS, because

a) most of the errors occurred to aircraft on Random tracks, for which the occupancy is lower; and

b) in the revised version of the Model 2 method collision risk assessment, the zeta error rate to be compared with the MNPS criterion was the weighted sum of the errors greater than 50 NM, which is generally much less than the number of zeta errors.

1.2.3.3 These points tend to emphasize the fact that, in assessing system safety, the most important activity is the regular estimation of risk and its comparison with the TLS rather than the comparison of navigation performance with the MNPS criteria. For this reason, the adoption of the revised MNPS was not regarded by the Group as an immediate necessity. However, this revised MNPS provided a useful warning as it was indicative of the quality of navigation performance which is required if the existing safety targets were to continue being met given likely increases in traffic.

1.2.3.4 The proposed introduction of new technology [e.g. Automatic Dependent Surveillance (ADS) and Global Navigation Satellite System (GNSS)] should allow improvements in system safety (in that the system would be designed to meet a more stringent TLS) and reductions in separation standards should be possible. In order to facilitate the development of the system along these lines, the Group agreed that this would necessitate that a further review of the MNPS criteria be undertaken, in accordance with NAT Implement Document line of action 3.6.

1.2.4 Core Navigation Performance

1.2.4.1 The Group noted that the SD obtained from the United Kingdom core sample had increased over the past 3 years, and that it would be necessary to monitor next year's results closely in order to determine whether this was a genuine trend or a statistical fluctuation. The Group noted that some of the spread of navigation errors apparent in the Canadian sample was due to two different radars having been used as sources of data. Thus the navigation accuracy was probably somewhat better than the 2.05 NM (1 SD). The relevant figures for the individual radars concerned were a mean of 3.4 NM and an SD of 1.72 NM for Gander, and a mean of 1.69 NM and an SD of 1.35 NM for Trepassey.

1.2.4.2 As in previous years, there was a noticeable difference between the results from the two sides of the ocean: almost 4 NM for the Eastern side and less than 2 NM on the Western side. This was thought to be due, at least in large part, to two causes:

a) different performance characteristics for INS systems in the two directions, which became particularly pronounced in Northern latitudes; and

b) a longer average stage length for eastbound aircraft prior to the points at which samples are taken.

1.2.5 Factors affecting Collision Risk

Tactical Monitoring

1.2.5.1 The Group was informed that there was a reduction, over the last monitoring year, in the number of aircraft in the MNPS airspace which were not certified for operation there. The Group welcomed this result, which - when combined with the greatly reduced number of GNEs committed by such aircraft observed by the CMA - suggested that good progress was being made in the task of reducing the risk due to non-approved users. The Group strongly supported the continuation of tactical monitoring by all provider States (Conclusion 27/3 also refers).

Separation Standards above FL400

1.2.5.2 The Group discussed the proposal that MNPS separation be applied above FL400 between aircraft authorized to operate within MNPS airspace. From the standpoint of collision risk, this is acceptable, because the rate of GNEs for MNPS-approved aircraft above FL400 should not be higher, on average, than is the case within MNPS airspace, while lateral occupancy would be lower (Conclusion 27/27 also refers).

1.2.5.3 The Group also considered a proposal to raise the upper limit of MNPS airspace to FL410. It was considered unlikely that such a change would have a significant effect on the level of collision risk in the MNPS airspace as a whole (Paragraph 4.3.10 also refers).

Airborne Collision Avoidance Systems

1.2.5.4 The Group agreed that the question of whether ACAS should be mandatory for operation in MNPS airspace would not be considered until:

a) safety analyses conducted by the SICASP are complete; and

b) ACAS Standards and Recommended Practices (SARPS) have been published by ICAO.

1.2.5.5 The Group noted that an international operational evaluation of ACAS was now under way, under the auspices of the SICASP, which involved the collection of data from several sources, including:

- ACAS recorders fitted in some aircraft;
- pilot report forms;
- reports from ATC.

1.2.5.6 The Group agreed that it should monitor the progress of the international evaluation, with particular reference to any reports involving ACAS traffic and/or resolution advisories which occur within the NAT Region (Conclusion 27/4 also refers).

1.2.6 Future System

Target Level of Safety

1.2.6.1 Line of action 3.2 in the NAT Implementation Document relates to the definition and application of a new horizontal TLS. The Group agreed that it was not necessary to change the TLS applied to lateral collision risk in the current system. However, it was considered necessary to revise the value of the TLS applied to the risk of collision in the horizontal plane (i.e. the lateral and longitudinal dimensions) as part of the process of planning future developments in the NAT system. Accordingly, the Group agreed that a review of the horizontal TLS be conducted, with the aim of recommending a revised value (for future application) to NAT SPG/28. In performing this review, the collision risk should continue to be assessed - and the TLS defined - in terms of fatal accidents per flight hour. However, as part of the process of setting a TLS it should translate into other units, such as in terms of the expected time between collisions.

CONCLUSION 27/7 - REVIEW OF THE HORIZONTAL TARGET LEVEL OF SAFETY (TLS)

That a review of the horizontal TLS be conducted by the Mathematiciens Working Group, with the aim of recommending a revised value (for future application) to NAT SPG/28.

1.2.6.2 The Group noted that the first stage in developing a value of the TLS for risks due to all causes should be the projection forward in time of the (downward) historical trend of the accident rate. However, the adoption of this value should be subject to comparisons with safety levels in other industries. The allocation of a fraction of the overall TLS to en-route collision risk should be performed on the basis of accident statistics, as has previously been the case.

1.2.6.3 Subsequently, portions of this horizontal TLS would then need to be allocated to equipment failure, human error, etc, in order to allow the derivation of a revised MNPS requirement; although for monitoring purposes, collision risk assessment would be performed for all types of navigation error in the horizontal plane, and assessed against the whole of the TLS.

1.2.6.4 A parallel need for the establishment of a horizontal TLS exists in regions other than the NAT. The work outlined above should therefore be co-ordinated with the Review of the General Concept of Separation Panel (RGCSP).

Separation Standards

1.2.6.5 The Group was informed of studies being carried out by the United States concerning the separations standards appropriate for a system in which aircraft were equipped with ADS. The Group agreed that the studies indicated the way ahead, but that a good deal more work was required. It was noted that the need to carry out work of this nature emphasised the usefulness of data on navigation errors of between 15 NM and 30 NM in magnitude. If separation standards are ultimately to be reduced from the current 60 NM, it was considered necessary to have more information regarding errors of this size. The Group noted that one possible way of obtaining such information would be increased scrutiny of large errors found in the core sampling exercises, and that their issue would be reviewed at NAT SPG/28.

1.2.7 Work Programme

1.2.7.1 The Group identified several areas of work which needed to be progressed over the next year. The main items were:

a) work required in order to implement the revised Model 2. This includes:

- development of action criteria ("warning lines")
- development of progress charts to accompany monthly briefings from the CMA
- assessment of the value of moving averages, etc.

b) determination of the TLS for the future system;

c) development of a two-dimensional approach to modelling of collision risk in the horizontal plane;

d) preliminary assessment of the safety benefits to be gained from ADS, and of the separation standards which might be achieved;

e) work to complete revised MNPS statement for application in the future system; and

f) work in support of the NAT Vertical Separation Implementation Group (VSIG) - Attachment D-1 to the report on Agenda Item 6 refers.

Note: work listed under a) and part of f) should be undertaken on the basis of a common and consistent approach.

ATTACHMENT A

CLASSIFICATION (see Note 1)		ERROR					
		50 - 70 NM (ZETA ERRORS)					
		TOTAL MNPS TRAFFIC		OTS TRAFFIC		RANDOM TRAFFIC	
		Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
A	4(11)*	3.00	3.00	0	0	3.00	3.00
B	1(1)*	1.00	0.46	0	0	1.00	0.46
C1	6(4)*	3.00	1.38	1.00	0.46	2.00	0.92
C2	4(2)*	3.00	1.38	0	0	3.00	1.38
D	4(2)*	2.00	2.00	0	0	2.00	2.00
E	0(0)*	0	0	0	0	0	0
F	3(4)*	2.00	2.00	1.00	1.00	1.00	1.00
Not classified	0(0)*	0	0	0	0	0	0
Total	22	14.00	10.22	2.00	1.46	12.00	8.76
Total in last period	24	13.00	10.84	3.00	2.46	10.00	8.38
Observed traffic		167506		100504		67002	
Last monitoring period		144151		86491		57660	
No. of errors within MNPS Airspace tolerated by the CRM	88.78 (5.3×10^{-4})	21.77 (1.3×10^{-4})		13.06 (1.3×10^{-4})		8.71 (1.3×10^{-4})	
No. of errors tolerated by the CRM before action based on operational judgement is required	133.17 (7.95×10^{-4})	32.66 (1.95×10^{-4})		19.60 (1.95×10^{-4})		13.06 (1.95×10^{-4})	

()* Previous years figures for each error classification

Note 1: The letters in the classification column means:

A: Aircraft not certified for MNPS Operations

B: ATC System Loop error

C1: Equipment Control error including inadverent 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

ATTACHMENT B-1

FORMAT OF THE LETTERS TO BE USED BY THE CENTRAL MONITORING AGENCY IN COMMUNICATIONS WITH STATES

Date:

Dear Sir,

MONITORING OF NORTH ATLANTIC (NAT) - APPROVALS FOR OPERATING IN MINIMUM NAVIGATION PERFORMANCE SPECIFICATION AIRSPACE (MNPSA)

At its 25th meeting the ICAO North Atlantic Systems Planning Group (NAT SPG) concluded that provider States should introduce, where possible, procedures designed to monitor the approval status of operators in NAT MNPS airspace, in order to assist in reducing the number of non-approved users. The procedure adopted by ..... Oceanic Area Control Centre is that when a pilot requests a NAT Oceanic clearance which includes MNPS levels he may be asked to confirm his approval status.

In the situation where a pilot is unable to give this confirmation the details are passed to this office, which acts as the Central Monitoring Agency (CMA) for NAT SPG, in order that the State of Registry or the State of the Operator involved may be notified.

It was noted that the pilot/s of the following flight/s/list of flights which took place on ....., and for which we believe you to be the State of Registry/the Operator, was/were unable to give assurance that he/they possessed NAT MNPS approval. We would be grateful if you would investigate the circumstances, and advise whether or not this/these flight/s was/were in possession of a formal State Approval for NAT MNPS Operations. If the flight/s was/were not so approved we would be grateful if you would further notify this office of your proposed course of action.

Yours faithfully,

ATTACHMENT B-2

Date: .....

Dear Sir,

MONITORING OF NORTH ATLANTIC (NAT) - APPROVALS FOR OPERATING IN MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS AIRSPACE (MNPSA)

In accordance with an agreement of the North Atlantic Systems Planning Group (Paragraph 1.1.2.4 of the Summary of the 27th NAT SPG meeting refers), I am writing to inform you that no response has been received, from your Administration, to a letter we wrote to you on ..... requesting information concerning the NAT MNPSA approval status of the under mentioned/attached/list of/flights/s.

The monitoring of NAT MNPS airspace in order to exclude non-approved users in considered to be an essential aspect of the safety management of that airspace. The lack of information in respect of operators attempting to use that airspace without the necessary State approval significantly reduces the effectiveness of the monitoring procedures and could ultimately affect the safety of operations within NAT MNPS airspace.

A copy of this letter is being sent to the ICAO Paris Office.

Yours faithfully,

ATTACHMENT C

ACAS EVALUATION FORM FOR ATS

Form ACAS/C

Name of reporting unit .....

Date and time of occurence .... UTC

Sector/Position .....

Workload Low ..... Normal ..... High .....

Is the occurence related to the use of ACAS? Yes ... No ... ?...

Description of the occurence . . . . . .

. . . . . .

. . . . . .

Position and altitude of the occurrence .... ft/FL

Involved aircraft #1

Call sign ..... SSR code ..... ACAS -equipped? Yes ... No ... ? ...

#2 Unknown? ....., otherwise:

Call sign ..... SSR code ..... ACAS -equipped? Yes ... No ... ? ...

VFR ..... Military ..... Other .....

R/T with a/c #1? Yes ... No ... R/T with a/c #2? Yes ... No ...

Did either pilot report a near collision (airmiss)? Yes ... No ...

Did either pilot ask for traffic information? Yes ... No ...

If "Yes", was it before manoeuvring? .....

after manoeuvring? .....

Was the action taken by the pilot justified in your views Yes ... No ...

(If "Yes" comment under "Remarks" below)

Will recorded radar data be available? Yes ... No ...

Did the occurrence disrupt your activities? Yes ... No ...

(If "Yes" comment under "Remarks" below)

Remarks

AGENDA ITEM 2: NAT AIR NAVIGATION SYSTEM OPERATIONS REVIEW

2.0 Introduction

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

a) air traffic services operations;

b) communication operations;

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

d) air traffic flow management.

2.1 Air Traffic Services Operations

2.1.0 The Group dealt with the following matters related to NAT ATS operations:

a) application and refinement of separation standards;

b) domestic/oceanic interface and transition problems adjacent to NAT MNPS airspace;

c) possible further short-term ATC improvements and determination of action for their implementation; and

d) ATS operational contingency planning in the NAT Region.

2.1.1 Application and refinement of separation standards

Practical application of criteria for separation of aircraft in the NAT Region

2.1.1.1 Further to discussions concerning the interpretation and application of separation minima in the NAT Region held at its last meeting (NAT SPG/26 Report, paragraph 2.1.8 refers), the Group was presented with proposals by the Member from Canada on how best to progress the matter. It was recalled that a requirement for close co-ordination among NAT provider States had been identified, in particular when employing or introducing automated data processing to achieve the application of separation minima. To this end, NAT SPG members had been requested to make their application description available for review at the 1990 meeting of NAT chiefs and subsequently to NAT SPG/27.

2.1.1.2 Inputs from NAT provider States were received and used to prepare revisions to the document published by Transport Canada on behalf of the NAT SPG. This document provides guidance recommended for use by both operational air traffic control personnel and those who design software algorithms for ATC automation. The current Second Edition of the "Practical Application of Criteria for Separation of Aircraft in the NAT Region" was last issued in April 1987.

2.1.1.3 At its fourth meeting (February 1991), the NAT SPG Task Force identified an urgent requirement for agreement on a common application of separation criteria and suggested that a group of ATC experts be set up to carry out this task. It also recognized that research was required to ensure that these criteria were represented in a form suitable for automated implementation whilst remaining capable of being clearly interpreted by operational controllers. In addition, the NAT Implementation Document developed by the Task Force foresaw a requirement to adopt an agreed version of the "Practical Application of Separation Criteria" document for 1992 (paragraph 4.2.11 also refers).

2.1.1.4 Aware that this subject might need to be addressed again when discussing its future work programme, the Group was of the opinion that the process to revise the "Practical Application of Separation Criteria" had progressed satisfactorily since October 1990. It agreed that the Member from Canada should continue to co-ordinate the revision of the document, through NAT SPG members, with the aim of obtaining endorsement by the members prior to NAT SPG/28.

CONCLUSION 27/8 - THIRD EDITION OF THE PRACTICAL APPLICATION OF SEPARATION CRITERIA DOCUMENT

That:

a) the Member from Canada continue to co-ordinate revisions to the Practical Application of Separation Criteria document for the NAT Region to be endorsed by NAT SPG members prior to NAT SPG/28; and

b) the Chairman of the NAT SPG be empowered to authorize the publication and distribution of the Third Edition of the Practical Application of Separation Criteria document for the NAT Region by Canada on behalf of the NAT SPG.

2.1.2 Domestic/oceanic interfaces and transition problems adjacent to NAT MNPS airspace

Shannon Oceanic Transition Area (SOTA)

2.1.2.1 The Group was presented with the latest developments by the Member from Ireland concerning operations in the SOTA which were successfully inaugurated at the beginning of 1991. Despite adverse weather conditions which affected the facilities supporting SOTA, operations commenced on 10 January 1991 as planned. SOTA was developed to allow for the provision of radar control service by Shannon ATC in part of the Shanwick OCA.

2.1.2.2 Being provided with a detailed update of the technical means and procedures deployed for the implementation of SOTA, the Group noted that the present three Very High Frequency (VHF) channels used (135.6, 131.15 and 121.5 MHz) would be complemented by two additional VHF channels in August 1991. Two monopulse SSRs provided an operational range of 256 NM at FL310 or above. In addition, the radars were backed-up by a single monopulse station with dual electronics.

2.1.2.3 It was reported that during the initial operations of SOTA (January to April 1991) air traffic figures exceeded expectations. To-date more than 2600 flights per month were operating throughout the area, of which approximately 15% were military movements. This latter category of traffic gave rise to a number of operational difficulties which had to be treated on the basis of ad hoc procedures. New arrangements were expected to enter into force in June 1991 aiming at preserving an acceptable level of co-ordination while satisfying military and civil operations. It was also

indicated that a large number of flight plans concerning movements operating through SOTA were not transmitted on the Aeronautical Fixed Telecommunication Network (AFTN) to Shannon Area Control Center (ACC). This situation was being corrected through contacts with aircraft operators and ATS units, particularly with regard to flights departing from the Caribbean area.

2.1.2.4 A second phase of implementation of SOTA was planned to come into effect on 27 June 1991. This step was to involve a delegation of control responsibility by the United Kingdom of traffic above FL245 in a small portion of the South West corner of the London Upper Information Region (UIR) to Shannon and Brest ACCs. This delegation would improve the ATS route structure and provide a better interface between the two areas in question. The final phase of implementation was scheduled for early 1992 which would involve further ATS route adjustments.

Implementation of the new airspace classifications

2.1.2.5 The Group noted that, at its fourth meeting, the NAT SPG Task Force had requested the Secretary to consult with States concerned in order to identify any potential problems that might have a bearing on the implementation of the new ICAO airspace classifications. Accordingly, all NAT provider States and all States adjacent to the NAT Region were requested to inform the European Office of ICAO of their respective implementation plans (State letter T 13/6.4/3-226 of 21 February 1991 refers).

2.1.2.6 Responses from States had indicated that most of them would be able to implement the new classifications on 14 November 1991 in accordance with the applicability date of Amendment 33 to Annex 11. It was also noted that States that could not meet the above deadline still expected to implement the new airspace classifications as soon as practical thereafter. In the interim, no changes to the provision of ATS were to be expected.

2.1.2.7 In this connection, a question was raised in relation to the establishment of Class G airspace over the high seas below FL55 and the absence of a requirement for radio communication when operating a flight in this class of airspace and the possibility of this being interpreted as a withdrawal of the existing provisions in the Regional Supplementary Procedures (Doc 7030) concerning the requirement for the carriage of appropriate communication equipment in the NAT airspace. Having documented the matter and consulted with ICAO Headquarters, the Secretariat had advised the Group that the description of Class G airspace requirements in the Table showing the ATS Airspace Classifications contained in Annex 11, Appendix 4 neither took precedence over nor contradicted the provisions contained in the NAT Regional Supplementary Procedures Doc 7030 (paragraph 12.1.1) and Annex 6 (Part II, paragraphs 6.3 and 6.4 refer) on the question of radio communication requirements for such flights.

Establishment of controlled airspace in Bodo Oceanic Flight Information Region (FIR)

2.1.2.8 The Group noted the information provided by the Representative of Norway on the steps it planned to take to introduce controlled airspace in Bodø Oceanic FIR in connection with the implementation of the new ATS airspace classifications. In its efforts towards standardization of the airspace structure, Norway had started the planning process in order to establish, by February 1992, Class A airspace between FL195 and FL460 in Bodø Oceanic FIR as soon as satisfactory communication links have been installed. Further plans foresaw the establishment of Class A airspace within Trondheim and Stavanger FIRs. Norway also informed the Group of its intention to suggest an extension of MNPS airspace to include Bodo FIR airspace at a later stage. The Representative of IATA suggested that Norway delegate to Reykjavik the responsibility of providing ATC services in Bodo FIR above FL195. Iceland and Norway agreed to study the matter.

Area Navigation (RNAV) route structure between Norway and Iceland

2.1.2.9 The Group was informed of Norway's plans to review and harmonize its existing RNAV route network through Norwegian FIRs to/from Reykjavik Control Area (CTA). Up to now, the published RNAV routes in Norwegian FIRs (UP-routes) between Aalborg VOR in Denmark and NAT entry/points at 00° of longitude and the Polar Track Structure (PTS) published by Iceland were of a totally different nature. The situation resulting from this difference was that some operators using the PTS in Reykjavik CTA were considered the continuation to/from anchor points in Norway as an ATS route although not published as such. Taking advantage of establishing Class A airspace between FL195 and FL460 in Bodø FIR, this situation should be rectified when the process of harmonization of the RNAV route structure through Norwegian FIRs to/from Reykjavik CTA would be initiated. In this context it was pointed out that Norway should consider using a single route identifier for each track when establishing those ATS routes.

Extension of required navigation performance (RNP) capability airspace at NAT/Canada interfaces

2.1.2.10 The Group was informed that Canada had taken steps aimed at extending the use of RNP separation at its Gander OAC/Montreal ACC interface and at its Gander OAC/Gander ACC (domestic) interface. The RNP separation, which had been introduced in Canadian controlled airspace some years ago, would now be applicable within the Montreal CTA extending to 60°W, provided radar coverage was available. The same would apply within the airspace East of and adjacent to the Gander Domestic FIR, from 45°N to 50°N and from 50°W and West thereof, provided radar was available. The RNP separation would improve system capacity and efficiency.

2.1.3 Possible further short term improvements and determination of action for their implementation

2.1.3.1 Several proposals were tabled by IATA concerning possible measures which might enhance the efficiency and capacity of the NAT Oceanic system as follows:

a) clearance delivery procedures in the New York OCA;

b) additional composite ATS route in the Western Atlantic Route System (WATRS) airspace;

c) replacement of ATS route AR9 by a new segment under radar coverage;

d) delegation of portions of New York OCA to Moncton and Gander; and

e) extended use of radar and VHF in NAT MNPS airspace.

2.1.3.2 Taking into account the increase of air traffic demand in the New York OCA, and other considerations such as changes in the distribution of traffic, the Representative of IATA explained that flight operations along North-South routes within the WATRS airspace might be improved by introducing specific procedures for the delivery of discrete Oceanic clearances. Such arrangements, it was suggested, would also facilitate the development and introduction of a data link method for Oceanic clearance delivery. Responding that an Oceanic planner position had now been established in the New York OAC, the Member from the United States indicated that the development of the Dynamic Ocean Track System (DOTS) installed in several facilities, including New York OAC (see also paragraph 3.5.1) would provide automated support to oceanic planning functions. Steps

which were now taken for the operational introduction of this system between June 1991 and March 1992 as well as other operational adjustments should be able to respond to the requirement suggested by IATA. In this context, the Representative of IFALPA objected to airborne discrete voice clearance delivery in the New York area on the basis that it would overload two crew cockpits operating in an area with extremely heavy radio traffic and ATC demands.

2.1.3.3 For the same reasons mentioned above, IATA also made a proposal for an additional ATS route to supplement A699 and A700 which were used to serve as access to/from NAT Oceanic airspace. This ATS route would replace AR9 and could remain under radar control along an alignment defined as follows: Norfolk (ORF) to a new reporting point (approximate location 3740N 07240W) then direct to JOBOC. Since the implementation of this proposal would require extensive civil/military co-ordination, it was noted that the United States would consider the issue at the earliest opportunity.

2.1.3.4 Another proposal tabled by IATA aimed at providing improved separation criteria based on radar surveillance in airspace contiguous to New York/Moncton/Gander OCA/ACCs. This proposal would allow an optimum traffic flow to operate when weather conditions required the placement of 2 to 3 oceanic tracks in New York OCA. It was assumed that Moncton and Gander ACCs might be in a position to provide ATC service within a portion of airspace of the New York OCA using two new radars which had been installed in Nova Scotia (Yarmouth and Sydney) as well as a third radar station expected to be installed in St John's, Newfoundland in November 1991. The range of 250 NM of those installations would cover traffic flows to/from Europe along the coast of Nova Scotia and Newfoundland. Traffic, which at the time, was separated on the basis of Oceanic separation criteria could thus be separated using radar separation criteria. The Members from Canada and the United States stated that they would endeavour to look further into the issue which not only had ATC repercussions but also involved possible changes to FIR boundaries.

2.1.3.5 Recognizing the limitations of the New York OCA since it had assumed control of the extension to the WATRS airspace, particularly as concerns crossing traffic, the Representative from IATA elaborated on a proposal to introduce a new ATS route located between A300 and A523, utilizing composite flight levels. The Member from the United States indicated that a re-evaluation of the feasibility of composite separation in WATRS airspace had been conducted in January 1991. It had been, again, noted that composite tracks were not feasible due to the amount of crossing traffic. However, the proposal by IATA for a limited composite system would be considered. As to operational aspects, the Representative of IFALPA indicated that the area in question was heavily affected at times by weather conditions which might have adverse effects on ATC. New York OAC was conducting a traffic survey to determine specifically the ratio of crossing traffic that could be handled in a composite system using FL330/350 or FL320/340. Using such a system, crossing traffic could be routed above or below the composite tracks. Should this appear workable, the FAA Technical Centre would be requested to perform the necessary risk analysis before adopting the proposal. It was also recognized that, although further analysis might be required, consideration had to be given to the navigation fit of aircraft utilizing the composite system. Historically, two independent navigation sets have been required for aircraft operating in a composite route structure.

2.1.3.6 On the basis of information provided by Iceland regarding its plans to exploit radar data from four sites in Iceland and one in the Faroe Islands, as well as extended VHF air/ground communications, IATA put forward a proposal that SSR radar surveillance and direct pilot controller communications could be used throughout extended portions of Oceanic airspace where currently procedural control and Oceanic separation criteria were applied. The coverage of these radar and VHF facilities suggested that some benefit could be derived from them if used by Reykjavik in some areas located within the Shanwick OCA. In this connection, the Group noted that the withdrawal of

communications services provided by the United States Air Force to Iceland, originally planned for September 1992, had now been advanced to 1 September 1991. Negotiations were underway to obtain an extension of those services and arrange for interim services to cater for the period between the withdrawal of the facilities and the provisions of the EUTELSAT terminal in Iceland (paragraph 2.2.2 also refers). In addition, the Members from Iceland and the United Kingdom agreed that these issues, including the proposals from IATA, would be considered in their ongoing bilateral discussions.

EUR-CAR Flex Track Procedures

2.1.3.7 The Member from the United States provided the Group with information on the development of a flexible track system between the Caribbean area and Europe using the DOTS. It was stated that DOTS could provide advantages in establishing fuel efficient tracks that incorporate appropriate ATS lateral separation criteria and take maximum advantage of upper winds. Despite the apparent benefits which could be derived from this system in terms of ATC handling, it was the view of the Member from Portugal, as far as Santa Maria airspace was concerned, that random routes were preferable. Furthermore, the operators were of the opinion that a flex track system would not provide for optimum flight profiles responding to individual airlines' needs. In the absence of conclusive discussion on this issue and taking into account the potential capabilities of DOTS as an Oceanic planning tool, it was agreed that further study was required before this issue could be concluded.

Impact of domestic traffic flow restrictions on North Atlantic Operations

2.1.3.8 The Representative of IATA informed the Group that, during past months, NAT operations had been affected significantly by a number of restrictions which were primarily put into force by domestic ACCs to accommodate shortcomings within their areas thus affecting the NAT interfaces. IATA stated that the NAT traffic was especially sensitive to such measures and that States providing services at NAT interfaces should give due consideration to the impact of Air Traffic Flow Management (ATFM) measures on long-haul flights. In a wider context, the Group discussed ATFM matters at a later stage which are reflected in the report on Agenda Item 2.4

2.1.4 ATS operational contingency planning in the NAT Region, as necessary

2.1.4.1 The Group recalled that NAT SPG/26, in consideration of Assembly Resolution A23-12 and the related guidelines for contingency measures which committed States to prepare contingency plans, had requested the NAT OAC Chiefs to develop an operational framework which would ensure that high seas airspace remains open to international air traffic. This task could not be addressed in a satisfactory manner at the OAC Chiefs'meeting due to the non-attendance of some of the concerned OACs. It was also recognized that contingency planning involved issues of a policy nature which could not be appropriately addressed in that forum. Therefore, it was agreed that contingency planning should constitute a task to be undertaken by the group of ATC experts set up by NAT SPG/27 (paragraph 4.2.7 refers).

2.2 Communications operations

2.2.0 Under this Agenda Item, The Group considered the following subjects:

a) aeronautical fixed services; and

b) aeronautical mobile services.

2.2.1 Aeronautical Fixed Services (AFS)

AFS circuits in the northern part of NAT Region

2.2.1.1 The Group was presented with an extract of the report of the 10th Informal NAT AFS/AFTN Meeting, which had been held in Paris from 22 to 26 April 1991. The meeting particularly discussed how to meet communication requirements of Greenland and the Faroe Islands after the withdrawal of existing communication facilities which have been provided by the United States military. The Group concurred with the views of the Informal NAT AFS/AFTN meeting, that the circuit configuration developed by the Informal NAT AFS/AFTN meeting as described in the Attachment A to the report on Agenda Item 2, would best meet both current and future communication requirements in that part of the NAT Region. Consequently, the Group recommended implementation of the configuration described.

CONCLUSION 27/9 - IMPLEMENTATION OF AFS COMMUNICATION FACILITIES

That Denmark and Iceland co-ordinate and implement as soon as possible the communication facilities necessary for the implementation of a circuit configuration between Greenland, Iceland and Faroe Islands as described in Attachment A to the Report on Agenda Item 2.

Performance of ATS direct speech circuits

2.2.1.2 The Member from Portugal again provided the Group with information relating to the performance of ATS speech circuits with particular reference to those between Santa Maria and Shanwick and between Santa Maria and New York/Gander. Difficulties had been encountered because of failures and malfunctions in the latter segment. Portugal repeated its request for action to be taken with respect to the identification and rectification of problems being experienced with this circuit.

2.2.1.3 The Group was informed that the ATS speech circuits now interconnecting the New York, Gander, Santa Maria, San Juan and Piarco OACs were in the process of being re-engineered by the United States. This work will result in the Piarco-New York segment of the circuit being segregated from the existing arrangement. The estimated date of completion was November 1991. It was expected that the re-engineering of these ATS speech circuits would eliminate the generally unsatisfactory technical performance that had been experienced for the past several months.

2.2.2 Aeronautical Mobile Services (AMS)

Next High Frequency (HF) and General Purpose (GP) VHF data collection

2.2.2.1 The Group recalled NAT SPG Conclusion 26/8 and recognized that the next HF and GP/VHF data collection was scheduled for 1993, the results of which would be presented to NAT SPG/30. In reviewing this timeframe, the Group considered whether the date for the next data collection should be advanced, particularly in view of the recent and proposed changes to the NAT HF network. The Group agreed, however, that this time frame should remain but that provider States should, in the meantime, compile statistics on traffic levels and frequency usage for presentation to future NAT SPG meetings.

CONCLUSION 27/10 - NAT HF AND GENERAL PURPOSE (GP) VHF DATA COLLECTIONS

That:

a) the time frame for the next NAT HF and GP/VHF data collection remain unchanged; and

b) States responsible for the main stations in the NAT HF network (Gander, New York, Reykjavik, Santa Maria and Shanwick) prepare summary reports for each calendar year on volumes of HF and GP/VHF communications traffic and present these to the NAT SPG as information papers.

Harmful interference to NAT HF operations

2.2.2.2 Information from member States regarding harmful interference on HF indicated that the problem had continued and that there was no appreciable change in the occurrence of harmful interference during the period under review.

2.2.2.3 Information regarding harmful interference had been presented with some variations to the agreed format. Accurate measurements of harmful interference emissions, so as to determine their source, class and frequency, were therefore difficult to obtain in some cases.

2.2.2.4 The Group agreed that each State should continue to provide a report on cases of harmful interference on HF encountered at their aeronautical stations since the previous NAT SPG meeting. In this manner, chronic HF interference problems that are common to other North Atlantic aeronautical stations could be identified. Efforts by States to clear the interference would be enhanced if it could be demonstrated that the harmful interference affects more than one NAT aeronautical station. In respect of the calendar year 1991, these reports will be collected and distributed among the main network stations before the end of March 1992 for scrutiny in advance of the NAT SPG/28.

2.2.2.5 HF interference reports should be presented in the agreed format with the addition of the following new "remarks" code, and segregated by reference to the existing five HF NAT families:

A. Number of times interference occurred:

1. First time
2. Occasionally
3. Often
4. Continuously

B. Duration of interference:

1. Seconds
2. Minutes
3. Hours
4. Days

C. Effect on system operation:

1. Usable
2. Usable with difficulty
3. Unusable

CONCLUSION 27/11 - HARMFUL HF INTERFERENCE

That NAT provider States:

a) continue to gather information on harmful HF interference in the NAT Region and present it in the agreed format to future NAT SPG meetings; and

b) continue to use the existing procedures to resolve specific HF interference problems.

Additional HF families

2.2.2.6 The Members from Ireland and Canada reported on measures taken in regard to NAT SPG Conclusion 26/10 concerning the implementation of additional HF families.

2.2.2.7 The introduction of HF family NAT-F (2962 kHz, 6622 kHz, 8831 kHz) would add extra air/ground communications capacity to the HF network, particularly for flight movements in the North-central part of the NAT Region. Implementation of NAT-F at Shanwick and Gander would, however, require the provision of additional transmit/receive facilities, new antenna systems and possibly extra manpower. A study of the implications of these changes needed to be completed before it would be possible to determine an accurate implementation timescale. A tentative schedule agreed by Canada and Ireland envisaged implementation in early 1993.

2.2.2.8 In accordance also with NAT SPG Conclusion 26/10, Canada had referred the matter of frequency assignments for HF NAT-G family to the ICAO COM/MET/OPS/90 Divisional meeting, recommending that frequencies currently assigned under ITU Radio Regulations, Appendix 27 Aer2, but not used, be reassigned to meet current needs in the NAT Region.

2.2.2.9 COM/MET/OPS/90 (Recommendation 3/2) agreed that an appropriate ICAO body be tasked to review the allotments contained in Appendix 27 Aer2 on an urgent basis in order to:

a) meet current and projected requirements brought about by changing air traffic patterns;

b) provide a proposal for a better distribution of allotments to Major World Air Route Area (MWARA), Regional Domestic Air Route Area (RDARA), VOLMET and long distance operational control (LDOC) functions based on requirements; and

c) document the proposed revisions accordingly.

2.2.2.10 The Air Navigation Commission had authorized the Secretariat, with the assistance of the Frequency Management Study Group (FMSG), to take action to accomplish the tasks identified in Recommendation 3/2.

2.2.2.11 The Group noted that:

a) the implementation of the HF NAT-E family provided relief to other extremely congested HF NAT families, particularly the HF NAT-B family, and contributed to a general improvement in HF air/ground communications operations in the NAT Region;

b) the HF NAT-E family was not assigned a 13 MHz-band frequency and it had been observed over the past eleven months that during certain hours a 13 MHz band frequency would have provided better communications with aircraft operating in the New York OCA than the frequencies currently assigned to the HF NAT-E family.

2.2.2.12 Based on the need for a 13 MHz-band frequency to be assigned to the HF NAT-E family, a search for a suitable frequency was conducted. Using provision 27/21 of ITU Appendix 27 Aer2, which provides for adaptation of the frequency allotment plan, frequency 13354 kHz was identified as the candidate 13 MHz-band frequency for the appropriate assignment. 13354 kHz was in use in the Central East Pacific (CEP) MWARA. However, it was proposed to use this frequency in the New York and Santa Maria aeronautical stations on a time-sharing basis by close co-ordination between the United States aeronautical stations concerned.

CONCLUSION 27/12 - ADDITION OF 13 MHz BAND FREQUENCY

That:

a) a 13 MHz band frequency be implemented by the United States and Portugal at the aeronautical stations at New York and Santa Maria for assignment to the HF NAT-E family;

b) this frequency be 13354 kHz if approved by the appropriate frequency management authorities; and

c) the Member from the United States make arrangements that his State prepare and submit to ICAO the necessary proposal for amendment to the NAT/NAM/PAC Air Navigation Plan (ICAO Doc 8755).

Automation of Shannon HF VOLMET

2.2.2.13 The Member from Ireland advised the Group that the Shannon HF VOLMET, operated in accordance with the HF VOLMET broadcast plan outlined in Table ATS-2 of the NAT/NAM/PAC Air Navigation Plan Publication (ICAO Doc 8755), would become automated during 1991.

2.2.2.14 The new system would be capable of automatically selecting, verifying and decoding METAR, TAF and SIGMET reports and of converting the information into audio signals suitable for modulating the HF transmitters. The voice outputs, broadcast on the appropriate frequencies, would be indistinguishable from natural unaccented speech in the English language. It was envisaged that the system would provide users in the NAT Region with a high-quality, consistent and reliable meteorological information service.

2.2.2.15 Equipment for the new system had been installed and trials were currently being conducted. On-line operations were scheduled to commence on 1 July 1991, from which date it was proposed to fully implement the system.

2.2.2.16 Until the implementation of the automated system, the current H24 manually-operated service was to be maintained.

Selective Calling (SELCAL) expansion

2.2.2.17 In late 1970, it was recognized that saturation in numbers of assignable SELCAL codes (2970 total) was approaching. Action which had been taken by ICAO in 1981 to relieve the problem by expanding the number of SELCAL tones from twelve to sixteen had been accepted by States effective from 1 September 1985.

2.2.2.18 To date, in excess of 3505 new SELCAL codes have been assigned by Aeronautical Radio, Inc. (ARINC), the ICAO-designated international registrar of SELCAL codes. These were discrete single user codes which would remain unshared. The major manufacturer of aircraft SELCAL equipment was now marketing two new models capable of using 16-tone code assignments, as well as adaptive units that convert 12-tone equipment to 16-tone capability. As more and more of these units were placed in service, the number of users sharing a common code would be reduced.

2.2.2.19 The SELCAL Registrar had widely disseminated information on the availability of the new codes, the new equipment and the advantages of using them. Maximum use of new codes was now being encouraged.

2.2.2.20 The Group expressed concern that, in other ICAO Regions, some States had not yet installed ground station SELCAL equipment capable of transmitting the new SELCAL codes. Consequently, aircraft operating in those areas were still limited to the use of shared codes selected from the original 12-tones. These limitations were imposing constraints in regard to communications with these aircraft when operated in other Regions. The Group noted that all of the aeronautical stations serving the NAT Region were now equipped with the 16-tone equipment.

CONCLUSION 27/13 - IMPLEMENTATION OF 16-TONE SELCAL EQUIPMENT

That ICAO, through its Regional Offices, urge States world-wide to implement, as a matter of urgency, full 16-tone SELCAL equipment to avoid constraints encountered with 16-tone airborne equipment in 12-tone ATS environments.

Extended VHF facility

2.2.2.21 In follow-up to NAT SPG Conclusion 26/11 which requested that Iceland consider the possibility of installing a VHF facility on the East coast of Greenland to be remotely controlled from Reykjavik, the Group was informed that this study had not been completed because of ongoing changes in the communication infrastructure between Iceland and Greenland. The Group therefore agreed that this investigation be continued.

CONCLUSION 27/14 - INSTALLATION OF VHF FACILITY IN EASTERN GREENLAND

That:

a) Denmark and Iceland jointly study the possibility of installing a VHF facility on the East coast of Greenland to be remotely controlled from Reykjavik; and

b) report the results of the study to NAT SPG/28.

2.3 Determination of the performance of the NAT Air Navigation System and the services provided to airspace users by ATC

2.3.1 In accordance with current procedures agreed to at previous NAT SPG meetings, reports on collections of statistical data regarding operations in OACs were provided to the Group (Conclusion 24/11 and Attachment A to Agenda Item 2 of NAT SPG/24 report refer).

2.3.2 An overview of operations within the Gander OAC was provided for 1990. The statistics used in compiling the information had been based on 50°W data collections with the exception of random traffic. That information had been derived by comparing Eastbound traffic to the night time OTS and Westbound traffic to the day time OTS. A breakdown of traffic figures indicated that the high level traffic (FL280 and above) had increased by 11.6% compared to 1989. Taking into account the increase of 2.4% for low level traffic, the total operations for Gander OAC had increased by 11.4% for 1990 vs 1989. Further breakdown of figures showed comparisons between the OTS and random traffic by area, direction, hourly and monthly distribution and the flight level utilisation including step climbs. The statistics also showed that the average number of tracks daily in the daytime system was 8.1 in 1990 compared to 7.7 in 1989. The night time daily track average was 6.8, compared with 5.8 during 1989. The highest average hourly flows occurred Eastbound between 0100 and 0500 UTC, and Westbound between 1400 and 1800 UTC. A review of the flight level usage for 1990 revealed that FL370 was the most used flight level in the Easbound mode, with FL350 being the most used flight level in the Westbound mode. The use of FL330 for Westbound traffic and FL350 for Eastbound traffic was significantly greater North of the OTS, compared to South of it. Finally, the Group noted that there was a slight increase in the percentage of random traffic (1.2%), that the effect of the datum line trial was reflected in a greater percentage of random traffic North of the OTS than in any other area and that the Eastbound traffic was frequently able to enter the oceanic area at optimum flight levels, due in part to the flight time from departure airports, and radar coverage extending East to the Gander OAC's oceanic boundary.

2.3.3 Figures presented by Canada, in accordance with the categories agreed to at NAT SPG/24, showed that 89.3% of OTS and 81.5% of random traffic had been cleared on the requested track at requested or higher flight levels. The figures produced by the United Kingdom, for the same category, showed 78.0% for the OTS and 54.6% for random tracks and those produced by Iceland showed 97.0% for the OTS and 94.7% for random tracks.

2.3.4 An overview of the air traffic situation within the WATRS area under the responsibility of the New York OAC was presented to the meeting. Traffic volume overall in 1990 had not increased compared to 1989. Although there was a considerable increase in military traffic, there had been a corresponding decrease in air carrier traffic due to the situation in the Gulf area. It was anticipated that civil traffic would start again to increase by 6% to 9% yearly as it had in past years.

2.3.5 Having considered all aspects involved in collecting data for the purpose of assessing the performance of the NAT air navigation system, the Group recognized that such efforts merited to be continued in future despite the influence of artificial factors such as flow management and capacity constraints which may be caused by domestic traffic handling. It was agreed that in the absence of a more satisfactory method to measure the performance and efficiency of the system, States concerned should continue such collections of data in accordance with the specifications established by NAT SPG/24 and report to NAT SPG/28. However, it was further agreed that the airspace users should recommend at NAT SPG/28 the type of data that should be collected to best reflect the efficiency of operations.

2.4 Air Traffic Flow Management

2.4.1 The Group noted information from various sources concerning a possible requirement for the development of methods aimed at optimizing traffic flows within the NAT Region. A requirement had been identified in the NAT Implementation Document for the establishment of air traffic flow management systems which were able to react quickly to operational constraints imposed by adjacent regions, unusual excessive traffic levels and unforeseen disruption of traffic flows. Such systems should have the capacity to meet forecast traffic levels on the understanding that the main emphasis should remain on the ability of ATC to cope with traffic demand rather than on the ability of the ATFM system to adjust the demand. They should be able to provide a transparent service as viewed from the cockpit and minimize, as far as practicable, any constraints which may affect en-route operations. In this context, the Representative of IFALPA stated that the captain in-command, in order that he might properly plan and manage his flight, must be fully informed at all times about all matters affecting his flight. With regard to ATFM, this would include anticipated delays, re-routings and altitude restrictions.

2.4.2 In the ensuing discussion, it was recognized that ATFM had been practiced to some extent in the NAT Region for many years. The OTS could be considered as an example of ATC providing a structured flow through airspace where demand would exceed capacity if a totally random route system were in force. However, the impact of ATFM measures applied on both sides of the NAT Region, could not be ignored and had to be taken into account in any further development.

2.4.3 In this context, the Member from Ireland reported on a recent meeting between representatives of the Data Bank EUROCONTROL (DBE) and States involved in the planning and control of NAT traffic. The purpose of the meeting was to improve the accuracy and timeliness of traffic data in the DBE and to examine how best NAT traffic could be integrated in the European system. The NAT SPG noted this information and agreed that any actions and recommendations affecting NAT operations should be properly co-ordinated through the NAT SPG and/or the European Air Navigation Planning Group (EANPG) as appropriate.

2.4.4 In order to respond to the operational need for ATFM identified in the NAT Implementation Document, the Group agreed that States should take action without delay to fit OACs with appropriate ATFM systems harmonized with adjacent oceanic and domestic systems and able to react quickly to their requirements. It was further emphasized that any specific interface problem should be given due regard. As far as the NAT-EUR interface was concerned, the Group requested the ICAO Representative to inform the EANPG of the above developments. It was also agreed that Canada and the United States would make arrangements for the harmonization aspects of the North American ATFM interface with the NAT Region.

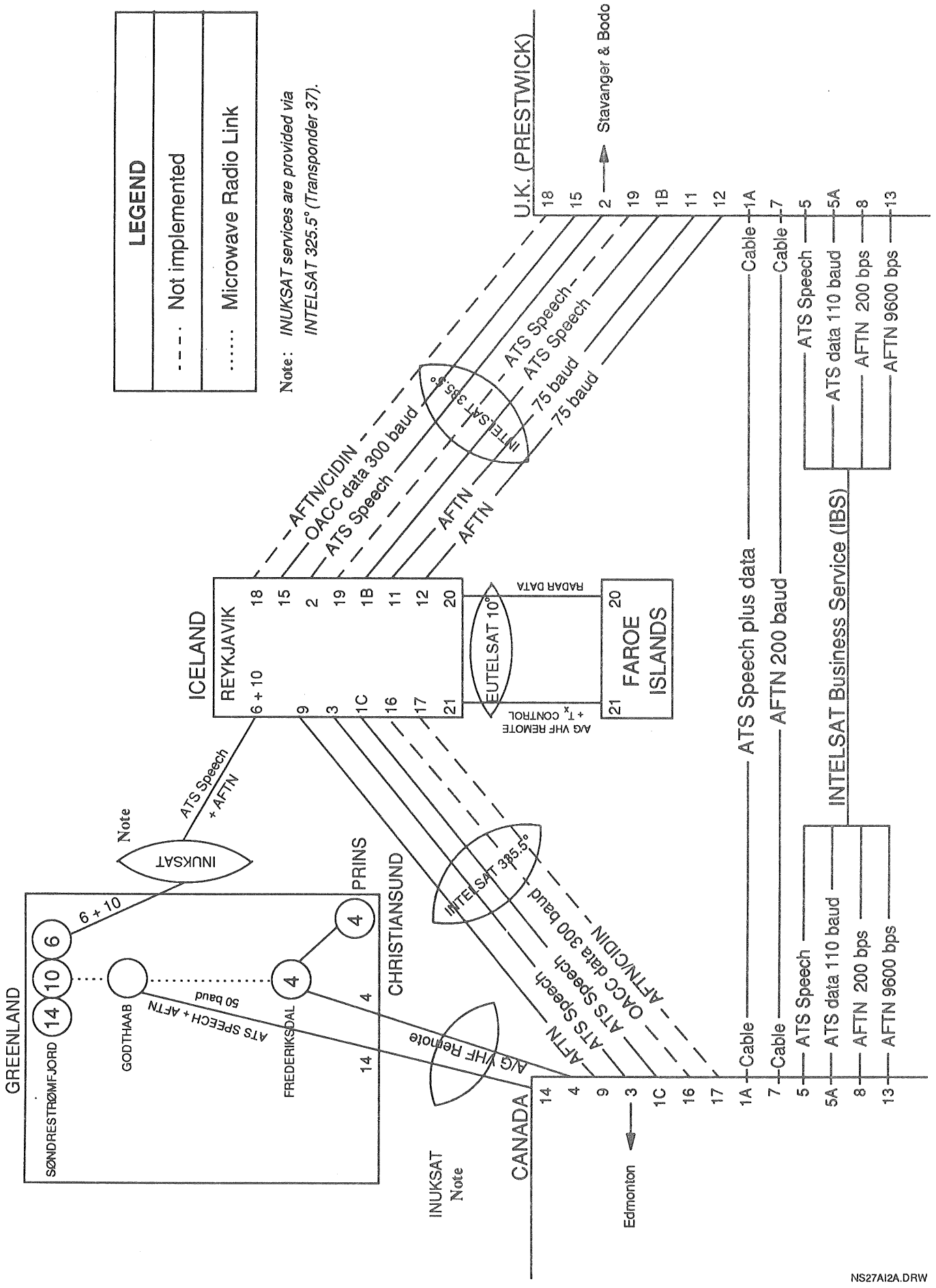
CONCLUSION 27/15 - DEVELOPMENT OF AN AIR TRAFFIC FLOW MANAGEMENT SERVICE (ATFM) FOR THE NAT REGION

That:

a) NAT provider States initiate work on the development of a regional ATFM system to cater for problems affecting the interface areas with Regions adjacent to the NAT Region, and

b) the ICAO Representative European Office take appropriate steps to inform the European Air Navigation Planning Group (EANPG) of these developments.

ATTACHMENT A



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

3.0 Introduction

3.0.1 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;

d) Automatic Dependent Surveillance; and

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

3.1 ATC Automation and traffic display systems in Oceanic Area Control Centres

3.1.1 The Group was informed of the medium and long term development plans for the Portuguese oceanic ATS system. It was still planned to move the Santa Maria OAC to Lisbon where the new systems will be installed. It was pointed out that, since the inception of the project, it was realized that satellite based technology for Communications, Navigation and Surveillance (CNS) would become available during the lifetime of the new oceanic system. Therefore, the decision had been taken to design a system which could be easily developed to utilize satellite technology at a later stage. Similarly, the design of the system was such that it be compatible with other NAT automated ATC systems in order to achieve a region wide homogenous ATS system. Because tactical control methods have proven to be the most adequate for the Santa Maria operational environment, the new system should provide appropriate tools for these characteristics to be further re-inforced. Provisions have been made for computer dialogue between the Oceanic and Domestic systems in order to ensure a smooth transition between the two FIRs concerned.

3.1.2 The project included a new building, new telephones and air/ground communications equipment; however, the key component was the Oceanic Data Processing and Visualization System (SATL) which was intended to provide the Portuguese Air Traffic Service with the added capacity, flexibility and system reliability needed to cope with the expected traffic growth in the Oceanic Area during the next ten years, while improving economy of flight operations and maintaining or improving today's level of safety.

3.1.3 As the SATL was intended to be an evolutionary system and was designed in such a way as to easily accommodate, in a second stage, new technology based on satellites. Therefore, the project comprised the following two main phases:

a) the first phase, planned to be concluded by 1993, aimed at the operational launch of the SATL within the context of current CNS; and

b) the second phase, would be the evolution of the SATL in order to utilize satellite CNS. The specifications for this phase would be developed during Phase 1 and would be in compliance with a common set of functions agreed between NAT provider States within the NAT SPG. The actual conclusion of this phase would depend on the transition plans agreed by the NAT providers and users.

3.1.4 In the initial phase, the SATL would carry out, inter alia, the following functions:

a) flight data processing: flight plans and modifications thereto, position reports, MET, OTS data and other aeronautical information;

b) graphic traffic display (pseudo radar);

c) conflict detection;

d) internal information management and display;

e) message addressing and posting, for both internal and external correspondents;

f) On-Line Data Interchange (OLDI) with adjacent systems with similar capability; and

g) the production of statistical data as well as legal manual inputs and data recording.

As regards the second phase, it would evolve in such a way as to comply with the key events and milestones described in the NAT Implementation Document.

3.1.5 In concluding the presentation, the Group was informed that a pre-selection of potential suppliers for SATL had been made and would be followed by two calls for tender: the first for the supply of Data Processing Systems (including Flight Data Processing and Visualization, Monitoring and Control, Audio Communications Recording, Time distribution and Working Positions) and the second for Communications Systems (including Air/Ground HF, Microwave Links and Public Automatic Branch Exchange (PABX)). The whole system was planned to be operational early in 1993.

3.1.6 The Member from Canada updated the meeting on the Gander Automated Air Traffic System (GAATS). The Group noted that the GAATS rehost project, which consisted of replacing all major hardware components (computers, keyboards, monitors, etc.) with modern high capacity equipment had been initiated in 1989 and implemented in March 1991.

3.1.7 The Group also noted that the GAATS enhancement project, created in 1990, was designed to accommodate outstanding requirements by utilizing the increased capability to the new rehosted system. The project had been divided into two phases:

a) Phase I which included high level Westbound conflict prediction, low level strip printing and a GAATS/radar interface. It was planned for delivery to Gander in June 1991; and

b) Phase II which included conformance checking based on position reports, universal conflict checking, sectorization, enhanced trial probe, message handling capability (replacement for Gander Automated Message Processing System), plus interfacing to various other agencies. It was planned for delivery to Gander in spring 1992.

3.1.8 The increased capacity and flexibility provided by the new hardware and the enhancements should enable the Gander OAC to stay current in the advanced air traffic control automation field while improving service to oceanic users.

3.1.9 The Member from the United States informed the Group that the Oceanic Display and Planning System (ODAPS) was being developed by the FAA as an automated tool to assist controllers in managing traffic in oceanic airspace. It contained the following major functions:

a) message parsing;

b) route conversion;

c) flight plan-based tracking;

d) flight strip printing;

e) progress report processing;

f) situation display;

g) conflict probe; and

h) automated communications interfaces with adjacent facilities.

In addition, the ODAPS would be the platform for satellite data link and other enhancements.

3.1.10 The Group noted that the ODAPS was currently partially operational at Oakland OAC. Flight data processing, including strip printing, was being performed. Situation displays were being used to provide visual clues to controllers. All communications interfaces had been implemented and were operational. Only the conflict probe function was not being used. The ODAPS had also been installed at New York OAC, but was not being used. A series of changes, most of which were unique to New York oceanic airspace, had been identified with an eighteen month schedule for completion. An operational readiness demonstration was scheduled for July 1993.

3.1.11 The United Kingdom then gave a presentation of work being carried out at Shanwick OAC on Man-Machine Interfaces (MMI). The aim of the work was to achieve an improved form of display while retaining the many good elements of the existing MMI. The display that was being developed was not too radical a departure from the system concept in use but was designed to enable staff to make better use of the functions which already existed in the Shanwick Flight Data Processing System (FDPS).

3.2 Developments in Global Navigation Satellite System

3.2.1 The Group was informed that the Federal Aviation Administration (FAA), in conjunction with other United States Government agencies, had embarked on an aggressive programme to exploit the benefits of the Global Positioning System (GPS) for civil aviation. With an eye towards satisfying the civil aviation operational requirements for satellite navigation promulgated by FANS, the FAA programme was structured to address the timely introduction of the benefits to civil aviation in the application of GPS. Concurrently, a bilateral technical programme to investigate the feasibility of combining GPS and Global Orbiting Satellite System (GLONASS) signals in a single receiver had also been initiated.

3.2.2 Initially, the programmes had focussed on augmentation of satellite signals to meet civil aviation approach and integrity requirements. Flight tests, with user co-operation, would validate and quantify the operational benefits. This would result in standards which would enable timely production and certification of navigation receivers to meet navigation requirements for the oceanic, en route, terminal and approach phases of flight.

3.2.3 The enhancement of satellite navigation with augmenting techniques, such as differential correction technology, would also be investigated to determine the operational benefits for high accuracy civil aviation requirements, such as approach, landing and airport surface navigation.

3.2.4 In line with international aviation benefits, several functionally-oriented initiatives were undertaken as part of the FAA satellite programme. Examples of these initiatives with planned completion dates were:

a) development of a navigation satellite test bed - 1993;

b) conduct differential GPS instrument approach tests - 1994;

c) investigation of both an internal and external GPS integrity system - Ground-based Integrity Channel (GIC) and Receiver Autonomous Integrity Monitoring (RAIM) - 1994;

d) conduct near-Category I instrument approach demonstrations - 1995; and

e) airport surface navigation and control - 1993.

3.2.5 In the ensuing discussion, the Group was informed that the expected accuracy of GPS, in the horizontal plane, was 100 meters on the basis that selective availability remains on. As regards to questions concerning the availability of the systems and financial matters, the Group was informed that these issues would be dealt with at the Tenth Air Navigation Conference (September 1991) and it was hoped that commitments would be made subsequent to the Conference.

3.3 Data link developments

3.3.1 The Member from Canada provided the Group with an update concerning the VHF data link between the GAATS and Air Canada's Air Ground Communication System (AGCS) VHF data link which had commenced trial operation in the summer of 1985. The purpose of the link was to deliver oceanic air traffic control clearances from GAATS through Air Canada's system directly to the cockpit of the aircraft.

3.3.2 The data link had been on test until the fall of 1990 when it had been commissioned for operational use. On contacting the Clearance Delivery Office (CDO), the pilot of a data link equipped aircraft need only read back the printed message for verification and validation of the anticipated flight level. When the aircraft is capable of down-linking the received clearance message, GAATS carries out an automatic integrity check and the voice verification becomes only a sequence number read-back, with flight level validation. The voice contact (much abbreviated) remains as the method of translating the clearance "message" into a valid clearance. The system has proven to be reliable and efficient and, at present by agreement between Air Canada and Transport Canada, there were four major airlines utilizing the system. There have been numerous other inquiries and it was anticipated that the list would grow quickly.

3.3.3 The Member from the United Kingdom then informed the Group of some of the results of the trials to deliver oceanic ATC clearances by VHF data link carried out by Shanwick OAC. The Group recalled that a Shanwick data link working group had been established in March 1988 with the mandate to prove the concept of data link oceanic clearance messages on the basis of the following three phases:

a) the voice request, data delivery and voice acknowledgement;

b) the voice request, data delivery and data acknowledgement; and

c) the data request, data delivery and data acknowledgement.

3.3.4 The first oceanic clearance message had been successfully issued from Shanwick by data link in May 1989. However, it was not until September 1989 that the complex implementation problems had been resolved and Phase 1 began with clearances being regularly uplinked from Shanwick OAC to Air Canada B767's Westbound across the Atlantic. The trials had provided a wealth of information and many anomalies have emerged. As a result of uncovering these shortcomings, work was being carried out in order to refine the mechanisms and communications in order to eliminate the resultant inefficiency.

3.3.5 The Group was informed that Aircraft Communications Addressing and Reporting System (ACARS) implementation had been slower than had been predicted in 1988. This was due primarily to delays in the delivery of airborne software. This had led to lower than predicted numbers of ACARS equipped aircraft actually in service. The numbers of aircraft used on transatlantic flights that were equipped for VHF data link had risen to 150 by the end of 1990. This figure was expected to rise to 875 by the end of 1995 thus showing an annual rise of about 145 aircraft which could be expected to continue until after the year 2000. Most new jet aircraft were now delivered with ACARS capability and every significant airline now had some kind of data link programme. This included, in some cases, a retrofit scheme.

3.3.6 From the airline viewpoint, once the aircraft was equipped with ACARS data link avionics, the crew could benefit from data link oceanic clearances. In the two-pilot aircraft, this was particularly significant, obviating the need for both pilots to monitor the oceanic voice clearance delivery frequency. Additionally, from an ATC stand-point, once the re-engineering of the link to Société Internationale de Telecommunications Aéronautiques (SITA) was complete, each data link clearance should reach the aircraft before the voice and therefore reduce frequency congestion and clearance delivery operator workload. It was noted that Phase 2 of the trial would commence during the summer of 1991 with Phase 3 being planned for the end of 1991.

3.3.7 The Member from the United States informed the Group that in 1990, the FAA took on an ambitious challenge and announced a full scale deployment of the Pre-Departure Clearance (PDC) data communications service at a total of 30 airports in less than a year. PDC was the first of many FAA ATC data link services to be deployed. The PDC demonstrations at three major airports (Dallas/Ft. Worth, Chicago O'Hare, and San Francisco) had clearly proven the benefits that data link had to offer in terms of information transfer.

3.3.8 With continuing co-operation among the airline industry and the FAA, it was envisioned that data link applications would rapidly expand to other ATC applications thereby augmenting in some fashion ATC voice applications.

3.3.9 The Member from Portugal informed the Group that their VHF data link trials had to be delayed for technical reasons, which had only been resolved early in 1991, and for personnel problems. However, it was expected that the trials would begin at the end of July 1991 and that a memorandum of understanding with interested airlines was being prepared.

3.3.10 The Member from Iceland also updated the Group on data link activities within his Administration. Connectivity to the SITA network had been realized and it was expected that oceanic clearances would be delivered by data link by the end of June 1991. It was also anticipated that other ATC instructions may also be sent by VHF data link. Finally, it was mentioned that attempts would be made to test HF data links.

3.3.11 In the ensuing discussions concerning the delivery of oceanic ATC clearances by data link, it was pointed out that there was a need to standardize the message format. In this context, the Group recalled that the technical sub-group, which had been established by the NAT SPG Task Force, had examined this matter at its meeting in Ottawa (17-21 September 1990) and had agreed on a common format. On the basis of this information, the Group agreed to accept the technical sub-group's recommendation for application throughout the NAT Region.

CONCLUSION 27/16 - COMMON MESSAGE FORMAT FOR THE DELIVERY OF OCEANIC ATC CLEARANCES

That the message format shown in Attachment A to the report on Agenda Item 3 be used for the delivery of Oceanic ATC clearances via VHF data link.

3.3.12 In concluding the discussions on this matter it was pointed out that voice would continue to be used for verification/validation of the data link delivered ATC clearances for the time being. However, sometime in the future, voice should no longer be required to carry out this function and, in order to substantiate the change, data was being systematically gathered.

3.4 Automatic Dependent Surveillance

3.4.1 The Member from the United States provided the Group with information on the ADS trials being carried out in the Pacific. In this context, it was pointed out that the principal objectives of the Pacific Engineering Trials (PET) programme, which was a trilateral co-operative effort between Australia, Japan, and the United States, was to identify, test, and evaluate operational and technical issues relating to the use of satellite data link for the transmission of ADS reports and free text messages.

3.4.2 The trials used existing and near-term equipment in order to gain operational experience with ADS and satellite data link communications. All participating aircraft in the United States used Collins Satellite Communications (SATCOM) avionics, consisting of a Satellite Data Unit, Radio Frequency Unit, and High Power Amplifier. Initially, those aircraft were fitted with the Ball Low Gain Antenna system. Many aircraft would be upgraded to include a High Gain Antenna system when that equipment became available. Message handling in the aircraft was performed by ACARS Management Units, which had been upgraded to communicate over the satellite data link. Pilots could create downlink messages and view uplink messages on the control display unit which formed part of the ACARS system. Reporting rates had nominally been five minutes for the trials. Rates could be changed by pilots or by uplink from the ground. On-request fields could be selected in the same manner.

3.4.3 On September 28, 1990 the first demonstration of the ADS PET system took place at Oakland OAC. A United Airlines flight from Hong Kong to San Francisco began transmission of satellite data link position reports. Several other tests were conducted with United Airlines; however, they had been in the process of upgrading their satellite communications avionics to be fully compatible with International Maritime Satellite Organization's (INMARSAT) Data 1 Service and flight testing resumed in April 1991 with three SATCOM equipped aircraft available to transmit ADS reports, satellite progress reports and free text messages.

3.4.4 The FAA Technical Centre was also carrying out tests using an FAA SATCOM equipped B727. The aircraft would be used to validate data link performance, satellite data link performance, evaluate ADS operational requirements and performance and to validate ICAO SARPS for the Aeronautical Mobile Communications Panel (AMCP) and the Automatic Dependent Surveillance Panel (ADSP). Concurrent with these activities was the validation process of a satellite data link for use in ATC. The test involved the post-flight comparison of satellite position reports to voice reports made using HF radio. The study would be used as a basis to justify the replacement of HF with satellite communication for oceanic ATC.

3.4.5 In follow-up to the presentation of the PET, the Member from France informed the Group that it was also carrying out pre-operational engineering trials in the South Pacific. In fact, the French Administration had planned to commence, by September 1991, an ATC satellite communication experimentation in Noumea OCA. A new B747-400 operated by UTA would be equipped and would fly four times a week in that area. In addition, experimental controller work stations with data

processing capability were under development. These facilities would interface via either SITA/ARINC* or AFTN networks with any Ground Earth Station (GES) available in the coverage of INMARSAT satellites. The objectives of the experimentation, which were very similar to those of the PET, were to gain technical and operational experience in satellite communications, to provide relevant information to ICAO Panels such as ADSP, AMCP and finally to evaluate ways of improving ATS in OCAs.

3.4.6 In concluding the presentation, it was pointed out that the results of the trials might be of interest to the PET and that it might be of interest to establish suitable arrangements in order to define procedures and methods of work that would allow closer co-operation between the administrations concerned.

3.4.7 The Member from the United Kingdom informed the group that the report of their participation in PRODAT Phase 2, which contained an analysis of commercial flight data obtained using satellite ADS, was available.

3.4.8 As a follow on to the presentation made to NAT SPG/26 by the ARINC/SITA Joint Venture, they had been invited to provide the Group with an update on their activities. They informed the Group that they were ready to participate in NAT ADS trials and that a meeting had been planned for mid July 1991 to address the matter. The Group responded by informing the ARINC/SITA Joint Venture that further work was required within the NAT SPG itself in order to develop comprehensive proposals for the type, extent and conduct of these trials; therefore, it appeared that a meeting planned to be held in mid July to discuss these issues, was premature.

3.4.9 The Group then turned its attention to the need for pre-operational and engineering ADS trials for the NAT Region. At the onset of the discussion, it was noted that providers and users unanimously agreed that such trials take place. It was also noted that some States, as indicated above, had already initiated trials and that all the technical elements such as satellites, terrestrial communications networks, SATCOM equipped aircraft and ATC work stations were either available in the NAT Region or would be in the very near future.

3.4.10 The Group discussed at considerable length the aims and objectives of the ADS trials. Although it could not prepare an all inclusive list, it did agree that the technical and ATS operational objectives, which are specified in Attachment B to the report on Agenda Item 3, would be considered.

3.4.11 The Group noted that several constraints must be also emphasized. First, it was considered that the trials must be, to the extent possible, transparent to the pilot, which would therefore entail the need for the controlling authority to activate, deactivate and alter the reporting rate of the aircraft. Furthermore, although the tests may use formats and/or procedures which were at variance with anticipated ICAO SARPs, use of such interim means must not be interpreted as endorsement of non-SARP methods. Where, for example, message formats existed or were in the process of being developed, such formats should be used, to ensure a logical progress towards a global ADS environment.

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* ARINC (Aeronautical Radio, Inc.) and SITA (Société Internationale de Télécommunications Aéronautiques) are not-for-profit, industry-owned companies providing telecommunications services to airlines and civil aviation authorities.

3.4.12 The Group agreed that, in order to reduce the possibility of duplication of efforts in the ADS Research and Development effort and to ensure that the results were meaningful to the Region as a whole, the ADS trials must be regionally co-ordinated. The Group also strongly felt that the NAT SPG should play the leading role in ADS trials. Therefore, to carry out this task, the Group agreed that an ADS development group be formed. In addition to the ADS trials themselves, this group would manage all other relevant ADS portions of the NAT Implementation Document.

CONCLUSION 27/17 - ESTABLISHMENT OF AN AUTOMATIC DEPENDENT SURVEILLANCE (ADS) DEVELOPMENT GROUP

That:

a) an ADS Development Group be established in accordance with the terms of reference specified in Attachment B to the report on Agenda Item 6; and

b) the objectives of the ADS trials to be co-ordinated by the above mentioned group be as specified in Attachment B to the report on Agenda Item 3.

3.5 Other technical development of relevance to the NAT Region

3.5.1 The Member from the United States provided the Group with an update on the development of DOTS. It was recalled that the system objectives were:

a) to provide a capability to produce flexible structured track systems that take into account changing winds (Track Generation Function);

b) to provide ATC with a display which depicts aircraft positions so that existing and planned oceanic traffic could be visualized (Traffic Display System); and

c) to provide users with a measure of airspace availability information in order to improve flight planning (Track Advisory).

3.5.2 It was explained that the track advisory process began when a flight plan was received at an oceanic facility. The DOTS system evaluated the projected airspace availability at the proposed crossing time. Several iterations were performed for each flight in an attempt to provide the desired altitude profile requested on the flight plan. Each available track was analyzed at the proposed entry time and with incremental delays built in. These alternatives were then presented to the dispatch for final flight planning determination. A verification and validation programme was being developed within DOTS. All messages would be validated, comparing reported position against the filed flight plan, reported altitude against the last cleared altitude, time against DOTS computed time using DOTS weather and filed mach number and general format errors.

3.5.3 Furthermore, a Traffic Display System (TDS) had been developed as a DOTS function. TDS automatically displayed aircraft position based on aircraft position reports. Other features included display of flight plans, warning areas, track systems, winds and temperatures. Prototype systems had been running continuously at Oakland OAC since September 1988 and New York OAC since August 1989, where it was being evaluated by oceanic area supervisors. Efforts were concentrated on testing and converting prototypes into operational systems.

3.5.4 Finally, testing was continuing in the field facilities to fine tune the capabilities and to determine procedures for operational use. Plans included the installation of DOTS as a stand alone system until such time that its functionality could be incorporated into other existing automation systems. The planning of integration efforts would begin after the basic DOTS capabilities had been installed.

ATTACHMENT A

COMMON MESSAGE FORMAT FOR THE DELIVERY OF OCEANIC AIR TRAFFIC CONTROL CLEARANCES

The following is the message format to be used for the delivery of oceanic ATC clearances. This format will be included in the NAT Common Interface Control Document:

PRIORITY DESTINATION ADDRESS COPY ADDRESSES
ORIGIN ADDRESS
MESSAGE LABEL
AN AIRCRAFT NUMBER/FI FLIGHT ID
- // ATC XXX EGGX TEST CLRNCE DATE TIME
FLIGHT ID CLRD TO DESTINATION VIA ENTRY POINT
ROUTE DETAILS
MNTN FLIGHT LEVEL SPEED FM ENTRY POINT/TIME
ATC/ ATC FIELDS

Note: The ATC/ ATC FIELDS line will only be present if there are ATC FIELDS present in the FDPS OCM to be expanded

The following is an example of this format:

QU QXSXMXS CPYXXXX PIKCOXS LONTOXS
. PIKCOXS
AGM
AN N606UA/FI UAL915
- // ATC XXX EGGX TEXT CLRNCE 910621 1206
UAL915 CLRD TO KIAD VIA 53N015W
NAT FOXTROT
MNTN F370 MO80 FM 53N015W/1330

ATTACHMENT B

PROPOSED AUTOMATIC DEPENDENT SURVEILLANCE (ADS) DEVELOPMENT OBJECTIVES

1. The 27th Meeting of the NAT SPG reaffirmed the need to perform trials to ensure the timely implementation of satellite technology and its application into the NAT Region in-line with the NAT Implementation Document. To achieve this, the Group developed a set of common objectives that all NAT Provider States would agree to follow in developing and using satellite technology including ADS.

2. The proposed objectives fall into two related areas covering technical and ATS operational issues. It was recognized that there was a strong interdependence between the technical design and performance of the communication system and the operational use of that communication system. Consequently, it was agreed that to the maximum extent possible all elements of the communications and ATS system should be in compliance with emerging ICAO Standards and Recommended Practices (SARPS).

Technical objectives

a) The evolutionary development of an ICAO SARPs compliant, integrated voice and data satellite communications system, capable of providing an operational Air Traffic Services Communication (ATSC), Aeronautical Operational Communications (AOC), Aeronautical Administrative Communications (AAC), Aeronautical Passenger Communications (APC) service in the North Atlantic Region.

b) Validation of Aeronautical Mobile Satellite Service (AMSS) SARPs in a realistic environment and identification of any change requirements.

c) Assessment of the total communication system integrity and identification of potential weaknesses.

d) Investigation into the requirements for and development of terrestrial ground communications infrastructure including topology and end-to-end performance requirements.

e) Means to achieve evolutionary implementation of the Aeronautical Telecommunications Network (ATN).

f) Development of communications system/Oceanic Area Control Center (OAC) voice and data interfaces, including channel accessing and addressing facilities.

g) Identification of ATC data processing functional requirements.

h) Investigation into how and when to achieve technical communications hand-overs.

i) The establishment of interim formats and protocols to support trials activity.

2. ATS operational objectives

a) Assessment of ADS data for future use in an oceanic environment as follows:

i) Assessment/validation of the ICAO proposed position update rates for operational use.

ii) Assessment of position accuracy by comparison of ADS with radar plots.

iii) In conjunction with (ii) investigate transitional problems of ADS to/from a radar environment (i.e. OAC/Domestic interface).

iv) Provide information on the likely impact on oceanic airspace of a mixed population of High Frequency (HF) (non ADS) and satellite data link (ADS) equipped aircraft.

v) Identify problems likely to be encountered in oceanic airspace during the transition from HF equipped aircraft to satellite communications equipped aircraft (data and voice).

vi) Confirm that the contents of the ADS messages (as proposed by the ICAO ADSP) are acceptable to, and adequate for, oceanic control and, in particular, investigate the usefulness of the TRACK/GROUND SPEED feature with a view to establishing what magnitude of change is the minimum that can be used in an operational system to identify a 'track' error.

vii) Investigation into how and when to achieve ATS hand-overs when using air-ground data communication systems.

b) Provide information on how to base the operational application of Figure Of Merit (FOM)

Note: The intention in the NAT Region is to use FOM as a 'go'-'no go' check initially. It's use for 'tactical' separation may come at a later date).

c) Assessment of pilot-controller satellite voice communications based on the performance expected from the AMSS SARPS including channel set-up time and acceptability of the 9.6k bit/second vocoded speech.

d) In conjunction with the World Meteorological Organization confirm that the meteorological information contained in the "associated ADS report" proposed by the ADSP is appropriate.

e) Investigate the use of the "Extended ADS message" proposed by the ADSP by Oceanic Flight Data Processing Systems.

f) Investigate the use of graphics displays to provide a dynamic picture including displayed range/windowing/zoom-in techniques.

g) Introduce ATC personnel to the ADS concepts.

h) Evaluate the use of pilot/controller data link messages.

i) Gather data for economic assessment of the use and benefits of ADS.

j) Evaluate the ATC implementation of ADS through real time simulation.

AGENDA ITEM 4: PLANNING IN THE NAT REGION

4.0 Introduction

4.0.1 Under this item, the Group discussed the following specific subjects:

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

b) development of medium and long term NAT Air Navigations Plans;

c) introduction of reduced vertical separation above FL290 in the NAT Region;

d) possible introduction of reduced horizontal separation above FL400;

e) development of a Common Interface Control Document; and

f) preparation for the NAT Regional Air Navigation Meeting.

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

4.1.1 Because the NAT Traffic Forecasting Group (NAT TFG) was meeting at the same time as the NAT SPG, the Group invited the Chairman of the NAT TFG to present a brief outline of its preliminary results concerning 1990 traffic. Accordingly, he indicated that there had been a 12% growth in traffic in 1990 over 1989. However, it was expected that this growth fell off sharply in 1991 and that a substantial component of 1991 traffic would be military.

4.1.2 As regards the medium term, it was expected that the traffic growth would return to the 1990 predicted levels in a few years because of several new factors. Some of these factors included the shift in leisure traffic away from southern Europe to North America and the more liberal aviation policies which permitted the opening of new routes and different city-pairs. These changes were partly reflected in the ever increasing percentage of twin jets now flying the Atlantic, 20% of the total.

4.1.3 The Group noted, from the presentation, that the assumption concerning traffic growth used in the Future NAT ATS Concept Document would appear to be still valid, irrespective of the present slump in traffic growth.

4.2 Development of medium and long term air navigation plans

4.2.1 The Group dealt with the following matters regarding medium and long term planning:

a) reports of the NAT SPG Task Force;

b) FANS II activities; and

c) preparations for the Tenth Air Navigation Conference.

Reports of the NAT SPG Task Force

4.2.2 The Rapporteur of the NAT SPG Task Force informed the Group that the Task Force had met twice since NAT SPG/26-Copenhagen (February 1991) and Paris (April 1991). Furthermore, the Group was informed that the Task Force had completed the final phase of its work programme which was the development of a general plan for the phased and orderly implementation of the various elements of the Future NAT ATS Concept. The Group further noted that the work was carried out in accordance with the directives specified in Attachment 4-A to the Summary of Discussions of Agenda Item 4 of the NAT SPG/26 report. In this context, it was noted that the technical group had met once in Ottawa (September 1990) and that the ATM group had met twice, once in Prestwick (October 1990) and once in Reykjavik (December 1990).

4.2.3 The Group was presented the draft NAT Implementation Document (NAT ID), which was the end result of the work of the Task Force. It noted that the NAT ID was divided into two parts. The first contained the overall implementation strategy identifying three overlapping phases covering the time-frame 1990 to 2010/15 that emphasised Phase I - 1990-2000. The second part comprised the detailed implementation plan. This part specifies the objectives, operational needs and the lines of action needed to achieve the stated objectives for the period 1990-2000. The Group found the NAT ID to be an excellent basis for implementation planning and agreed that it be used as the framework for the implementation of the Future NAT ATS Concept description. Although some members would have preferred the Group to explicity endorse the NAT ID, all present agreed with the above.

CONCLUSION 27/18 - IMPLEMENTATION STRATEGY/PLAN FOR THE FUTURE NAT ATS SYSTEM CONCEPT

That:

a) all NAT provider States and international organizations concerned accept that the NAT Implementation Document serve as the framework for the phased and orderly implementation of the future NAT Air Traffic Service Concept throughout the NAT Region; and

b) ICAO arrange for the publication of the NAT Implementation Document in order to ensure its availability to all interested parties.

4.2.4 Considering that the Task Force had completed its work programme, it was therefore agreed that it should now be disbanded. In doing so, the Group expressed its sincere appreciation to the Task Force in general and to its Rapporteur in particular for the excellence of the work that had been carried out in such a short time frame.

CONCLUSION 27/19 - DISBANDMENT OF THE NAT SPG TASK FORCE

That:

a) the work of the NAT SPG Task Force be considered completed;

b) the NAT SPG Task Force be accordingly disbanded; and

c) the ICAO Representative, European Office, convey the appreciation and thanks of the NAT SPG to the individual members of the Task Force for their most valuable contribution to its work.

4.2.5 Recognizing that the NAT ID contained operational objectives and commensurate commitments to be undertaken by States in successive phases, it was apparent that a follow-up of its application would be necessary to secure the coherent introduction of all air navigation improvements in the NAT Region as well as at the interfaces with adjacent regions.In addition, the Tenth Air Navigation Conference (September 1991) would examine many issues relating to regional planning and institutionnal arrangements with a likely impact on the NAT Region. Regardless of the outcome of the Conference, some form of machinery was clearly required to co-ordinate activities that would undoubtedly emanate from the NAT ID. It was agreed that this machinery would have to take into account any decisions concerning global planning and institutional arrangements that might eventually be adopted by ICAO.

4.2.6 The Group then had an extensive discussion on the management of the NAT ID. It would require updating on a continuous basis, possibly a significant modification after the Tenth Air Navigation Conference and a close monitoring of the milestones upon which the development of the NAT System and its complex inter-related components will crucially depend. States and the NAT SPG would have to be alerted to trigger action as may be necessary and the complex inter-relationship of system components would have to be continuously surveyed.

4.2.7 The NAT SPG considered various options on how to manage this important programme which parallels in many respects the European Civil Aviation Conference (ECAC)/EUROCONTROL EATCHIP (European Air Traffic Control Harmonization and Integration Programme) in importance. These options were:

a) the NAT SPG would annually include the NAT ID in its agenda and carry out the review during its regular meetings; this would likely require a special meeting of members in advance of each NAT SPG meeting which could be wasteful of resources;

b) a small group of NAT SPG members could be charged with the task of updating and revising the NAT ID in advance of NAT SPG meetings which would approve recommendations from this group; or

c) the ICAO Representative, European Office, could be requested to centrally and continuously manage the NAT ID in close co-operation with States and international organizations concerned.

4.2.8 It was felt that the most efficient way would be centralized management, supported by State inputs as necessary, by the ICAO Representative, European Office. This activity would closely inter-relate with the services provided to the NAT SPG itself, as well as to its enhanced planning machinery. In addition, this arrangement would ensure closest possible co-ordination of the work of the NAT SPG with that of the EANPG, including the complex matters expected to arise in the interface between the NAT and EUR Regions.

4.2.9 Considering the paramount importance for proper management of all NAT planning and implementation matters for the timely, progressive, orderly and cost effective implementation of the FANS concept, the European Office would have to be given adequate resources to discharge this responsibility successfully. The matter did not allow room for significant error as delays, and inefficiency could have disruptive and chaotic consequences.

4.2.10 For this reason, the Group requested its Secretary to document the subject for consideration by the Council to ensure the required support and that the necessary resources would be foreseen in the budget for the forthcoming triennium, due to be presented at the next regular Session of the ICAO Assembly (1992).

CONCLUSION 27/20 - RESOURCES FOR THE EUROPEAN OFFICE OF ICAO TO MANAGE THE PLANNING TASKS RELATED TO THE NAT REGION

That the ICAO Representative, European Office, in his capacity as Secretary of the NAT SPG, document for presentation to the Council of ICAO at the next suitable opportunity, the requirements of the European Office in terms of manpower and financing needed to manage the full range of North Atlantic planning and implementation activities, crucial for orderly development of the Future NAT ATS System Concept, so as to ensure that the required support and necessary resources would be foreseen in the ICAO budget for the forthcoming triennium (1993-1995).

4.2.11 The Group then turned its attention to other issues that were identified by the Task Force for which NAT SPG action was deemed necessary. In particular, an urgent requirement for an ATC group to review and agree on a common application of separation criteria to be implemented by all NAT provider States was identified. In addition, research was required into the representation of these criteria in a form suitable for automated implementation whilst remaining capable of being clearly interpreted by operational controllers. During the discussions on this matter, it was noted that such a group of experts would have more to do then simply the task mentioned above. Bearing in mind the need for ATC expertise in various fields as well as the need for a mechanism to follow up on the NAT ID, the Group agreed that an Air Traffic Management (ATM) group be created and be given the task of overseeing the relevant parts of the NAT ID and other related tasks.

CONCLUSION 27/21 - ESTABLISHMENT OF AN AIR TRAFFIC MANAGEMENT (ATM) GROUP

That a group of ATC experts be established with the terms of reference and work programme specified in Attachment C to the report on Agenda Item 6.

FANS II activities

4.2.12 The Representative from INMARSAT informed the Group that satellite capacity to support aeronautical communications in the AMS(R)S band would be available world-wide by the end of 1991 covering all regions between latitudes 75° North and 75° South. Spot beam satellites permitting more efficient use of satellite resources would be introduced from 1994 onwards, with regional satellite services supplementing the global service. Support for GNSS wide band integrity monitoring and differential corrections would become available world-wide during 1995 and it was expected that satellite communications would be possible in extreme North polar regions by the year 2000. Total satellite communications capacity during the period 1991 to 2010 was expected to increase by a factor of 30. Furthermore, a world-wide terrestrial network was currently in place to support aeronautical communications and this would be upgraded to provide full Aeronautical Telecommunications Network (ATN) compatibility by 1993.

4.2.13 As regards the available satellites, it was pointed out that the first INMARSAT-II satellite had been successfully launched in October 1990 and had been declared operational in December 1990, was serving the Indian Ocean region. The second satellite had been launched in March 1991 and was now operational in the Atlantic Ocean (E) region. The remaining two satellites would be launched by the end of 1991 and would serve the Pacific and the Atlantic (W) Ocean Regions. INMARSAT also operates a number of first generation satellites which provide back-up capacity in the event of an interruption in service through an INMARSAT-II satellite. INMARSAT has recently awarded a contract for the construction of four INMARSAT-III satellites which would be capable of supporting communications in the whole 20 MHz band allocated to AMS(R)S services (1545-1555 and 1646.5-1656.5 MHz), and would have a communications capacity approximately ten times that of the INMARSAT-II series. In addition to global services, the INMARSAT-III satellites also included a number of spot beams to concentrate coverage in areas where there was a high demand for service. The INMARSAT-III satellite would also provide navigation support capacity in the band allocated to satellite navigation. This will permit competent authorities to provide wide-band integrity monitoring, differential corrections and GNSS overlay signals on a global basis from 1995. Because of geometrical limitations, satellites in geostationary orbits could only support communications up to approximately 75° North and South latitudes. Plans were now being made by a number of organizations to launch satellites in other orbits (low earth orbit-LEO and highly elliptical orbit-HEO) that would also provide coverage of polar regions. The first of these should be operational in the late 1990s thus providing coverage of the North Polar region. INMARSAT had also set up a team to start studying possible scenarios for fourth generation satellites.

4.2.14 It was further pointed out that GESs to support aeronautical satellite communications were now entering service for both voice and data communications. Already 12 (4 covering the NAT region) were in operation and by the end of 1991 at least 14 aeronautical GESs would be operational. In this connection, it was noted that world-wide ground networks which would integrate the satellite systems and terrestrial ground communications network, which incorporates a high degree of redundancy and which use high speed (up to 64 Mb/s) cable or satellite links, were being set up. The high priority accorded to ATC messages together with high speed operations and automatic re-routing, when necessary, insured very short message transit times.

4.2.15 In the same context, it was suggested that the existing low-speed AFTN may be the only ATS terrestrial network in service in some areas for a number of years, even when large parts of the ATN would have been completed in more developed areas. It is important therefore that, where necessary, the AFTN service was extended to appropriate GES's. Since the AFTN operated at a rate of 50 bits/s it must be made to interface with the faster data rates available from the GES's so as to form an efficient connection with ATS facilities. Work was ongoing with a view to integrating the AFTN/CIDIN into the ATN.

4.2.16 Aircraft Earth Station (AES) development activities are aimed at completing plans for the introduction of the air transport interim low data rate service and corporate aviation's initial single channel voice service. Partial equipment deliveries for both these programmes began during the second quarter of 1990 on a small scale in anticipation of full access approval (which had not yet been granted to any installation). The first voice installations were now in operation on 29 aircraft which had been commissioned and were using the system daily. INMARSAT forecasts suggest that there would be 350 aircraft equipped for SATCOM by the end of 1992 with about 1800 by 1995. Most of these would of course be operating on long range routes.

4.2.17 In concluding his presentation, the Representative from INMARSAT stated that the one factor that would limit the growth of satellite services was the adequacy of the spectrum to support aeronautical communications. Technological developments would result in more efficient use of the available spectrum but, even taking these into consideration, the current 20 MHz would prove inadequate during the period covered by the NAT ID. Because of the five-year time cycle that was required when procuring satellites, early decisions regarding expansion of the spectrum allocated to AMS(R)S communications were essential. Therefore, the importance was stressed that States ensure that aviation personnel participate in the forthcoming International Telecommunications Union World Administrative Radio Conference for the Mobile Service (WARC-92), to be held in Malaga, Spain, in February 1992, in order to protect the aeronautical spectrum and indeed to try and obtain more of it.

Preparations for the Tenth Air Navigation Conference (September 1991)

4.2.18 The Group was informed that the NAT SPG Task Force had identified the need for the NAT SPG to inform both the FANS Phase II Committee and the Tenth Air Navigation Conference of its activities. It was felt that they should be cognizant of the implementation plans so far developed by the NAT SPG in view of the amount of resources that had already gone into the task of drafting the concept and associated implementation document. Furthermore, the FANS II Working Group of the Whole meeting (Paris, 29 October - 9 November 1990) recommended that the NAT SPG present a paper to FANS II/2 summarizing its progress. On the basis of the above, a paper had been prepared and reviewed by the Task Force at its fifth meeting (Paris, 23-26 April 1991). The draft paper had then been circulated to all the Members before being presented to the FANS II Meeting as an information paper.

4.2.19 After agreeing to a few minor changes to the draft paper, the Group endorsed it and indicated that it should be presented to the Tenth Air Navigation Conference on its behalf. The Group was informed that ICAO procedures did not allow for a regional planning group to submit papers directly to the Conference and that, as a result, it would have to be a Secretariat paper and therefore subject to unilateral amendments. Some Members expressed their consternation that one State could submit the paper, which could not then be altered, yet a group of nine States did not enjoy the same priviledge. Nevertheless, the Group agreed that the Secretariat should submit the working paper to the Conference.

4.3 Introduction of reduced vertical separation above FL290 in the NAT Region

4.3.1 The Rapporteur of the NAT SPG Vertical Studies Group (VSG), which had been established pursuant to NAT SPG/26 Conclusion 26/18, informed the Group that it had met twice since NAT SPG/26 - Atlantic City (September 1990) and Ottawa (May 1991).

4.3.2 In reviewing the work carried out under the terms of reference of the VSG, the Group noted that the first item had been completed and that the implementation plan should include the following:

a) reduced VSM be effected within MNPS airspace;

b) transition to/from reduced VSM be effected in domestic airspace adjacent to the MNPS airspace; however, this transition airspace must be of defined dimensions;

c) reduced VSM be applied between those aircraft approved for such operations when transiting to/from MNPS airspace outside MNPS airspace; and

d) the transition be effected, when practicable, in airspace where radar coverage is available.

4.3.3 The Group was informed that the benefit/cost issues associated with the introduction of reduced VSM in the NAT Region had been addressed in general terms by the RGCS Panel. However, the NAT VSG considered that a more specific review, which only addressed NAT MNPS airspace, be carried out. This task had been undertaken by the United States and had included estimates of the re-equipment of commercial aircraft as well as the additional ATC facilities required at Shanwick, Gander and New York OACs. The other OACs concerned had not been included due to lack of time. Several different scenarios had been considered and the benefit/cost ratio had been assessed at 2 to 2.5 to 1. This would provide a cumulative saving of between $218 M and $412M by the year 2010. The Group further noted that 92% to 98% of the costs involved had been assessed against additional ATC facilities.

4.3.4 The Group was then presented with the results of the discussions on the choice of a TLS for use in the application of reduced VSM. In this connection, the Group was informed that although the global TLS of 2.5×10^{-9} had been recommended for use in the application of reduced VSM, guidance had been sought from the RGCSP concerning the precise definition of the TLS. Although the RGCSP could not give a precise definition of the types of risk encompassed in the TLS of 2.5×10^{-9}, it had agreed that this TLS should encompass the risk of collision resulting solely from vertical navigation errors of aircraft to which procedural separation had been correctly applied and not to contributions from other sources of risk. The Group was also informed that the Manual on implementation of 1000 ft. VSM between FL290 and FL410 inclusive highlighted the need for regional planning authorities to employ operational judgement in the determination of the tolerable level of risk attributable to the error causes not encompassed by the TLS.

4.3.5 With the above in mind, the Group agreed that an overall TLS, which would encompass all causes of the risk of collision due to the loss of vertical separation in the NAT Region, be agreed upon. In this regard, it agreed that the following categories of potential causes of collision risk be taken into account:

a) equipment errors which form part of height-keeping performance specification and which are addressed by the Minimum Aircraft System Performance Specifications (MASPS):

i) Altimetry System Error (ASE);

ii) Flight Technical Error (FTE); and

b) operational errors, many of which are approximately multiples of one separation standard and are, to a large extent, independent of the separation standard:

i) Equipment control problems;

ii) Weather deviations;

iii) Errors in the assignment of altitude;

iv) Crew misinterpretation of clearances;

v) Errors in following airspace reservations; and

vi) Intentional deviation from clearances.

The Group noted that this list was not necessarily exhaustive and that further work was necessary in order to fully define and categorize all types of error for use in the collection of data and in collision risk modelling.

4.3.6 The Group agreed that it would be necessary to adopt a broader definition of vertical risk that encompassed all sources of error. This definition includes equipment errors for which an MASPS had been developed as well as pilot and controller operational errors. Accordingly, the Group agreed that this TLS be increased from 2.5 x 10^{-9} to 5 x 10^{-9} in order to be consistant with the new definition. This TLS of 5 x 10-9 lays within the ranges of TLS values which had been proposed initially to the RGCSP.

CONCLUSION 27/22 - DEFINITION OF A TARGET LEVEL OF SAFETY (TLS) FOR THE IMPLEMENTATION OF THE REDUCED VSM IN THE NAT REGION

That the TLS be defined as follows:

a) the TLS for collision risk in the vertical dimension due to all causes be 5.0 X 10^{-9} fatal accidents per flight hour and that the overall collision risk in the vertical plane be assessed against this TLS; and

b) the TLS would not be partitioned into separate components for different types of risk. However, assessments of height-keeping performance would need to be conducted with reference to a safety constraint of 2.5 X 10^{-9}, as this is the value which has been used to derive the Minimum Aircraft System Performance Specification.

4.3.7 The Group agreed that one of the consequences of this modified approach had immediate repercussions upon the operation of the NAT MNPS airspace with respect to the number of operational errors which were occurring in the airspace. The Group was informed about the data which had been collected by the CMA (1985 to present) on large height deviations in the NAT Region. It accepted that this data did not reflect the total number of such occurrences and it was agreed that action was necessary to improve the effectiveness of the monitoring of height keeping performance in the airspace and to reduce the number of operational errors in the vertical plane. The Group also noted that one State had already initiated action to address the latter.

CONCLUSION 27/23 - MONITORING THE NAT MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) AIRSPACE FOR OPERATIONAL ERRORS IN THE VERTICAL PLANE

That:

a) NAT provider States take action, as necessary, to improve the effectiveness of the reporting of height deviations within the NAT MNPS airspace; and

b) data, which can be obtained from the following sources, be sent to the Central Monitoring Agency:

i) ATC reports of ATC clearance violations;

ii) deviations noted in routine position reports;

iii) Mode C SSR deviations ≥ 300 ft reported by ATC; or

iv) all Mandatory Occurrence Reports, Aviation Safety Reports or similar occurrence reports.

CONCLUSION 27/24 - ACTION TO BE TAKEN TO REDUCE THE NUMBER OF OPERATIONAL ERRORS IN THE VERTICAL PLANE

That States take action to institute measures to improve height keeping performance in NAT MNPS airspace. These measures should include:

a) the promulgation of NOTAM or AICs to highlight the frequency of operational height keeping errors;

b) an education programme to explain typical causes of height deviations and recommend remedial measures. The following points in particular need to be addressed:

i) airspace reservation requests or ICAO flight plans do not constitute an ATC clearance; and

ii) aircraft must comply with ATC instructions;

c) the review of ATC clearances and phraseology in order to:

i) minimize the risk of ambiguity and/or misunderstanding;

ii) assess the value or risk of using terms such as "expect FL.. at ...";

iii) review phraseology employed in the issuance of forward clearances (eg step-climbs) and to introduce checks to ensure that aircraft adhere to such clearances; and

iv) improve the co-ordination of clearances at OAC boundaries.

4.3.8 The Group was informed that a study had been carried out which clearly showed that the need for the application of MASPS in MNPS airspace would be needed in order to meet the TLS. In the light of this information, the Group agreed that the implementation should be based on the need to apply MASPS in MNPS airspace and that non-conforming aircraft could be allowed to transit the airspace concerned using an airspace reservation. The Group expressed satisfaction at the initiative taken by the FAA to re-activate the necessary work to develop the MASPS and, in particular, noted that a series of meetings had been scheduled with the Joint Airworthiness Authorities (JAA) and other aviation authorities. The first meeting was scheduled to take place in Annapolis, Maryland on 7 and 8 August 1991.

4.3.9 Turning to the question of Height Monitoring Units (HMUs), the Group was informed that studies were continuing on the number of HMUs required, their ideal siting as well as matters relating to their design and performance. However, the Rapporteur of the NAT VSG indicated that questions of cost sharing and cost recovery needed to be addressed by the NAT SPG in order to provide the necessary guidance. In this context, the Group was informed that ICAO could develop a draft protocol concerning cost sharing/recovery which could then be circulated to the provider States concerned for their endorsement.

CONCLUSION 27/25 - COST SHARING/RECOVERY ASSOCIATED WITH THE INSTALLATION OF HEIGHT MONITORING UNITS

That the ICAO Secretariat be invited to:

a) develop material on cost sharing/recovery matters related to the installation and maintenance of Height Monitoring Units; and

b) circulate the material to Members of the NAT SPG for their endorsement.

4.3.10 The Group was informed that by applying reduced VSM in the current MNPS airspace, FL400 would become unusable. The Group noted the information and agreed that his matter should be taken up at a later date (paragraph 1.2.5.3 also refers).

4.3.11 The Group then turned its attention to matters related to Air Traffic Services. It noted that the problems associated with ATS should be viewed as affecting two distinct areas, the first being interfaces outside of the NAT Region (the transition areas) and the second dealing with interfaces within the NAT Region as well as ATS issues in general. The Group agreed that matters relating to interface problems outside the NAT Region should be urgently brought to the attention of the responsible planning bodies or States -namely the EANPG on the one hand and Canada and the United States on the other- by the Secretary. The Group also agreed that a group should be

established to deal exclusively with ATS issues related to the implementation of reduced VSM in the NAT Region.

4.3.12 The Group went on to discuss planning in general. It recalled the timescale indicated in NAT ID, Line of Action 3.3.1, and agreed that it would require substantial effort by all concerned. In this connection, it agreed to the proposals put forward by the Rapporteur of the VSG to modify the terms of reference, structure and working methods of the VSG. It also agreed that States be urged to make the required commitments to this project in terms of financial and human resources. It also agreed that, without this commitment, it would not be possible to meet the established timescale.

CONCLUSION 27/26 - IMPLEMENTATION PLANNING FOR THE INTRODUCTION OF 1000 FT VERTICAL SEPARATION MINIMUM BETWEEN FL290 AND FL410 INCLUSIVE

That:

a) the NAT Vertical Studies Group, established pursuant to NAT SPG/26 Conclusion 26/19, be disbanded;

b) a NAT Vertical Studies Implementation Group (VSIG) be established in accordance with the terms of reference and work programme set out in Attachment A to the report on Agenda Item 6;

c) the Secretary urgently inform the European Air Navigation Planning Group to address the issues related to the interface between the NAT and EUR Regions so as to meet the agreed timescales;

d) Canada and the United States urgently address the issue of the transition areas that will be located in their domestic airspace; and

e) that the ICAO Representative, European Office be requested to inform States that the planning for the introduction of 1000 ft reduced vertical separation minima between FL290 and FL410 is a priority item and that the necessary resources should be made available.

4.4 Possible introduction of reduced horizontal separation above FL400

4.4.1 Against the background of operational experience with MNPS certified aircraft reaching and crossing the NAT Region at flight levels above MNPS airspace which therefore suffered penalties from the requirement by ATC to apply non-MNPS lateral separation of 120 NM between such aircraft, the Group considered two options that would eliminate that penalty. These were:

a) to permit the application of 60 NM lateral separation between MNPS equipped aircraft operating in non-MNPS airspace above MNPS airspace; or

b) to raise the upper limit of MNPS airspace to encompass a majority of such flight operations (e.g. FL 450).

4.4.2 The Group recalled that the delineation of the horizontal and vertical extent of the MNPS airspace had been determined on the basis of the airspace within which the majority of flight operations between Europe and North America would benefit from reduced horizontal separation, without, however, excluding aircraft that could not adhere to the stringent navigation performance specifications, to cross the Atlantic remaining outside MNPS airspace. The stringent exclusive requirements to be met by aircraft to operate within that airspace were based on the complexity of providing ATC service to a mixture of aircraft requiring the application of different separation standards within that high density environment.

4.4.3 An upper limit of FL400 for the MNPS airspace in the NAT Region had been considered suitable to contain the mass of MNPS certified aircraft, while allowing crossings by non-MNPS certified aircraft above or below such regulated airspace. It was noted that raising the upper limit of MNPS airspace to a higher level would allow MNPS certified aircraft to be separated horizontally by 60NM, it would also exclude any non-MNPS certified aircraft from crossing at such altitudes therefore imposing a considerable penalty on them.

4.4.4 However, since the traffic density at such altitudes was significantly lower than that within the MNPS airspace, the application of different separation standards would be feasible to the ATC system in most cases. Therefore, it appeared that application of 60 NM lateral separation between MNPS certified aircraft, and 120 NM between two aircraft where one or both are non-MNPS certified, would not present insurmountable problems.

4.4.5 In the light of this situation, the option of permitting such a mix of applied horizontal separation standards was considered more advantageous to the airspace user community than the extension of the MNPS airspace to higher altitudes. It was therefore agreed that the relevant provisions of the NAT SUPPs should be amended accordingly. It was also agreed that the Member from the United States would make the necessary arrangements for his State to present the proposal to ICAO in accordance with the established procedures (paragraphs 1.2.5.2 and 1.2.5.3 also refer).

CONCLUSION 27/27 - REDUCED LATERAL SEPARATION BETWEEN MNPS APPROVED AIRCRAFT OPERATING ABOVE OR BELOW THE NAT MNPS AIRSPACE

That the Member from the United States make arrangements within his Administration to submit to ICAO the following proposal for amendment to the NAT Regional Supplementary Procedures (Doc 7030) permitting the application of 60 NM lateral separation between MNPS certified aircraft within the airspace above or below the NAT MNPS airspace:

"7.1.1 2) c) operate above or below MNPS airspace."

4.5 Development of a common Interface Control Document (ICD)

4.5.1 The Rapporteur of the OLDI group, which was established pursuant to NAT SPG/26 Conclusion 26/17, informed the Group that the OLDI group had met twice - Ottawa (November 1990) and Paris (April 1991). The Group was informed that the first meeting concentrated on developing an overall philosophical approach to the ICD using as a basis the material that had been agreed to at NAT SPG/26 (NAT SPG/26 paras 4.2.14 and 4.2.15 refer). The second meeting carried out an in-depth analysis of the draft ICD and examined the problems identified at the first meeting.

4.5.2 The Group noted that the draft ICD was fairly mature and that States were now in a position to use it for planning purposes. In this context, the Member from Portugal informed the Group that his Administration had included it as an Annex in their call for tender for their automated flight plan processing system. The Group also noted that the ICD had been developed in order to support an evolutionary transition from present agreements to the common ICD. Therefore, although recognizing that the ICD required additional work, the Group agreed that States should endeavour to replace existing agreements with the common ICD by the end of 1991.

4.5.3 The Group then examined the other issues that had been brought to their attention, in particular the following:

a) the need to include a standardized master list of fixes defined in degrees, minutes and seconds expressed in terms of the World Geodetic System (WGS/84) reference datum;

b) the need to standardize air/ground message formats transmitted from receiving air radio stations to the appropriate OACs;

c) the need to develop procedures to ensure the compatibility of data bases particularly to support system re-starts; and

d) the need to develop standardized data link messages to support current trials and to ensure that NAT requirements in this field are captured for onward submission to the ADS Panel.

4.5.4 On the basis of the above, the Group agreed that the master list of fixes should form part of the ICD and would therefore be maintained in accordance with NAT SPG/26 Conclusion 26/17 b). The Group also agreed that the terms of reference of the OLDI group be changed so that it can carry out the work identified in paragraph 4.5.3 above.

4.5.5 As regards to the technical parts of the ICD, the Group noted that similar type work was being carried out in other fora and that the OLDI group was monitoring this matter and that when this work was sufficiently mature, it would be presented to the NAT SPG for eventual inclusion in the ICD.

CONCLUSION 27/28 - CHANGE OF TERMS OF REFERENCE OF THE OLDI WORKING GROUP

That the following items be added to the terms of reference of the OLDI working group established pursuant to NAT SPG Conclusion 26/17 a):

a) ensure data base compatibility;

b) ensure the standardization of air/ground message formats transmitted from receiving stations to the appropriate Oceanic Area Control Center; and

c) ensure the standardization of data link messages to support current trials.

(Attachment A to the report on Agenda Item 6 also refers)

4.6 Preparation for the Limited NAT Regional Air Navigation (RAN) Meeting (1992)

4.6.1 At its twenty-sixth meeting, the NAT SPG had agreed that planning in the NAT Region was now sufficiently mature to support holding a Limited NAT (COM/MET/RAC) RAN Meeting in 1992. Accordingly, it requested ICAO to take the necessary action to convene such a meeting (NAT SPG/26, Conclusion 26/19 refers).

4.6.2 At the same time, the Group had asked the Secretariat to prepare a draft agenda and to propose a structure for the meeting. This matter had been brought to the attention of the Air Navigation Commission (ANC) and was to be dealt with during its 127th Session (mid- June 1991).

4.6.3 When reviewing this matter, the Group noted the rules concerning RAN meetings as contained in the document "Directives to Regional Air Navigation Meetings and Rules of Procedure for their Conduct" (ICAO Doc 8144-AN/874/5). However, because of the special nature of the planned LIM NAT RAN meeting, it may be necessary to slightly adapt the directives to meet the requirements of the meeting.

4.6.4 This was particularly relevant to the use of the Table of Aircraft Operations which is normally a basic planning tool during RAN meetings. NAT SPG/26 suggested that the NAT TFG forecasts be used in lieu of the Table of Aircraft Operations in view of its better suitability for the purpose of air navigation planning in the NAT Region. This had been suggested to the ANC.

4.6.5 Furthermore, one of the main objectives of the RAN meeting was to prepare the implementation of the FANS concept. It had therefore been proposed that the agenda specifically addresses Air Traffic Management and Communications, Navigation and Surveillance Systems rather than ATS, Airspace Utilization, Communications and Radionavigation Aids. The individual Agenda Items proposed for the LIM NAT RAN Meeting would obviously need to be expanded to include the relevant sub-items. The overall approach that had been proposed to the ANC was based on the FANS concept. In addition, it could be expected that the results of the Tenth Air Navigation Conference could have a significant impact on the agenda sub-items.

4.6.6 As regards the structure of the meeting, it was anticipated that three technical committees would be required to deal with the various agenda items, as follows:

ATM Committee
COM Committee
MET Committee

This structure would follow the above referred Directives. However, the Directives did not specify how each Committee within itself should be structured; therefore, in order to be able to address the Agenda in accordance with the FANS concept, it would be important that the structure of the ATM and COM Committees be carefully planned. Again, the outcome of the Tenth Air Navigation Conference could have an impact on the proposed structure of the Committees.

4.6.7 It was anticipated that the MET Committee would work in accordance with the Directives. In the absence of a Table of Aircraft Operations, the information needed to update the MET Tables would be obtained directly from States and international organizations concerned.

4.6.8 Furthermore, an Implementation Working Group of the General Committee would need to be established. One of the main tasks of this group would be to address the NAT Implementation Document. In addition, the following issues would also need to be addressed by this Working Group:

a) incorporation of the NAT Implementation Document in the ICAO Regional Air Navigation Plan;

b) the possible need for the NAT Regional Plan to become a separate publication;

c) the impact of the Tenth Air Navigation Conference on Regional Planning;

d) the proposed global implementation plan; and

e) the future management of the NAT Regional Plan.

4.6.9 Turning to the last point raised at NAT SPG/26 concerning the length of the RAN meeting (10 days), The Group noted with some concern that all of the technical committees would need to complete their work in approximately six working days, assuming two days for report approval, half-a-day for administration and one and a half days for the Implementation Working Group to finalize its tasks. This analysis of available time reinforced the need to structure the technical committees in a very efficient manner and to ensure that material presented to the RAN Meeting was very mature.

4.6.10 In the light of the above, the Group agreed to examine the necessary structure of the technical committees at its next meeting (NAT SPG/28), taking into account the outcome of the Tenth Air Navigation Conference.

AGENDA ITEM 5: GENERAL MATTERS

5.0 Introduction

5.0.1 Under this item, the Group discussed the following specific subjects:

a) status of processing of outstanding proposals for amendment of Regional Supplementary Procedures (Doc 7030 - NAT) and the NAT/NAM/PAC Air Navigation Plan (ANP) (Doc 8755); and

b) updating of the NAT Guidance and Information material, the NAT MNPS airspace Operations Manual and the Manual on International General Aviation.

5.1 Status of processing of outstanding proposals for amendment of Regional Supplementary Procedures and the Air Navigation Plan

5.1.1 The Meeting recalled that, pursuant to NAT SPG Conclusion 23/11, the United Kingdom, in consultation with other NAT provider States, had developed a proposal for amendment of the NAT Regional Supplementary Procedures (Doc 7030) in respect of the format of position reports. The processing of the proposal had subsequently reached an impasse since it appeared to be in conflict with Annex 3, Annex 11 and PANS-RAC (Doc 4444) regarding the requirement to distinguish between routine and special air reports. The Meeting was advised that Recommendation 10/1 of the COM/MET/OPS Divisional Meeting (Montreal, 1990) called, inter alia, for a suitable body to update the provisions for both automatic and manually produced air reports and to develop appropriate amendments to all relevant ICAO documents. The Secretariat had suggested that the new body give due consideration to the problems associated with the above proposal for amendment with a view to resolving the problem. The Group was informed that the Director, Air Navigation Bureau, had confirmed that the question of message type designators would be considered by this new body.

5.1.2 The Group was also informed that the question of runway state information being added as supplementary information to routine meteorological reports (METAR) had also been considered by the COM/MET/OPS Divisional Meeting. It had been agreed that the provision of such information should be subject to regional air navigation agreement. Consequently, a proposal for amendment of the NAT ANP, to the effect that the runway state be reported at Keflavik and Reykjavik in accordance with procedures already promulgated for the EUR Region, was being circulated among States and international organizations concerned. In order not to deprive operators of this information unnecessarily, Iceland is taking steps to implement the procedure.

5.1.3 The Group was informed that amendment proposals to the SUPPS concerning NAT MNPS cross-check procedures and MNPS certification, which had been submitted by Canada, had been approved by the President on behalf of the Council. However, the amendment proposal to the SUPPS relating to the operation of transponders, in order to ensure that Mode C was always on, had run into some difficulties because world-wide requirements for continuous operation of transponders on Mode C already exist in PANS-OPS (Doc 8168), Volume I, Part VIII, paragraph 1.1.3. Furthermore, the proposal appeared ambiguous with respect to the operation of transponders beyond a period of thirty minutes after aircraft entry into NAT airspace.

5.1.4 In view of the above comments, the Group agreed that clarification of the SUPPS was indeed necessary. It also agreed that some form of indication of the PANS OPS requirements should be included in the SUPPS. Therefore, the Group agreed that Canada should re-submit an amendment proposal that would eliminate the ambiguity concerning the code to squawk after 30 minutes and the need to cross refer to the relevant PANS OPS provisions.

CONCLUSION 27/29 - AMENDMENT TO THE REGIONAL SUPPLEMENTARY PROCEDURES RELATING TO THE OPERATION OF TRANSPONDERS

That:

a) the NAT Regional SUPPS regarding the operation of transponders in the NAT Region (Doc 7030/4-NAT, Part I, paragraphs 8.0 and 8.1.1) be amended to read:

"8.0 Use of Secondary Surveillance Radar (SSR)
(P-RAC, Part X; P-OPS, Part VIII)

8.1 Operation of transponders

8.1.1 Unless otherwise directed by ATC, pilots of aircraft equipped with SSR flying in NAT flight information regions shall retain the last assigned identity (Mode A) code for a period of 30 minutes after entry into NAT airspace and operate the SSR transponder on Mode A Code 2000 after this period.

Note - This procedures does not affect the use of the special purpose code (7500, 7600, 7700) in cases of unlawful interference, radio failure, interception or emergency. Furthermore, the Procedures for Air Navigation Services Aircraft Operations (PANS-OPS) Volume 1, Part VIII Chapter 1 stipulates the general provisions concerning the operation of transponders.

b) the member from Canada take the necessary steps within the Administration to present a formal proposal for amendment of Doc 7030 to ICAO.

5.1.5 The Group noted that in follow-up to NAT SPG/26 (NAT SPG/26 report, paragraph 2.2.13 refers) the United States submitted an amendment proposal related to the implementation of HF NAT-E family in the NAT Region. This amendment had been approved by the President on behalf of the Council on 9 January 1991. It will be incorporated in the next consolidated amendment to the NAT ANP. Subsequently, the United States submitted a consequential amendment proposal to the SUPPS which is presently awaiting comments from States and international organizations concerned.

5.1.6 The Group recalled the discussions on a proposal to amend the SUPPS in respect of in-flight contingencies and in particular that there had been many attempts to refine them. These efforts had continued in the Pacific Oceanic areas as well as in the Atlantic Region. The commonly held view had been that the current procedures do not adequately address all emergency conditions in light of new system planning considerations. The range of discussions included weather contingencies, diversion across the prevailing traffic flow and turn-back procedures. To address all

the types/scenarios that could take place would probably result in an overly complex procedure. Thus it was apparent that varied situations necessitate a very general procedure with several caveats.

5.1.7 On the basis of the above and after further review of existing procedures and taking into account the implementation of new technologies such as ADS, GNSS and AMSS in the oceanic environment, the Group agreed that amendment to existing in-flight contingency procedures would not, at present, be timely or cost-effective.

5.2 Updating of the NAT Guidance and Information material, the NAT MNPSA Operations Manual and the Manual on International General Aviation

5.2.1 In follow-up to the decision taken at NAT SPG/26 (NAT SPG/26 report, paragraph 5.3.21 refers) to overhaul the NAT Guidance and Information Material concerning Air Navigation in the NAT Region (NAT Doc 001), the Group was presented with a draft version of the document which included several suggestions for change. Following a review of the material, the Group agreed in principle with the draft and it also agreed that the following points be taken into account when preparing the final version:

a) a Glossary of terms is needed;

b) the information contained in Part 1 Chapter 4 and 5 (pages 7-9), although of a general nature, should be included, and should remain in Part 1;

c) the material contained in Part V and in particular paragraphs 4.4, 4.5 and 4.6 should be retained. It was felt, however, that when reference was made to national procedures a caveat should be added to the effect that National AIPs must be consulted;

d) the main text of Appendix E should be included in the main body of the document; however, the message formats would be retained as appendices;

e) the duties of the CMA should be included in Part IV;

f) the details from individual State sources must be brought up to date;

g) the inclusion of future plans in the document would also need to be reflected in operations manuals;

h) the VHF coverage at the levels shown, at the moment, may not reflect the needs of those operators who require levels close to MNPS levels; therefore it may be necessary to consider other VHF coverage levels;

i) some amendments would be necessary within the paragraph describing tactical monitoring;

j) because it might be difficult, in the future, to maintain a corresponding by numbered edition of the Guidance Material and the MNPS Operations Manual and the fact that there now is an IGA operations Manual (1st edition), the document be published as the 6th Edition; and

h) some changes may be necessary to the MNPS Operations Manual.

5.2.2 The Group agreed that every effort should be made to ensure that the amended edition be published by 1 November 1991. In order to meet this deadline, it was agreed that States should send their comments to the United Kingdom as soon as possible and, in any event by 1 August 1991. The comments would be incorporated into the draft which would then be circulated for final review prior to publication.

5.2.3 The Group was also presented with revised Loran C coverage diagrams which it agreed should be included in the new edition of the Guidance Material.

5.2.4 The Group then considered the first edition of the IGA Operations Manual which had been published by the United States on 1 November 1990. The Group expressed its appreciation to the United States for undertaking the task and noted that, to date, insufficient comments had been received to warrant an amendment. The Group was also informed that the French version was now available and that translation into Russian is pending; however the status of the Spanish version was unknown.

AGENDA ITEM 6: UPDATING OF THE WORK PROGRAMME OF THE NAT SPG

6.0 Introduction

6.0.1 Under this item the Group considered the following items:

a) review of the work programme;

b) arrangements for the next meeting;

6.1 Review of the future work programme

6.1.1 The Group undertook its customary review of its future work programme, updating and amending it as required. As a result of this review and taking into account the agreement that the NAT ID be the framework for future planning, the following items were retained:

PART I - AIR NAVIGATION SYSTEM SAFETY PERFORMANCE REVIEW

1. Review of Gross Navigational Errors
(Scrutiny: Rapporteur United Kingdom):

   a) lateral performance;

   b) longitudinal performance;

   c) vertical performance; and

2. Review of in-flight contingencies.

3. Lateral collision risk estimation
(Mathematicians: Rapporteur United Kingdom):

   a) occupancy;

   b) lateral collision risk;

   c) review of MNPS criteria;

   d) core lateral performance; and

   e) review of the basic model and assumed parameter values.

4. Short and long-term contingency (fall-back) procedures, alternative track structures and the target level of safety.

5. Mathematical/statistical issues relating to vertical and longitudinal collision risk.

PART II - AIR NAVIGATION SYSTEM OPERATIONS REVIEW

1. Air Traffic Services Operations:

   a) application and refinement of separation standards;

   b) domestic/oceanic interface and transition problems adjacent to NAT MNPS airspace;

   c) possible further short-term ATS improvements and determination of action for their implementation;

   d) extended-range twin-engined aircraft operations in the NAT Region;

2. Communications Operations
   (Communications: Rapporteur Denmark):

   a) fixed services; and

   b) mobile services.

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

4. Matters related to Air Traffic Flow Management.

PART III - TECHNOLOGICAL DEVELOPMENTS

1. ATC automation and traffic display systems in Oceanic Area Control Centers.

2. Developments in global navigation satellite systems.

3. Data-link developments.

4. Other technological developments of relevance to the NAT Region.

PART IV - PLANNING AND IMPLEMENTATION IN THE NAT REGION

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

2. Management of the NAT ID

   a) report of the ATM group;

   b) report of the ADS development group;

   c) report of the OLDI group;

d) report of the VSI group; and

e) report on the management of the NAT ID.

3. Possible extension of MNPS airspace.

4. Preparation for the Limited NAT Regional Air Navigation (RAN) Meeting (1992).

5. ICAO activities relevant to planning in the NAT Region

6. ATS operational contingency planning in the NAT Region, as necessary.

PART V - GENERAL MATTERS

1. Status of processing of outstanding proposals for amendment of the NAT Regional Supplementary Procedures and the NAT Regional Air Navigation Plan.

2. Updating of the NAT Guidance and Information Material, the NAT MNPS airspace Operations Manual and the Manual on International General Aviation.

PART VI - WORK PROGRAMME

1. Assignment of lines of action to groups.

6.1.2 In view of the Group's agreement that the NAT ID be the framework for future planning, it was apparent that the method of managing the work programme needed to be reviewed. Furthermore, the Group agreed that the tasks assigned to the various groups which had been created as well as their working methods needed to be clearly defined. Therefore the Group agreed that the following guidelines be followed by all the groups as well as any sub-group created by the four main groups:

1. In view of the complexity of the NAT ID, the first task of all the groups/sub-groups will be to review their terms of reference and report any identified problems and/or omissions to NAT SPG Members.

2. Groups have been allocated lines of actions from the NAT ID. The intent is to identify firstly lines of action which call for activity in the near term - secondly those which don't require immediate action but should be monitored by the appropriate group and actions undertaken later.

3. In the allocation of lines of action, only the primary interest group is identified and that group is expected to liaise with other groups/sub-groups with an interest in the subject. Additionally the primary interest group must co-ordinate with the ICAO European Office Secretariat to ensure that:

a) the maintenance of the NAT ID is facilitated;

b) the Secretary is kept fully aware of developments by all the groups/sub-groups;

c) additions, time scale changes, etc. to lines of action are identified to the Secretary.

6.1.3 The Group then addressed each of the four groups that were agreed to during the course of the meeting (Attachments A, B, C and D to the report on Agenda Item 6). It nominated a rapporteur for each group, reviewed the lines of action assigned to each one and agreed on their terms of reference. When discussing the composition of the groups, many participants were unable to make firm commitments. The Group noted this and agreed that the Secretary should be informed by 15 July 1991 of their intentions as well as an initial schedule of meetings. The Group also noted and agreed that the ICAO European Office will only provide Secretaries to the four groups. All sub-groups which may be created would have to nominate their own secretaries.

6.1.4 The Group noted that the Future NAT ATS Concept will have a significant impact on the interfaces on both sides of the Atlantic. Accordingly, the Group agreed that all of the groups should be informed of the need to pay particular attention to these interfaces and that the Secretary of the NAT SPG ensures that the necessary co-ordination is carried out with other planning bodies or concerned States.

CONCLUSION 27/30 - CO-ORDINATION BETWEEN NAT/NAM/EUR REGIONS

That:

a) all NAT SPG working groups pay particular attention to planning which might affect the interfaces between the NAT/NAM and the NAT/EUR Regions; and

b) the Secretary of the NAT SPG ensures that the co-ordination required as the result of the above is carried out with all concerned.

6.1.5 The Group then examined all of the lines of action in the NAT ID. It assigned each line of action to one of the four groups as well as to the Mathematicians, the COM group and the CMA. (Attachment E to the report on Agenda Item 6 refers). In addition to the lines of action specifically assigned to the Mathematicians, it was noted that they would have to provide support to all the groups in order to assist them to carry out their tasks. The Mathematicians work programme is at paragraph 1.2.7.1.

6.1.6 In concluding its discussions on this matter, the Group agreed that the review of the working methods and assignment of lines of actions be added to the work programme.

6.2 Arrangements for the next meeting

6.2.1 The Group agreed that yearly meetings are required to review the NAT system. Also, in order to permit the timely processing of documentation for the planned LIM NAT RAN Meeting (end of 1992) sufficient time must be allowed for so that the working groups can progress their assigned tasks. Therefore, the Group agreed that its next meeting be held in Paris from 18 to 29 May 1992. The Group also agreed that every effort should be made to ensure that all papers to be presented to NAT SPG/28 reach the Secretary at least 30 days in advance of the meeting.

ATTACHMENT A

ON-LINE DATA INTERCHANGE (OLDI) GROUP

Rapporteur: United Kingdom

Secretary: European Office of ICAO

Members: Canada, Iceland, Ireland, Portugal, United States

TERMS OF REFERENCE

- To introduce a common Interface Control Document (ICD) into operational service
- To monitor the ICD once operational
- To recommend required changes to the ICD to NAT SPG
- To progress those changes when adopted into operational service
- To ensure database compatibility
- To standardize air/ground message formats transmitted from receiving stations to appropriate Oceanic Area Control Centres
- To ensure standardization of data link messages to support current trials
- To address other OLDI matters as deemed necessary
- To report to NAT SPG/28

Lines of action allocated to OLDI Group:

2.1
5.3
5.11
5.12
5.13

ATTACHMENT B

AUTOMATIC DEPENDENT SURVEILLANCE (ADS) DEVELOPMENT GROUP

Rapporteur: Canada

Secretary: European Office of ICAO

Members: Canada, Denmark*, France, Iceland, Ireland, Netherlands, Portugal, United Kingdom, United States, Union of Soviet Socialist Republics, IATA, IFALPA

Observers: Inmarsat, ARINC/SITA Joint Venture

TERMS OF REFERENCE

- To co-ordinate pre-operational engineering trials in the NAT Region and to oversee the work related to ADS which is specified in Chapter 4 of the NAT Implementation Document
- To consider the objectives at Attachment B to the report on Agenda Item 3
- To define requirements in terms of the possible carriage and use of ADS in the NAT MNPS airspace
- To address other ADS related issues as deemed necessary
- To report to NAT SPG/28

Lines of action allocated to ADS Development Group

1.4
1.5
3.4
4.2
5.1
5.2
5.7

* Represented by Iceland

ATTACHMENT C

AIR TRAFFIC MANAGEMENT (ATM) GROUP

Rapporteur: United States

Secretary: European Office of ICAO

Members: Canada, Denmark, France, Iceland, Ireland, Netherlands, Portugal, United Kingdom, United States, IATA, IFALPA

TERMS OF REFERENCE

- To review and agree on a common application of separation criteria capable of being clearly interpreted by operational controllers and suitable for automated implementation
- To develop a common approach to contingency planning for the NAT Region
- To develop a plan for the establishment of Air Traffic Flow Management service with computer assistance as required
- To develop draft procedures for reduced lateral separation to 30 NM
- To develop draft procedures for reduced longitudinal separation to 5 minutes
- To develop common approach to airspace reservations
- To address other related issues as deemed necessary
- To report to NAT SPG/28

Lines of action allocated to ATM Group

1.2	6.1
1.3	6.2
3.5	6.3
4.1	7.1
5.6	7.2
5.8	7.3
5.9	8.1
5.10	9.1
5.14	10.1
5.15	

ATTACHMENT D-1

VERTICAL SEPARATION IMPLEMENTATION (VSI) GROUP

Rapporteur: United Kingdom

Secretary: European Office of ICAO

Members: Sub-group rapporteurs plus advisers as needed, Mathematicians, France, IATA, IFALPA, EUROCONTROL

TERMS OF REFERENCE

- To co-ordinate the activities of 3 sub-groups - ATC, OPS/AIR, AIRSPACE.
- To report to NAT SPG/28 an expanded implementation strategy for reduced vertical separation of 1000 ft between FL290 and FL410.
- To prepare the working paper for submission to the RAN Meeting scheduled for the autumn of 1992.

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

3.3
5.4

ATTACHMENT D-2

VSIG

ATC SUB-GROUP

Rapporteur: United States

Members: Canada, Denmark*, Iceland, Portugal, United Kingdom, United States, IATA, IFALPA

TERMS OF REFERENCE

- Agree on in-flight contingency procedures applicable in NAT reduced Vertical Separation Minimum airspace
- Review phraseology employed in ATC clearances
- Clarify use of airspace reservations
- Determine ATC's role in all monitoring processes
- Define additional ATC requirements
- Prepare draft amendments to relevant ATC documentation
- Review detailed implementation plan in connection with ATC aspects and the overall strategy
- Address other relevant issues and co-ordinate with the other groups
- Provide progress reports to NAT VSIG

* Represented by Iceland

ATTACHMENT D-3

VSIG

OPS/AIR SUB-GROUP

Rapporteur: United States

Members: Canada, Ireland, Portugal*, United Kingdom, United States, USSR, IATA, IFALPA

TERMS OF REFERENCE

- Provide representation on and to monitor the work of the Federal Aviation Administration/Joint Aviation Authority (FAA/JAA) Group tasked with the development of Minimum Aircraft System Performance Specification and airworthiness approval procedures
- Develop guidance for States on routine and periodic maintenance requirements covering rules/regulations; procedures, manuals, training and spares documentation and minimum equipment lists
- Develop guidance on the requirements and methodology for the approval of operators
- Co-ordinate with the ATC sub-group regarding measures to reduce operational errors, possible use of track offset facilities, in-flight contingency procedures, and procedures for IFR only operations
- Initiate necessary action to amend relevant aeronautical charts
- Address other operational/airworthiness issues
- Provide progress reports to NAT VSIG

* Participation in the group to be confirmed

ATTACHMENT D-4

VSIG

AIRSPACE MONITORING SUB-GROUP

Rapporteur: United Kingdom

Members: Canada, Portugal*, United Kingdom, United States, EUROCONTROL

TERMS OF REFERENCE

- Finalise Height Monitoring Unit (HMU) specifications
- Agree on the optimum number and location of HMUs
- Establish the mechanism for the completion of the duties of the Regional Monitoring Agency
- Develop the necessary documentation for the reports of height deviations and the routine monthly monitoring letter (graphs and tables)
- Investigate and develop the principle of a National/Central Data Base of approved users
- Provide progress reports to NAT VSIG

* Participation in the group to be confirmed

ATTACHMENT E

THE NAT ID LINES OF ACTION ARE ALLOCATED AS FOLLOWS:

OLDI Group	ADS Group	ATM Group		VSI Group and sub-groups
2.1	1.4	1.2	6.1	3.3
5.3	1.5	1.3	6.2	5.4
5.11	3.4	3.5	6.3	
5.12	4.2	4.1	7.1	
5.13	5.1	5.6	7.2	
	5.2	5.8	7.3	
	5.7	5.9	8.1	
		5.10	9.1	
		5.14	10.1	
		5.15		

Additionally, some lines of action were identified as being more appropriate to existing NAT SPG bodies. These are as follows:

COMM Group	MATHS Group	Central Monitoring Agency
1.1	3.1	5.5
2.2	3.2	
	3.6	

Lines of action associated with NAT ID, Chapter 11, Human Resources, were not allocated to specific groups as they need to be further developed by NAT SPG Members and individual States.

AGENDA ITEM 7: ANY OTHER BUSINESS

7.1 Oceanic clearances

7.1.1 The Group was informed that, on 1 May 1991, Gander OAC commenced a trial during which the term "flight plan route" is used in the issuance of oceanic clearances to eastbound, transatlantic aircraft who will be proceeding on their flight plan route. The following requirements are to be met in the application of this trial procedure:

a) applicable for eastbound NAT traffic only transiting the Gander Domestic and Gander Oceanic FIRs;

b) the clearance shall, at the minimum, include:

- aircraft identification
- clearance limit
- flight level(s)
- speed/Mach number

c) a detailed clearance readback, including route, is required from the aircraft.

7.1.2 The Group was further informed that Gander OAC issued a NOTAM (C0786/91) on 24 April 1991 concerning this trial and that additional information regarding the trial is contained in the daily (eastbound) Organized Track Message. If the trial results are favourable, it is Canada's intention to recommend to NAT SPG/28 appropriate changes to ICAO documentation of formalize the procedure.

7.2 Participation in the work of NAT SPG

7.2.1 The Group considered the International Federation of Air Traffic Control Association's (IFATCA) request to become an observer in the NAT SPG. Mindful of the need to keep the size of the Group as small as possible, the Group nevertheless agreed that IFATCA should be invited to NAT SPG meetings because of their ability to contribute to this meeting and in recognition that the implementation of the Future NAT ATS Concept will have a significant impact on the way air traffic controllers carry out their tasks in the future. Accordingly, the Group agreed that the Secretary undertake the necessary steps to enable the Group to invite IFATCA to future meetings.

7.2.2 The Group learnt with regret that Mr. Paul Wood, the Member from the United Kingdom, would be leaving. It expressed its appreciation for Mr. Wood's outstanding contributions and particularly as regards the leadership he showed in the development of the NAT ID.

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